

Chapter 2: Atomic Structure

1. Which of the following statements is true about the electron in Bohr's model of the atom?

- A) Electrons revolve around the nucleus in elliptical orbits.
- B) Electrons revolve in fixed circular orbits without radiating energy.
- C) Electrons are at rest in fixed positions.
- D) Electrons can exist anywhere in the atom.

Correct Option: B) Electrons revolve in fixed circular orbits without radiating energy.

2. The quantum number that determines the shape of an orbital is:

- A) Principal quantum number
- B) Magnetic quantum number
- C) Azimuthal quantum number
- D) Spin quantum number

Correct Option: C) Azimuthal quantum number

3. Which of the following is the maximum number of electrons that can occupy an 'f' orbital?

- A) 2
- B) 6
- C) 10
- D) 14

Correct Option: D) 14

4. What is the value of the principal quantum number for the first shell of an atom?

- A) 1
- B) 2

C) 3

D) 0

Correct Option: A) 1

5. Who proposed the concept of quantized energy levels in atoms?

A) Rutherford

B) Bohr

C) Thomson

D) Planck

Correct Option: B) Bohr

6. What is the maximum number of electrons that can be present in the third energy level ($n = 3$)?

A) 2

B) 8

C) 18

D) 32

Correct Option: C) 18

7. The energy associated with an electron in an atom is quantized and can only have certain values. This concept was introduced by:

A) Bohr

B) Planck

C) Einstein

D) Heisenberg

Correct Option: B) Planck

8. Which quantum number describes the orientation of an orbital in space?

A) Principal quantum number

B) Azimuthal quantum number

C) Magnetic quantum number

D) Spin quantum number

Correct Option: C) Magnetic quantum number

9. What does the Pauli Exclusion Principle state?

A) Two electrons in the same orbital must have opposite spins.

B) Electrons in the same shell must have the same energy.

C) Electrons must be arranged in increasing order of energy.

D) All orbitals must be filled before pairing occurs.

Correct Option: A) Two electrons in the same orbital must have opposite spins.

10. The number of subshells in the second energy level ($n = 2$) is:

A) 1

B) 2

C) 3

D) 4

Correct Option: B) 2

11. Which of the following describes the shape of the 'p' orbital?

A) Spherical

B) Dumbbell-shaped

C) Double dumbbell-shaped

D) Complex

Correct Option: B) Dumbbell-shaped

12. In the Bohr model, the radius of an electron's orbit is proportional to:

A) The square of the principal quantum number (n^2).

B) The cube of the principal quantum number (n^3).

C) The square root of the principal quantum number.

D) The inverse of the principal quantum number.

Correct Option: A) The square of the principal quantum number (n^2).

13. Which subatomic particle is responsible for the negative charge of an atom?

- A) Proton
- B) Neutron
- C) Electron
- D) Photon

Correct Option: C) Electron

14. The maximum number of electrons that can occupy the second shell ($n = 2$) is:

- A) 2
- B) 8
- C) 10
- D) 18

Correct Option: B) 8

15. What does the Heisenberg Uncertainty Principle state?

- A) The position and momentum of a particle can be known precisely.
- B) The position and momentum of a particle cannot be known simultaneously with perfect accuracy.
- C) Electrons move in fixed orbits around the nucleus.
- D) The energy of an electron is quantized.

Correct Option: B) The position and momentum of a particle cannot be known simultaneously with perfect accuracy.

16. In which region of the atom is the proton located?

- A) Electron cloud
- B) Nucleus
- C) Outer orbitals
- D) Shells

Correct Option: B) Nucleus

17. Which of the following particles has a mass nearly equal to that of a proton?

- A) Neutron
- B) Electron
- C) Positron
- D) Photon

Correct Option: A) Neutron

18. The atomic number of an element corresponds to:

- A) The number of neutrons in the nucleus
- B) The number of protons in the nucleus
- C) The number of electrons in an atom
- D) The number of orbitals in the atom

Correct Option: B) The number of protons in the nucleus

19. Which of the following quantum numbers determines the spin orientation of an electron?

- A) Principal quantum number
- B) Azimuthal quantum number
- C) Magnetic quantum number
- D) Spin quantum number

Correct Option: D) Spin quantum number

20. The region where the probability of finding an electron is highest is called the:

- A) Orbital
- B) Shell
- C) Nucleus
- D) Energy level

Correct Option: A) Orbital

21. The shape of a 'd' orbital is:

- A) Spherical
- B) Dumbbell-shaped
- C) Double dumbbell-shaped
- D) Complex

Correct Option: C) Double dumbbell-shaped

22. The energy of an electron in a hydrogen atom is:

- A) Negative
- B) Zero
- C) Positive
- D) Infinite

Correct Option: A) Negative

23. The maximum number of electrons in the fourth shell is:

- A) 8
- B) 18
- C) 32
- D) 64

Correct Option: C) 32

24. What is the main limitation of Bohr's model of the atom?

- A) It could not explain the spectra of multi-electron atoms.
- B) It could not explain the mass of the electron.

C) It could not explain the quantum behavior of particles.

D) It could not explain the existence of neutrons.

Correct Option: A) It could not explain the spectra of multi-electron atoms.

25. The electron configuration for the element with atomic number 8 is:

A) $1s^2 2s^2 2p^4$

B) $1s^2 2s^2 2p^2$

C) $1s^2 2p^6$

D) $1s^2 2p^3$

Correct Option: A) $1s^2 2s^2 2p^4$

26. Which subatomic particle was discovered by J.J. Thomson?

A) Proton

B) Neutron

C) Electron

D) Photon

Correct Option: C) Electron

27. The number of orbitals in the $n = 3$ shell is:

A) 1

B) 3

C) 5

D) 9

Correct Option: C) 5

28. The Bohr radius is:

- A) The size of the electron orbit
- B) The distance between nucleus and electron
- C) The size of the nucleus
- D) The radius of the atom's outermost shell

Correct Option: B) The distance between nucleus and electron

29. Which of the following quantum numbers determines the energy of an electron in an atom?

- A) Principal quantum number
- B) Azimuthal quantum number
- C) Magnetic quantum number
- D) Spin quantum number

Correct Option: A) Principal quantum number

30. The magnetic quantum number indicates:

- A) The size of the orbital
- B) The energy of the electron
- C) The shape of the orbital
- D) The orientation of the orbital

Correct Option: D) The orientation of the orbital

31. The electron cloud is:

- A) A dense region where electrons are most likely to be found
- B) The path electrons follow in orbits
- C) A fixed path that electrons follow
- D) The nucleus of the atom

Correct Option: A) A dense region where electrons are most likely to be found

32. The maximum number of electrons that can occupy the 'p' subshell is:

- A) 2
- B) 6
- C) 10
- D) 14

Correct Option: B) 6

33. The quantum number that specifies the spin direction of an electron is:

- A) Principal quantum number
- B) Azimuthal quantum number
- C) Magnetic quantum number
- D) Spin quantum number

Correct Option: D) Spin quantum number

34. Which of the following is the value of the principal quantum number for the third energy level?

- A) 1
- B) 2
- C) 3
- D) 4

Correct Option: C) 3

35. Which scientist introduced the concept of wave-particle duality of matter?

- A) Bohr
- B) Einstein
- C) De Broglie
- D) Planck

Correct Option: C) De Broglie

36. The number of electrons in an atom of element with atomic number 17 is:

- A) 8
- B) 17
- C) 35
- D) 34

Correct Option: B) 17

37. The atomic mass unit (amu) is based on the mass of:

- A) Proton
- B) Neutron
- C) Electron
- D) Carbon-12 isotope

Correct Option: D) Carbon-12 isotope

38. The principal quantum number (n) indicates the:

- A) Shape of the orbital
- B) Energy level and distance from nucleus
- C) Orientation of the orbital
- D) Spin direction of an electron

Correct Option: B) Energy level and distance from nucleus

39. The concept of electron shells was first proposed by:

- A) Rutherford
- B) Bohr
- C) Thomson
- D) Heisenberg

Correct Option: B) Bohr

40. The electron configuration of an atom with atomic number 11 is:

- A) $1s^2 2s^2 2p^6 3s^1$
- B) $1s^2 2s^2 2p^6 3p^1$
- C) $1s^2 2s^2 3s^2$
- D) $1s^2 2s^2 2p^3$

Correct Option: A) $1s^2 2s^2 2p^6 3s^1$

41. The first energy level ($n=1$) can hold a maximum of:

- A) 2 electrons
- B) 8 electrons
- C) 18 electrons
- D) 32 electrons

Correct Option: A) 2 electrons

42. The de Broglie wavelength of an electron depends on:

- A) Mass of the electron
- B) Velocity of the electron
- C) Both mass and velocity of the electron
- D) Charge of the electron

Correct Option: C) Both mass and velocity of the electron

43. The magnetic quantum number (m) determines the:

- A) Shape of the orbital
- B) Orientation of the orbital
- C) Size of the orbital

D) Energy of the orbital

Correct Option: B) Orientation of the orbital

44. Which of the following statements about the Bohr model is true?

A) It explains the hydrogen spectrum

B) It predicts the exact location of electrons

C) It is applicable to all elements

D) It describes electron paths as fixed orbits

Correct Option: A) It explains the hydrogen spectrum

45. The dual nature of matter was proposed by:

A) Einstein

B) Bohr

C) Heisenberg

D) De Broglie

Correct Option: D) De Broglie

46. The number of orbitals in the p subshell is:

A) 1

B) 2

C) 3

D) 4

Correct Option: C) 3

47. The magnetic quantum number for a 4d orbital is:

A) -2 to +2

B) -3 to +3

C) -1 to +1

D) 0 to +1

Correct Option: A) -2 to +2

48. The total number of orbitals in the $n = 3$ shell is:

- A) 3
- B) 9
- C) 18
- D) 12

Correct Option: B) 9

49. Which of the following is true according to the Aufbau principle?

- A) Electrons fill the highest energy orbitals first
- B) Electrons fill orbitals in order of increasing energy
- C) Electrons fill orbitals randomly
- D) Electrons never occupy the same orbital

Correct Option: B) Electrons fill orbitals in order of increasing energy

50. The energy of an electron in an atom increases as:

- A) The principal quantum number increases
- B) The magnetic quantum number increases
- C) The azimuthal quantum number increases
- D) The spin quantum number increases

Correct Option: A) The principal quantum number increases

51. Which of the following quantum numbers determines the shape of an orbital?

- A) Principal quantum number
- B) Azimuthal quantum number
- C) Magnetic quantum number
- D) Spin quantum number

Correct Option: B) Azimuthal quantum number

52. The maximum number of electrons that can occupy the p orbitals in any shell is:

- A) 2
- B) 6
- C) 10
- D) 18

Correct Option: B) 6

53. Which of the following elements has an electron configuration that ends with $2p^6 3s^2 3p^6$?

- A) Neon
- B) Sodium
- C) Argon
- D) Calcium

Correct Option: C) Argon

54. The value of the spin quantum number for an electron can be:

- A) 0 or 1
- B) $+1/2$ or $-1/2$
- C) 0 or -1
- D) +1 or -1

Correct Option: B) $+1/2$ or $-1/2$

55. The Heisenberg uncertainty principle is best described as:

- A) The impossibility of determining the exact location and velocity of an electron simultaneously
- B) The impossibility of determining the energy of an electron
- C) The uncertainty in the value of quantum numbers
- D) The uncertainty in the number of protons in the nucleus

Correct Option: A) The impossibility of determining the exact location and velocity of an electron simultaneously

56. The angular momentum quantum number (l) for an s orbital is:

- A) 0
- B) 1
- C) 2
- D) 3

Correct Option: A) 0

57. Which of the following electrons has the highest energy?

- A) 1s
- B) 2s
- C) 2p
- D) 3s

Correct Option: C) 2p

58. The energy of an electron in an atom is quantized, which means it can only:

- A) Take on any value
- B) Change at random
- C) Exist in specific energy levels
- D) Be affected by external fields

Correct Option: C) Exist in specific energy levels

59. The electron in an atom of hydrogen is most stable when it is in:

- A) The ground state
- B) The first excited state
- C) The second excited state
- D) The third excited state

Correct Option: A) The ground state

60. The atomic number of an element is determined by the number of:

- A) Neutrons
- B) Electrons
- C) Protons
- D) Neutrons and protons

Correct Option: C) Protons

61. Which of the following orbitals has the highest energy?

- A) 3s
- B) 2p
- C) 3p
- D) 3d

Correct Option: D) 3d

62. Which of the following statements about orbitals is true?

- A) An s orbital is spherical in shape
- B) A p orbital is spherical in shape
- C) A d orbital has no defined shape
- D) An f orbital is a single lobe

Correct Option: A) An s orbital is spherical in shape

63. Which of the following best describes the shape of a p orbital?

- A) Spherical
- B) Dumbbell-shaped
- C) Clover-shaped
- D) Circular

Correct Option: B) Dumbbell-shaped

64. What is the maximum number of electrons that can occupy the fourth shell ($n=4$)?

- A) 8
- B) 18

C) 32

D) 50

Correct Option: C) 32

65. The value of the magnetic quantum number (m) for a 4p orbital is:

A) -1

B) -2 to +2

C) -3 to +3

D) -1 to +1

Correct Option: B) -2 to +2

66. Which quantum number describes the orientation of an orbital in space?

A) Principal quantum number

B) Magnetic quantum number

C) Azimuthal quantum number

D) Spin quantum number

Correct Option: B) Magnetic quantum number

67. Which of the following is the correct order of increasing energy for orbitals?

A) $1s < 2s < 2p < 3s < 3p$

B) $1s < 2p < 2s < 3p < 3s$

C) $2s < 1s < 3p < 2p$

D) $2p < 1s < 3s < 2s$

Correct Option: A) $1s < 2s < 2p < 3s < 3p$

68. The quantum number $n = 4$ corresponds to which energy level?

A) Fourth

B) Second

C) Third

D) Fifth

Correct Option: A) Fourth

69. The concept of electron shells and orbitals was first introduced by:

A) Rutherford

B) Bohr

C) Schrödinger

D) Heisenberg

Correct Option: B) Bohr

70. What is the maximum number of electrons in the p subshell?

A) 2

B) 6

C) 8

D) 10

Correct Option: B) 6

Chapter 3: Chemical Bonding

1. The bond formed by the sharing of electrons between atoms is called:

A) Ionic bond

B) Covalent bond

C) Metallic bond

D) Hydrogen bond

Correct Option: B) Covalent bond

2. The type of bond formed between two metals is:

A) Ionic bond

B) Covalent bond

C) Metallic bond

D) Coordinate bond

Correct Option: C) Metallic bond

3. In an ionic bond, electrons are:

A) Shared

B) Donated

C) Accepted

D) Transferred

Correct Option: D) Transferred

4. A molecule with a linear shape typically has:

A) Two bonding pairs

B) Three bonding pairs

C) Four bonding pairs

D) No bonding pairs

Correct Option: A) Two bonding pairs

5. The octet rule states that atoms tend to gain, lose, or share electrons to have:

A) Four electrons

B) Six electrons

C) Eight electrons

D) Ten electrons

Correct Option: C) Eight electrons

6. The electronegativity difference between atoms in a covalent bond is:

A) 0

B) Less than 0.5

C) 0.5 to 1.7

D) Greater than 1.7

Correct Option: B) Less than 0.5

7. The ion formed by chlorine (Cl) in an ionic bond is:

- A) Cl^-
- B) Cl^+
- C) Cl^{2-}
- D) Cl^{2+}

Correct Option: A) Cl^-

8. The lattice energy of an ionic compound depends on the:

- A) Atomic mass
- B) Electronegativity difference
- C) Size of ions
- D) Covalent radius

Correct Option: C) Size of ions

9. Which molecule has a polar covalent bond?

- A) O_2
- B) Cl_2
- C) H_2O
- D) N_2

Correct Option: C) H_2O

10. The bond angle in a trigonal planar molecule is:

- A) 90°
- B) 120°
- C) 180°
- D) 109.5°

Correct Option: B) 120°

11. The number of electrons involved in a double bond is:

- A) 2
- B) 4
- C) 6
- D) 8

Correct Option: B) 4

12. A covalent bond is formed when atoms share:

- A) Neutrons
- B) Protons
- C) Electrons
- D) Nuclei

Correct Option: C) Electrons

13. Which element commonly forms a triple bond with nitrogen?

- A) Oxygen
- B) Carbon
- C) Hydrogen
- D) Phosphorus

Correct Option: B) Carbon

14. The shape of a molecule with two bonding pairs and two lone pairs is:

- A) Linear
- B) Tetrahedral
- C) Bent
- D) Triangular

Correct Option: C) Bent

15. The type of bond formed by the transfer of electrons is:

- A) Covalent bond
- B) Ionic bond
- C) Metallic bond
- D) Polar bond

Correct Option: B) Ionic bond

16. The dipole moment in a molecule arises due to:

- A) Sharing of electrons
- B) Unequal sharing of electrons
- C) Equal sharing of electrons
- D) Movement of electrons

Correct Option: B) Unequal sharing of electrons

17. The electron pair repulsion theory is used to predict:

- A) Bond angles
- B) Lattice energy
- C) Ionization energy
- D) Atomic radius

Correct Option: A) Bond angles

18. The bond between sodium (Na) and chlorine (Cl) is:

- A) Ionic
- B) Covalent
- C) Metallic
- D) Hydrogen

Correct Option: A) Ionic

19. The molecule with the highest electronegativity difference is:

- A) HCl
- B) NaCl
- C) Cl_2
- D) O_2

Correct Option: B) NaCl

20. Which bond has the highest ionic character?

- A) F-F
- B) Na-Cl
- C) H-F
- D) O-H

Correct Option: B) Na-Cl

21. Which of the following molecules has a tetrahedral shape?

- A) CH_4
- B) NH_3
- C) H_2O
- D) CO_2

Correct Option: A) CH_4

22. The energy required to break a bond is known as:

- A) Lattice energy
- B) Ionization energy
- C) Bond dissociation energy

D) Electron affinity

Correct Option: C) Bond dissociation energy

23. A molecule with a trigonal bipyramidal shape has how many bonding pairs?

A) 2

B) 3

C) 5

D) 6

Correct Option: C) 5

24. The bond order in a molecule refers to the:

A) Number of bonds between two atoms

B) Distance between two atoms

C) Electronegativity difference

D) Size of atoms

Correct Option: A) Number of bonds between two atoms

25. Which molecule has a bond angle of 120° ?

A) CO_2

B) H_2O

C) NH_3

D) BF_3

Correct Option: D) BF_3

26. The bond formed between a metal and a nonmetal is:

- A) Covalent bond
- B) Ionic bond
- C) Metallic bond
- D) Polar bond

Correct Option: B) Ionic bond

27. Which of the following has the highest electronegativity?

- A) Oxygen
- B) Nitrogen
- C) Fluorine
- D) Chlorine

Correct Option: C) Fluorine

28. In a covalent bond, electrons are:

- A) Completely transferred
- B) Shared equally
- C) Shared unequally
- D) Absorbed by the nucleus

Correct Option: B) Shared equally

29. The ionic bond is formed between:

- A) Two non-metals
- B) Two metals
- C) A metal and a nonmetal
- D) Two electrons

Correct Option: C) A metal and a nonmetal

30. The octet rule is mainly applicable to which types of elements?

- A) Transition metals
- B) Alkali metals
- C) Halogens
- D) Noble gases

Correct Option: C) Halogens

31. Which of the following molecules is nonpolar?

- A) H_2O
- B) CO_2
- C) NH_3
- D) CH_4

Correct Option: B) CO_2

32. Which bond is formed by the overlap of 's' and 'p' orbitals?

- A) Sigma bond
- B) Pi bond
- C) Ionic bond
- D) Coordinate bond

Correct Option: A) Sigma bond

33. The number of lone pairs on the nitrogen atom in NH_3 is:

- A) 1
- B) 2
- C) 3
- D) 0

Correct Option: A) 1

34. Which of the following is an example of a coordinate bond?

- A) H_2O
- B) NH_3
- C) CO_2
- D) NH_4^+

Correct Option: D) NH_4^+

35. The bond angle in a tetrahedral molecule is approximately:

- A) 90°
- B) 120°
- C) 109.5°
- D) 180°

Correct Option: C) 109.5°

36. The bond type in a molecule with high electronegativity difference is:

- A) Polar covalent bond
- B) Nonpolar covalent bond
- C) Ionic bond
- D) Metallic bond

Correct Option: C) Ionic bond

37. The energy released when an ionic bond is formed is called:

- A) Ionization energy
- B) Electron affinity
- C) Lattice energy
- D) Electronegativity

Correct Option: C) Lattice energy

38. Which molecule has a bent shape due to lone pair repulsion?

- A) CO_2
- B) NH_3
- C) H_2O
- D) CH_4

Correct Option: C) H_2O

39. The hybridization of carbon in CH_4 is:

- A) sp
- B) sp^2
- C) sp^3
- D) sp^3d

Correct Option: C) sp^3

40. Which of the following molecules has a bond order of 1?

- A) O_2
- B) N_2
- C) Cl_2
- D) H_2

Correct Option: C) Cl_2

41. The electron cloud in a covalent bond is:

- A) Spherical
- B) Pointed
- C) Non-uniform
- D) Uniform

Correct Option: D) Uniform

42. The bond angle in a linear molecule is:

- A) 90°
- B) 120°
- C) 180°
- D) 109.5°

Correct Option: C) 180°

43. Which of the following molecules exhibits ionic bonding?

- A) NaCl
- B) H_2O
- C) O_2
- D) CO_2

Correct Option: A) NaCl

44. The hybridization of the central atom in CO_2 is:

- A) sp
- B) sp^2
- C) sp^3
- D) sp^3d

Correct Option: A) sp

45. In which molecule is the central atom sp^3 hybridized?

- A) CO_2
- B) NH_3
- C) CH_4

D) H_2O

Correct Option: C) CH_4

46. A molecule formed by the overlap of two p orbitals will form:

A) Sigma bond

B) Pi bond

C) Ionic bond

D) Coordinate bond

Correct Option: B) Pi bond

47. The bond length in a triple bond is:

A) Longer than in a double bond

B) Shorter than in a double bond

C) Same as in a double bond

D) Irrelevant

Correct Option: B) Shorter than in a double bond

48. The bond angle in a trigonal pyramidal molecule is approximately:

A) 120°

B) 109.5°

C) 90°

D) 180°

Correct Option: B) 109.5°

49. In a covalent bond, the shared electrons are located:

A) Closer to the nucleus of the less electronegative atom

B) Equally between both atoms

C) Closer to the nucleus of the more electronegative atom

D) Distributed randomly

Correct Option: C) Closer to the nucleus of the more electronegative atom

50. Which of the following has a trigonal bipyramidal molecular shape?

A) CH_4

B) BF_3

C) PF_5

D) NH_3

Correct Option: C) PF_5

51. A molecule with polar bonds but no net dipole moment is:

A) CO_2

B) H_2O

C) CH_4

D) NH_3

Correct Option: A) CO_2

52. Which of the following pairs of elements are likely to form an ionic bond?

A) Carbon and Oxygen

B) Sodium and Chlorine

C) Nitrogen and Hydrogen

D) Sulfur and Oxygen

Correct Option: B) Sodium and Chlorine

53. The bond type in Na and Cl in NaCl is:

A) Ionic

B) Covalent

- C) Hydrogen
- D) Polar covalent

Correct Option: A) Ionic

54. Which of the following has a tetrahedral structure?

- A) H_2O
- B) CH_4
- C) CO_2
- D) BF_3

Correct Option: B) CH_4

55. Which of the following molecules has an octahedral shape?

- A) SF_6
- B) H_2O
- C) NH_3
- D) CH_4

Correct Option: A) SF_6

56. Which type of bond is formed by the overlap of 'p' orbitals?

- A) Sigma bond
- B) Pi bond
- C) Ionic bond
- D) Covalent bond

Correct Option: B) Pi bond

57. The total number of bonds in the N_2 molecule is:

- A) 1

- B) 2
- C) 3
- D) 4

Correct Option: C) 3

58. The number of bonding pairs in a molecule with a linear structure is:

- A) 1
- B) 2
- C) 3
- D) 4

Correct Option: B) 2

59. Which of the following compounds has the highest electronegativity difference?

- A) H_2O
- B) NaCl
- C) HCl
- D) CO_2

Correct Option: B) NaCl

60. The shape of a molecule with three bonding pairs and one lone pair is:

- A) Linear
- B) Tetrahedral
- C) Trigonal pyramidal
- D) Trigonal planar

Correct Option: C) Trigonal pyramidal

61. The bond formed by the transfer of electrons between atoms is known as:

- A) Covalent bond
- B) Ionic bond

- C) Metallic bond
- D) Hydrogen bond

Correct Option: B) Ionic bond

62. In which of the following compounds does nitrogen form an ionic bond?

- A) N_2
- B) NaNO_3
- C) NH_3
- D) NO_2

Correct Option: B) NaNO_3

63. The octet rule is applicable to:

- A) Only metals
- B) Only non-metals
- C) Both metals and non-metals
- D) Hydrogen and helium

Correct Option: C) Both metals and non-metals

64. Which of the following molecules contains a covalent bond?

- A) NaCl
- B) MgCl_2
- C) Cl_2
- D) CaO

Correct Option: C) Cl_2

65. The bond between two non-metals is typically:

- A) Ionic
- B) Covalent
- C) Metallic
- D) Coordinate covalent

Correct Option: B) Covalent

66. The lattice energy of an ionic compound is:

- A) Directly proportional to the distance between ions
- B) Inversely proportional to the distance between ions
- C) Unaffected by ionic radius
- D) Directly proportional to the molecular mass

Correct Option: B) Inversely proportional to the distance between ions

67. In a covalent bond, atoms share electrons to achieve:

- A) Stable electron configuration
- B) Increased atomic size
- C) Decreased ionization energy
- D) Increased electronegativity

Correct Option: A) Stable electron configuration

68. The electronegativity difference between two atoms determines:

- A) The bond length
- B) The bond angle
- C) The ionic or covalent character of the bond
- D) The electron affinity

Correct Option: C) The ionic or covalent character of the bond

69. Which of the following molecules has a polar covalent bond?

- A) H_2
- B) CO_2
- C) HCl
- D) N_2

Correct Option: C) HCl

70. In a molecule of water (H_2O), the hydrogen atoms are:

- A) At the center of the molecule
- B) Connected to oxygen by ionic bonds
- C) Bonded to oxygen by covalent bonds
- D) Bonded to oxygen by metallic bonds

Correct Option: C) Bonded to oxygen by covalent bonds

71. The shape of the methane (CH_4) molecule is:

- A) Linear
- B) Tetrahedral
- C) Trigonal planar
- D) Bent

Correct Option: B) Tetrahedral

72. Which of the following elements is most likely to form a covalent bond with oxygen?

- A) Lithium
- B) Sodium
- C) Carbon
- D) Potassium

Correct Option: C) Carbon

73. The bond formed between two atoms with a large difference in electronegativity is:

- A) Non-polar covalent bond
- B) Polar covalent bond
- C) Ionic bond
- D) Hydrogen bond

Correct Option: C) Ionic bond

74. In which of the following substances is a metallic bond present?

- A) NaCl
- B) H₂O
- C) Cu
- D) O₂

Correct Option: C) Cu

75. Which molecule has a trigonal planar geometry?

- A) CH₄
- B) BF₃
- C) NH₃
- D) H₂O

Correct Option: B) BF₃

76. The hybridization of the central atom in CO₂ is:

- A) sp
- B) sp²
- C) sp³
- D) sp³d

Correct Option: A) sp

77. The bond angle in the water molecule is:

- A) 90°
- B) 104.5°
- C) 120°
- D) 180°

Correct Option: B) 104.5°

78. The formal charge on the oxygen atom in O₂²⁻ is:

- A) +1
- B) -1

- C) 0
- D) +2

Correct Option: B) -1

79. The bond formed by the sharing of a lone pair of electrons from one atom to another is called:

- A) Polar covalent bond
- B) Non-polar covalent bond
- C) Coordinate covalent bond
- D) Ionic bond

Correct Option: C) Coordinate covalent bond

80. The structure of sodium chloride (NaCl) is best described as:

- A) A network of covalently bonded atoms
- B) A crystalline structure with alternating ions
- C) A tetrahedral structure
- D) A linear arrangement of ions

Correct Option: B) A crystalline structure with alternating ions

81. Which of the following molecules has a non-polar covalent bond?

- A) Cl_2
- B) CO_2
- C) H_2O
- D) HCl

Correct Option: A) Cl_2

82. The type of bond in the molecule HF is:

- A) Polar covalent bond
- B) Ionic bond
- C) Non-polar covalent bond
- D) Metallic bond

Correct Option: A) Polar covalent bond

83. Which of the following has the strongest bond?

- A) $\text{O}=\text{O}$
- B) $\text{N}\equiv\text{N}$
- C) $\text{C}\equiv\text{C}$
- D) $\text{F}-\text{F}$

Correct Option: B) $\text{N}\equiv\text{N}$

84. The bond order in a molecule is:

- A) The number of bonds between two atoms
- B) The average distance between atoms
- C) The difference in electronegativity
- D) The total number of valence electrons

Correct Option: A) The number of bonds between two atoms

85. In a covalent bond, the electrons are:

- A) Completely transferred
- B) Shared equally
- C) Shared unequally
- D) Lost

Correct Option: C) Shared unequally

86. The bond in H_2O is:

- A) Covalent
- B) Ionic
- C) Metallic
- D) Van der Waals

Correct Option: A) Covalent

87. In an ionic bond, the force of attraction is between:

- A) Two positive ions
- B) Two negative ions
- C) A positive and a negative ion
- D) Two neutral atoms

Correct Option: C) A positive and a negative ion

88. The octet rule states that atoms tend to:

- A) Lose electrons to form stable ions
- B) Achieve a full outer electron shell
- C) Share electrons equally
- D) None of the above

Correct Option: B) Achieve a full outer electron shell

89. Which of the following molecules has a tetrahedral geometry?

- A) CO_2
- B) H_2O
- C) CH_4
- D) NH_3

Correct Option: C) CH_4

90. The bond length in a double bond is:

- A) Shorter than in a single bond
- B) Longer than in a single bond
- C) The same as in a single bond
- D) The longest of all types of bonds

Correct Option: A) Shorter than in a single bond

91. The structure of the ammonia molecule (NH_3) is:

- A) Linear
- B) Trigonal planar

- C) Tetrahedral
- D) Trigonal pyramidal

Correct Option: D) Trigonal pyramidal

92. The electronegativity difference between atoms in a covalent bond is:

- A) Zero
- B) Less than 0.4
- C) Between 0.4 and 1.7
- D) Greater than 1.7

Correct Option: C) Between 0.4 and 1.7

93. Which of the following molecules is held together by hydrogen bonding?

- A) H_2O
- B) O_2
- C) N_2
- D) CO_2

Correct Option: A) H_2O

94. The bond angle in the CO_2 molecule is:

- A) 90°
- B) 120°
- C) 180°
- D) 109.5°

Correct Option: C) 180°

95. The number of valence electrons in a nitrogen atom is:

- A) 1
- B) 3
- C) 5
- D) 7

Correct Option: C) 5

96. The angle between bonds in a trigonal planar molecule is approximately:

- A) 90°
- B) 109.5°
- C) 120°
- D) 180°

Correct Option: C) 120°

97. Which of the following is a characteristic of ionic compounds?

- A) Low melting points
- B) Soluble in non-polar solvents
- C) Good conductors of electricity in the solid state
- D) High melting points

Correct Option: D) High melting points

98. The bond order of the O_2 molecule is:

- A) 1
- B) 2
- C) 3
- D) 4

Correct Option: B) 2

99. The bond angle in a linear molecule is:

- A) 90°
- B) 120°
- C) 180°
- D) 109.5°

Correct Option: C) 180°

100. Which of the following is the strongest bond?

- A) Single bond
- B) Double bond
- C) Triple bond
- D) Ionic bond

Correct Option: C) Triple bond

Chapter 4: Stoichiometry

1. The molar mass of NaCl is:

- A) 58 g/mol
- B) 35.5 g/mol
- C) 22.99 g/mol
- D) 44.99 g/mol

Correct Option: A) 58 g/mol

2. The number of moles in 36 grams of water (H_2O) is:

- A) 1 mole
- B) 2 moles
- C) 3 moles
- D) 0.5 moles

Correct Option: A) 1 mole

3. 4 moles of Na react with chlorine to form NaCl. How many grams of NaCl will be produced? (Molar mass of NaCl = 58 g/mol)

- A) 116 g
- B) 232 g
- C) 58 g

D) 29 g

Correct Option: A) 116 g

4. The limiting reagent in a reaction is the substance that:

A) Is completely consumed

B) Remains in excess

C) Does not participate in the reaction

D) Is produced in the greatest quantity

Correct Option: A) Is completely consumed

5. In the reaction $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$, if 4 moles of H_2 and 2 moles of O_2 are used, how many moles of H_2O will be formed?

A) 4 moles

B) 2 moles

C) 1 mole

D) 6 moles

Correct Option: A) 4 moles

6. The empirical formula of a compound is CH_2O . If its molecular mass is 180 g/mol, the molecular formula is:

A) $\text{C}_6\text{H}_{12}\text{O}_6$

B) CH_2O

C) $\text{C}_4\text{H}_8\text{O}_4$

D) $\text{C}_3\text{H}_6\text{O}_3$

Correct Option: A) $\text{C}_6\text{H}_{12}\text{O}_6$

7. 0.25 moles of NaOH are dissolved in water to make 1 liter of solution. The molarity of NaOH is:

- A) 0.25 M
- B) 1 M
- C) 2 M
- D) 0.5 M

Correct Option: A) 0.25 M

8. What is the mole ratio of H_2 to O_2 in the reaction $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$?

- A) 1:1
- B) 2:1
- C) 2:2
- D) 1:2

Correct Option: B) 2:1

9. 3 moles of oxygen (O_2) will react with how many moles of hydrogen (H_2) in the reaction $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$?

- A) 6 moles
- B) 3 moles
- C) 2 moles
- D) 1 mole

Correct Option: A) 6 moles

10. The percentage composition of oxygen in water (H_2O) is:

- A) 33.3%
- B) 66.6%
- C) 50%
- D) 80%

Correct Option: B) 66.6%

11. What volume of 0.5 M NaOH solution contains 2 moles of NaOH?

- A) 1 L
- B) 2 L
- C) 0.5 L
- D) 0.25 L

Correct Option: B) 2 L

12. The reaction $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$ produces how many grams of NaCl from 1 mole of Na and 1 mole of Cl_2 ?

- A) 58 g
- B) 116 g
- C) 29 g
- D) 60 g

Correct Option: A) 58 g

13. The molar volume of a gas at standard temperature and pressure (STP) is:

- A) 22.4 L
- B) 12.1 L
- C) 24.3 L
- D) 36.2 L

Correct Option: A) 22.4 L

14. The molar mass of calcium carbonate (CaCO_3) is:

- A) 100 g/mol
- B) 150 g/mol
- C) 200 g/mol
- D) 120 g/mol

Correct Option: A) 100 g/mol

15. If 0.5 moles of NaOH react with HCl, how many moles of NaCl will be produced? (Balanced equation: $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$)

- A) 0.5 moles
- B) 1 mole
- C) 2 moles
- D) 0.25 moles

Correct Option: A) 0.5 moles

16. Which of the following is a stoichiometric calculation?

- A) Finding the amount of energy released in a reaction
- B) Determining the pressure of a gas
- C) Finding the mass of a product formed
- D) Calculating the bond length of a molecule

Correct Option: C) Finding the mass of a product formed

17. In a reaction, 2 moles of reactant A produces 3 moles of product B. If 6 moles of A are used, how many moles of B are formed?

- A) 6 moles
- B) 9 moles
- C) 12 moles
- D) 4 moles

Correct Option: B) 9 moles

18. In the reaction $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$, how many grams of H_2 are required to form 18 g of water (H_2O)?

- A) 4 g
- B) 9 g
- C) 2 g

D) 1 g

Correct Option: A) 4 g

19. What is the molar mass of sulfuric acid (H_2SO_4)?

A) 98 g/mol

B) 102 g/mol

C) 92 g/mol

D) 88 g/mol

Correct Option: A) 98 g/mol

20. How many molecules are present in 1 mole of CO_2 ?

A) 1.2×10^{23}

B) 6.022×10^{23}

C) 3.5×10^{23}

D) 1.5×10^{23}

Correct Option: B) 6.022×10^{23}

21. The molar mass of methane (CH_4) is:

A) 16 g/mol

B) 18 g/mol

C) 14 g/mol

D) 20 g/mol

Correct Option: A) 16 g/mol

22. In the reaction $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$, how many grams of oxygen are required to react with 4 moles of hydrogen?

A) 32 g

B) 64 g

C) 16 g

D) 8 g

Correct Option: A) 32 g

23. The molarity of a solution containing 10 moles of NaOH in 2 liters of solution is:

- A) 5 M
- B) 2 M
- C) 1 M
- D) 0.5 M

Correct Option: A) 5 M

24. In a balanced chemical equation, the coefficients represent:

- A) Moles of molecules involved
- B) Number of atoms involved
- C) Volume of gases involved
- D) Pressure of reactants

Correct Option: A) Moles of molecules involved

25. 0.1 moles of NaOH is dissolved in 250 mL of solution. The molarity is:

- A) 0.4 M
- B) 0.25 M
- C) 0.5 M
- D) 0.1 M

Correct Option: B) 0.25 M

26. The number of moles in 88 grams of CO_2 is:

- A) 1 mole
- B) 2 moles
- C) 3 moles
- D) 0.5 moles

Correct Option: A) 1 mole

27. How many moles of H_2O are produced when 2 moles of H_2 react with 1 mole of O_2 ?

- A) 1 mole
- B) 2 moles
- C) 3 moles
- D) 4 moles

Correct Option: B) 2 moles

28. If 1 mole of oxygen reacts with 2 moles of hydrogen, how many grams of water (H_2O) will be produced?

- A) 18 g
- B) 36 g
- C) 9 g
- D) 28 g

Correct Option: A) 18 g

29. What is the volume of 1 mole of an ideal gas at STP?

- A) 11.2 L
- B) 22.4 L
- C) 24.3 L
- D) 30.0 L

Correct Option: B) 22.4 L

30. The empirical formula of a compound is CH_3 . Its molecular mass is 46 g/mol. What is the molecular formula?

- A) C_2H_6

- B) CH_4
- C) C_3H_6
- D) C_6H_{18}

Correct Option: A) C_2H_6

31. In a reaction, 2 moles of reactant A produce 4 moles of product B. How many grams of B will be formed from 5 moles of A?

- A) 5 g
- B) 10 g
- C) 20 g
- D) 40 g

Correct Option: C) 20 g

32. Which of the following is the correct mole-to-mole ratio for the reaction $4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$?

- A) 4:3
- B) 4:2
- C) 3:4
- D) 2:3

Correct Option: A) 4:3

33. 0.5 moles of NaCl are dissolved in 1 liter of water. The molarity is:

- A) 0.5 M
- B) 2 M
- C) 1 M
- D) 0.25 M

Correct Option: A) 0.5 M

34. The number of molecules in 2 moles of CO_2 is:

A) 6.022×10^{23}

B) 1.2×10^{23}

C) 2.4×10^{23}

D) 12.044×10^{23}

Correct Option: C) 2.4×10^{23}

35. If 3 moles of hydrogen gas react with excess oxygen, how many grams of water will be formed?

A) 18 g

B) 36 g

C) 9 g

D) 54 g

Correct Option: B) 36 g

36. What is the number of atoms in 2 moles of oxygen gas (O_2)?

A) 6.022×10^{23}

B) 3.011×10^{23}

C) 1.204×10^{23}

D) 12.044×10^{23}

Correct Option: B) 3.011×10^{23}

37. The volume of 1.5 moles of an ideal gas at STP is:

A) 22.4 L

B) 33.6 L

C) 44.8 L

D) 11.2 L

Correct Option: B) 33.6 L

38. The formula for calculating the number of moles is:

A) moles = mass \times molar mass

B) moles = mass \div molar mass

C) moles = volume \times molarity

D) moles = moles \div volume

Correct Option: B) moles = mass \div molar mass

39. What is the molar mass of nitrogen gas (N_2)?

A) 28 g/mol

B) 14 g/mol

C) 56 g/mol

D) 7 g/mol

Correct Option: A) 28 g/mol

40. The molarity of a solution prepared by dissolving 4 moles of KOH in 2 liters of solution is:

A) 2 M

B) 0.5 M

C) 4 M

D) 8 M

Correct Option: A) 2 M

41. How many grams of NaCl are present in 2 moles of NaCl?

A) 58 g

B) 116 g

C) 29 g

D) 72 g

Correct Option: B) 116 g

42. In a reaction, if 4 moles of A react with 3 moles of B, how many moles of C will be produced if the ratio is $2\text{A} + 3\text{B} \rightarrow 4\text{C}$?

A) 3 moles

B) 6 moles

C) 4 moles

D) 8 moles

Correct Option: B) 6 moles

43. The molar mass of sodium sulfate (Na_2SO_4) is:

A) 142 g/mol

B) 96 g/mol

C) 120 g/mol

D) 56 g/mol

Correct Option: A) 142 g/mol

44. How many moles of oxygen are required to react with 8 moles of hydrogen in the reaction $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$?

A) 8 moles

B) 2 moles

C) 4 moles

D) 16 moles

Correct Option: C) 4 moles

45. What volume of CO_2 gas will be produced from 2 moles of $\text{C}_6\text{H}_{12}\text{O}_6$ in the reaction $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$? (At STP)

A) 22.4 L

B) 44.8 L

C) 33.6 L

D) 12.8 L

Correct Option: B) 44.8 L

46. If 10 grams of NaOH are dissolved in water to make 0.5 liters of solution, what is the molarity? (Molar mass of NaOH = 40 g/mol)

A) 0.5 M

- B) 1 M
- C) 2 M
- D) 0.25 M

Correct Option: A) 0.5 M

47. What is the percentage composition of hydrogen in methane (CH_4)?

- A) 25%
- B) 50%
- C) 75%
- D) 80%

Correct Option: C) 75%

48. How many moles of H_2O will be produced when 5 moles of H_2 react with excess oxygen in the reaction $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$?

- A) 10 moles
- B) 5 moles
- C) 2.5 moles
- D) 20 moles

Correct Option: A) 10 moles

49. What is the empirical formula of a compound with 40% carbon, 6.7% hydrogen, and 53.3% oxygen?

- A) CH_2O
- B) $\text{C}_2\text{H}_6\text{O}$
- C) CH_4O_2
- D) $\text{C}_4\text{H}_{12}\text{O}_2$

Correct Option: A) CH_2O

50. The volume of 1 mole of an ideal gas at STP is:

A) 10.6 L

B) 22.4 L

C) 33.6 L

D) 44.8 L

Correct Option: B) 22.4 L

51. The number of moles in 88 grams of CO_2 (molar mass = 44 g/mol) is:

A) 1 mole

B) 2 moles

C) 0.5 moles

D) 4 moles

Correct Option: A) 1 mole

52. In the reaction $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$, how many moles of NH_3 are produced from 6 moles of H_2 ?

A) 4 moles

B) 2 moles

C) 6 moles

D) 12 moles

Correct Option: B) 4 moles

53. The molar volume of an ideal gas at standard temperature and pressure (STP) is:

A) 22.4 L

B) 24 L

C) 30 L

D) 44.8 L

Correct Option: A) 22.4 L

54. The empirical formula of a compound with the molecular formula $\text{C}_6\text{H}_{12}\text{O}_6$ is:

A) CH_2O

B) $\text{C}_3\text{H}_6\text{O}_3$

C) $\text{C}_2\text{H}_6\text{O}_2$

D) $\text{C}_6\text{H}_{12}\text{O}_6$

Correct Option: A) CH_2O

55. If 4 moles of NaOH react with H_2SO_4 , how many moles of Na_2SO_4 will be produced?

A) 1 mole

B) 2 moles

C) 4 moles

D) 3 moles

Correct Option: B) 2 moles

56. The ratio of moles of reactants to products in a chemical reaction is determined by:

A) The coefficients in the balanced chemical equation

B) The temperature and pressure

C) The volume of the substances

D) The type of reaction

Correct Option: A) The coefficients in the balanced chemical equation

57. In the reaction $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$, if 3 moles of Na are reacted, how many moles of NaCl will be formed?

A) 1 mole

B) 3 moles

C) 6 moles

D) 2 moles

Correct Option: B) 3 moles

58. The limiting reagent is completely consumed when:

A) The reaction reaches equilibrium

B) The reaction is half completed

C) One reactant is used up

D) There are equal amounts of reactants

Correct Option: C) One reactant is used up

59. How many grams of O_2 are needed to react completely with 10 grams of CH_4 in the reaction $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$?

- A) 8 grams
- B) 16 grams
- C) 32 grams
- D) 4 grams

Correct Option: B) 16 grams

60. The molecular formula of a compound gives the:

- A) Simplest whole number ratio of elements
- B) Number of atoms of each element in a molecule
- C) Number of molecules in a mole
- D) Molar mass of the compound

Correct Option: B) Number of atoms of each element in a molecule

61. The molecular mass of one mole of a substance is called:

- A) Atomic mass
- B) Molar mass
- C) Equivalent mass
- D) Molecular volume

Correct Option: B) Molar mass

62. If 1 mole of $NaOH$ is dissolved in 1 liter of water, the molarity of the solution is:

- A) 1 M
- B) 0.1 M
- C) 0.5 M
- D) 2 M

Correct Option: A) 1 M

63. The amount of product formed in a chemical reaction is determined by:

- A) The rate of reaction
- B) The limiting reagent
- C) The activation energy
- D) The equilibrium constant

Correct Option: B) The limiting reagent

64. 1 mole of NaCl contains:

- A) 6.022×10^{23} Na and Cl ions
- B) 6.022×10^{23} Na atoms
- C) 1.12×10^{23} Na and Cl ions
- D) 3.011×10^{23} Na atoms

Correct Option: A) 6.022×10^{23} Na and Cl ions

65. How many grams of NaCl are required to make 1 liter of 1M NaCl solution?

- A) 58.44 grams
- B) 100 grams
- C) 50 grams
- D) 120 grams

Correct Option: A) 58.44 grams

66. In the reaction $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$, if 4 moles of hydrogen react, how many moles of water will be produced?

- A) 4 moles
- B) 2 moles
- C) 8 moles
- D) 10 moles

Correct Option: A) 4 moles

67. The mole ratio between H_2 and H_2O in the reaction $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$ is:

- A) 1:1
- B) 2:1
- C) 1:2
- D) 1:4

Correct Option: B) 2:1

68. In a balanced reaction, if 2 moles of A react with 3 moles of B to form 4 moles of C, the mole ratio of A to C is:

- A) 1:2

- B) 2:3
- C) 2:4
- D) 3:4

Correct Option: A) 1:2

69. The volume of 1 mole of gas at standard temperature and pressure (STP) is:

- A) 22.4 L
- B) 0.5 L
- C) 11.2 L
- D) 44.8 L

Correct Option: A) 22.4 L

70. The amount of substance present in 5.6 L of hydrogen gas at STP is:

- A) 0.25 moles
- B) 1 mole
- C) 2 moles
- D) 3 moles

Correct Option: B) 1 mole

71. The molecular mass of methane (CH_4) is:

- A) 12 g/mol
- B) 16 g/mol
- C) 18 g/mol
- D) 20 g/mol

Correct Option: B) 16 g/mol

72. The percent composition of oxygen in H_2O is:

- A) 11.1%
- B) 22.2%
- C) 33.3%
- D) 66.6%

Correct Option: A) 11.1%

73. The reaction $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$ is an example of a:

- A) Combination reaction
- B) Decomposition reaction
- C) Single replacement reaction
- D) Double replacement reaction

Correct Option: A) Combination reaction

74. The number of moles of atoms in 10 grams of aluminum (Al) is:

- A) 0.5 moles
- B) 1 mole
- C) 2 moles
- D) 4 moles

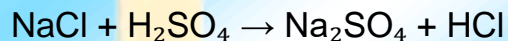
Correct Option: A) 0.5 moles

75. In the reaction $2K + Cl_2 \rightarrow 2KCl$, if 2 moles of K are used, how many moles of KCl will be formed?

- A) 1 mole
- B) 2 moles
- C) 3 moles
- D) 4 moles

Correct Option: B) 2 moles

76. If 3 moles of NaCl are mixed with 6 moles of H_2SO_4 , how many moles of Na_2SO_4 will be formed in the reaction:



- A) 1 mole
- B) 2 moles
- C) 3 moles
- D) 6 moles

Correct Option: B) 2 moles

77. What is the total number of moles in 22 grams of carbon (C)?

- A) 0.5 moles
- B) 1 mole
- C) 2 moles
- D) 3 moles

Correct Option: B) 1 mole

78. The stoichiometric coefficient of oxygen in the combustion of methane, $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$, is:

- A) 1
- B) 2
- C) 3
- D) 4

Correct Option: B) 2

79. What is the molar mass of sodium sulfate (Na_2SO_4)?

- A) 82 g/mol
- B) 88 g/mol
- C) 98 g/mol
- D) 102 g/mol

Correct Option: B) 88 g/mol

80. The reaction $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$ follows a ratio of:

- A) 1:3:2
- B) 1:2:3
- C) 3:2:1
- D) 2:3:1

Correct Option: A) 1:3:2

81. The number of grams in 0.5 moles of H_2O is:

- A) 9 grams
- B) 18 grams
- C) 36 grams
- D) 72 grams

Correct Option: B) 18 grams

82. Which of the following is the limiting reagent in the reaction: $3\text{Fe} + 4\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$, if 5 moles of Fe and 3 moles of O_2 are present?

- A) Fe

- B) O_2
- C) Fe_2O_3
- D) No limiting reagent

Correct Option: B) O_2

83. The amount of oxygen in 4 moles of CO_2 is:

- A) 4 moles
- B) 8 moles
- C) 6 moles
- D) 2 moles

Correct Option: B) 8 moles

84. The percent yield of a reaction is calculated by:

- A) Experimental yield / Theoretical yield $\times 100$
- B) Actual yield / Theoretical yield $\times 100$
- C) Theoretical yield / Experimental yield $\times 100$
- D) Actual yield / Experimental yield $\times 100$

Correct Option: B) Actual yield / Theoretical yield $\times 100$

85. In the reaction $3H_2 + N_2 \rightarrow 2NH_3$, how many moles of H_2 are required to produce 4 moles of NH_3 ?

- A) 6 moles
- B) 3 moles
- C) 4 moles
- D) 2 moles

Correct Option: A) 6 moles

86. How many moles of oxygen are required to completely burn 5 moles of CH_4 (methane)?

- A) 10 moles
- B) 5 moles
- C) 15 moles
- D) 20 moles

Correct Option: A) 10 moles

87. The number of molecules in 1 mole of a substance is known as:

- A) Avogadro's number
- B) Atomic number
- C) Molar mass
- D) Molecular weight

Correct Option: A) Avogadro's number

88. How many moles are in 12 grams of carbon (C)?

- A) 0.5 moles
- B) 1 mole
- C) 2 moles
- D) 12 moles

Correct Option: B) 1 mole

89. The molar volume of an ideal gas at STP is:

- A) 22.4 L/mol
- B) 1 L/mol
- C) 32 L/mol
- D) 44.8 L/mol

Correct Option: A) 22.4 L/mol

90. Which of the following is not a stoichiometric relationship?

- A) Moles of reactants to moles of products
- B) Molecules of reactants to molecules of products
- C) Volume of reactants to volume of products
- D) Molecule ratio of reactants to volume of products

Correct Option: D) Molecule ratio of reactants to volume of products

91. The reaction $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$ is:

- A) A redox reaction
- B) A decomposition reaction
- C) A double replacement reaction
- D) A combination reaction

Correct Option: A) A redox reaction

92. Which of the following is the mole ratio of NaCl to Na₂SO₄ in the reaction:



- A) 1:1
- B) 1:2
- C) 2:1
- D) 2:2

Correct Option: C) 2:1

93. In the reaction $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$, if 1 mole of N₂ is reacted, how many moles of H₂ are required?

- A) 1 mole
- B) 2 moles
- C) 3 moles
- D) 4 moles

Correct Option: C) 3 moles

94. How many grams of NaOH are in 0.5 moles of NaOH?

- A) 4 grams
- B) 20 grams
- C) 40 grams
- D) 58.44 grams

Correct Option: B) 20 grams

95. Which of the following factors affects the stoichiometric calculations?

- A) The state of matter
- B) Temperature and pressure
- C) The number of molecules
- D) All of the above

Correct Option: D) All of the above

96. The reaction $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ is an example of:

- A) Combination reaction
- B) Decomposition reaction
- C) Double displacement reaction

D) Redox reaction

Correct Option: A) Combination reaction

97. The molar mass of carbon dioxide (CO_2) is:

A) 32 g/mol

B) 44 g/mol

C) 48 g/mol

D) 56 g/mol

Correct Option: B) 44 g/mol

98. How many moles of H_2O are formed when 2 moles of H_2 react with excess O_2 ?

A) 2 moles

B) 4 moles

C) 6 moles

D) 8 moles

Correct Option: B) 4 moles

99. The number of moles of a substance is equal to:

A) The mass of the substance divided by the molar mass

B) The mass of the substance multiplied by the molar mass

C) The volume of the substance divided by the molar volume

D) None of the above

Correct Option: A) The mass of the substance divided by the molar mass

100. The percent composition of sulfur in Na_2SO_4 is:

A) 24%

B) 32%

C) 50%

D) 16%

Correct Option: B) 32%

Chapter 5 : States And Phases Of Matter

1. Which of the following states of matter has a definite volume but no definite shape?

- A) Solid
- B) Liquid
- C) Gas
- D) Plasma

Correct Option: B) Liquid

2. What is the phase transition from gas to liquid called?

- A) Sublimation
- B) Condensation
- C) Freezing
- D) Evaporation

Correct Option: B) Condensation

3. The temperature at which a liquid changes into a solid is called:

- A) Boiling point
- B) Freezing point
- C) Melting point
- D) Sublimation point

Correct Option: B) Freezing point

4. In which state of matter are particles most tightly packed?

- A) Solid
- B) Liquid
- C) Gas
- D) Plasma

Correct Option: A) Solid

5. What happens to the kinetic energy of particles as a substance changes from solid to liquid?

- A) It increases
- B) It decreases
- C) It stays the same
- D) It oscillates

Correct Option: A) It increases

6. Which phase transition occurs when a substance changes from a gas directly to a solid?

- A) Deposition
- B) Sublimation
- C) Evaporation
- D) Condensation

Correct Option: A) Deposition

7. The boiling point of water at standard atmospheric pressure is:

- A) 50°C
- B) 100°C
- C) 0°C
- D) 150°C

Correct Option: B) 100°C

8. Which of the following has the highest kinetic energy?

- A) Solid
- B) Liquid
- C) Gas
- D) Plasma

Correct Option: C) Gas

9. The change of state from liquid to gas is called:

- A) Condensation
- B) Evaporation
- C) Freezing
- D) Sublimation

Correct Option: B) Evaporation

10. The volume of a gas is most affected by which factor?

- A) Temperature
- B) Pressure
- C) Volume
- D) Mass

Correct Option: B) Pressure

11. Which gas law states that volume is inversely proportional to pressure at constant temperature?

- A) Charles's Law
- B) Boyle's Law
- C) Avogadro's Law
- D) Ideal Gas Law

Correct Option: B) Boyle's Law

12. What is the state of matter with neither a definite volume nor a definite shape?

- A) Solid
- B) Liquid
- C) Gas
- D) Plasma

Correct Option: C) Gas

13. The substance that sublimates at room temperature is:

- A) Water

- B) Iodine
- C) Mercury
- D) Sodium

Correct Option: B) Iodine

14. The relationship between the pressure and temperature of a gas is described by:

- A) Boyle's Law
- B) Charles's Law
- C) Gay-Lussac's Law
- D) Avogadro's Law

Correct Option: C) Gay-Lussac's Law

15. Which of the following statements is true for liquids?

- A) Liquids have no definite volume.
- B) Liquids have a definite shape but no definite volume.
- C) Liquids have both definite shape and volume.
- D) Liquids have a definite volume but no definite shape.

Correct Option: D) Liquids have a definite volume but no definite shape.

16. The energy required to change a substance from solid to liquid is called:

- A) Heat of fusion
- B) Heat of vaporization
- C) Latent heat
- D) Specific heat

Correct Option: A) Heat of fusion

17. Which of the following is a characteristic of gases?

- A) Gases are incompressible.
- B) Gases have fixed shapes.

C) Gases expand to fill the container.

D) Gases have high densities.

Correct Option: C) Gases expand to fill the container.

18. The energy required to change a liquid to a gas is called:

A) Heat of fusion

B) Heat of vaporization

C) Specific heat

D) Latent heat

Correct Option: B) Heat of vaporization

19. A substance at its critical temperature and pressure is in the:

A) Liquid state

B) Gas state

C) Supercritical fluid state

D) Solid state

Correct Option: C) Supercritical fluid state

20. The temperature at which the vapor pressure of a liquid equals the atmospheric pressure is called the:

A) Boiling point

B) Freezing point

C) Melting point

D) Critical point

Correct Option: A) Boiling point

21. Which of the following best describes the particles in a gas?

A) Close together and fixed in place

B) Spread far apart and move freely

C) Close together but can move past each other

D) None of the above

Correct Option: B) Spread far apart and move freely

22. The term "liquid crystals" refers to substances that:

- A) Can only exist at very low temperatures
- B) Have properties between liquids and solids
- C) Are found in solid form at room temperature
- D) Are always gaseous

Correct Option: B) Have properties between liquids and solids

23. The heat required to convert a solid into a liquid at its melting point is called:

- A) Latent heat of fusion
- B) Latent heat of vaporization
- C) Specific heat
- D) Enthalpy of fusion

Correct Option: A) Latent heat of fusion

24. What is the effect of temperature on the volume of a gas?

- A) Volume decreases with temperature
- B) Volume remains constant with temperature
- C) Volume increases with temperature
- D) Volume becomes negative at high temperature

Correct Option: C) Volume increases with temperature

25. The intermolecular forces are weakest in which phase of matter?

- A) Solid
- B) Liquid
- C) Gas
- D) Plasma

Correct Option: C) Gas

26. Which of the following gases would deviate most from ideal gas behavior?

- A) Oxygen
- B) Hydrogen
- C) Nitrogen
- D) Ammonia

Correct Option: D) Ammonia

27. The boiling point of a liquid decreases with:

- A) Decrease in pressure
- B) Increase in pressure
- C) Decrease in temperature
- D) Increase in temperature

Correct Option: A) Decrease in pressure

28. Which of the following best describes the phase change from gas to solid?

- A) Sublimation
- B) Deposition
- C) Condensation
- D) Melting

Correct Option: B) Deposition

29. A solid is changed directly into a gas without becoming a liquid. This process is called:

- A) Evaporation
- B) Sublimation
- C) Freezing
- D) Condensation

Correct Option: B) Sublimation

30. In which state of matter do particles have the least kinetic energy?

- A) Solid
- B) Liquid
- C) Gas
- D) Plasma

Correct Option: A) Solid

31. A substance with high vapor pressure at room temperature is generally:

- A) A solid
- B) A liquid with strong intermolecular forces
- C) A liquid with weak intermolecular forces
- D) A gas

Correct Option: C) A liquid with weak intermolecular forces

32. The critical temperature of a substance is the temperature above which:

- A) The substance cannot exist as a liquid
- B) The substance cannot exist as a gas
- C) The substance becomes a solid
- D) The substance freezes

Correct Option: A) The substance cannot exist as a liquid

33. Which of the following is true about the gas phase?

- A) Gas particles are close together but move slowly
- B) Gas particles are far apart and move freely
- C) Gas particles are close together and move rapidly
- D) Gas particles have strong intermolecular forces

Correct Option: B) Gas particles are far apart and move freely

34. What happens to the volume of a gas if the temperature is doubled at constant pressure?

- A) The volume stays the same
- B) The volume doubles
- C) The volume halves
- D) The volume decreases by half

Correct Option: B) The volume doubles

35. The melting point of a substance is:

- A) The temperature at which it changes from gas to liquid
- B) The temperature at which it changes from solid to liquid
- C) The temperature at which it freezes
- D) The temperature at which it boils

Correct Option: B) The temperature at which it changes from solid to liquid

36. In which state of matter do particles have the highest kinetic energy?

- A) Solid
- B) Liquid
- C) Gas
- D) Plasma

Correct Option: D) Plasma

37. The energy required to convert a liquid to a gas at its boiling point is called:

- A) Latent heat of fusion
- B) Latent heat of vaporization
- C) Specific heat
- D) Heat capacity

Correct Option: B) Latent heat of vaporization

38. Which phase transition occurs when a gas turns directly into a solid?

- A) Sublimation
- B) Deposition
- C) Condensation
- D) Evaporation

Correct Option: B) Deposition

39. What happens to the gas volume if the pressure is reduced while temperature remains constant?

- A) Volume decreases
- B) Volume remains the same
- C) Volume increases
- D) Volume fluctuates

Correct Option: C) Volume increases

40. What is the phase change from liquid to gas below the boiling point called?

- A) Boiling
- B) Evaporation
- C) Condensation
- D) Freezing

Correct Option: B) Evaporation

41. In a gas, the intermolecular forces are:

- A) Strong
- B) Weak
- C) Negligible
- D) Variable

Correct Option: C) Negligible

42. The behavior of real gases deviates most from ideal gas behavior at:

- A) High temperature and low pressure
- B) High pressure and low temperature
- C) Low pressure and high temperature
- D) Standard temperature and pressure

Correct Option: B) High pressure and low temperature

43. The volume occupied by gas molecules is considered in the Van der Waals equation through the term:

- A) a
- B) b
- C) T
- D) P

Correct Option: B) b

44. At the critical point, the density of the liquid and vapor phases:

- A) Becomes equal
- B) Becomes zero
- C) Becomes infinite
- D) Remains the same as in other states

Correct Option: A) Becomes equal

45. The compressibility factor of an ideal gas is:

- A) Always greater than 1
- B) Always less than 1
- C) Equal to 1
- D) Depends on the pressure only

Correct Option: C) Equal to 1

46. During the process of condensation, the temperature of a substance:

- A) Increases
- B) Decreases
- C) Remains constant
- D) Fluctuates

Correct Option: C) Remains constant

47. In which phase does a substance have both a definite volume and shape?

- A) Liquid
- B) Gas
- C) Solid
- D) Plasma

Correct Option: C) Solid

48. The heat of vaporization is:

- A) The energy needed to convert a gas to liquid
- B) The energy needed to convert a solid to liquid
- C) The energy needed to convert a liquid to gas
- D) The energy needed to convert a solid to gas

Correct Option: C) The energy needed to convert a liquid to gas

49. According to the kinetic molecular theory, the average kinetic energy of particles is directly proportional to:

- A) The temperature of the gas
- B) The volume of the gas
- C) The pressure of the gas
- D) The molar mass of the gas

Correct Option: A) The temperature of the gas

50. The boiling point of a substance decreases as:

- A) The atmospheric pressure increases
- B) The temperature increases
- C) The atmospheric pressure decreases
- D) The vapor pressure decreases

Correct Option: C) The atmospheric pressure decreases

51. The state of matter with the least kinetic energy is:

- A) Solid
- B) Liquid
- C) Gas
- D) Plasma

Correct Option: A) Solid

52. In which state of matter do particles have the most freedom of movement?

- A) Solid
- B) Liquid
- C) Gas
- D) Plasma

Correct Option: C) Gas

53. The process in which a gas turns into a liquid is called:

- A) Sublimation
- B) Freezing
- C) Condensation

D) Evaporation

Correct Option: C) Condensation

54. Which of the following is true for gases?

A) They have a definite shape and volume

B) They expand to fill the container

C) Their particles are closely packed

D) They are incompressible

Correct Option: B) They expand to fill the container

55. The volume of a gas at constant temperature is inversely proportional to its pressure, according to:

A) Boyle's Law

B) Charles's Law

C) Avogadro's Law

D) Ideal Gas Law

Correct Option: A) Boyle's Law

56. Which of the following is an example of a solid to gas phase transition?

A) Melting

B) Freezing

C) Sublimation

D) Condensation

Correct Option: C) Sublimation

57. The ideal gas law is given by the equation:

A) $PV = nRT$

B) $PV = RT$

C) $P = V/nRT$

D) $P = nRT/V$

Correct Option: A) $PV = nRT$

58. Which of the following has the highest intermolecular forces?

A) Gas

B) Liquid

- C) Solid
- D) Plasma

Correct Option: C) Solid

59. What happens to the volume of a gas if the pressure is doubled while the temperature remains constant?

- A) The volume is halved
- B) The volume is doubled
- C) The volume remains unchanged
- D) The volume is quartered

Correct Option: A) The volume is halved

60. Which phase change occurs when a liquid turns into a gas?

- A) Sublimation
- B) Melting
- C) Condensation
- D) Evaporation

Correct Option: D) Evaporation

61. A solid has:

- A) A fixed shape and fixed volume
- B) A fixed shape but not a fixed volume
- C) No fixed shape or volume
- D) No fixed shape but a fixed volume

Correct Option: A) A fixed shape and fixed volume

62. In which state of matter are the particles in closest contact with each other?

- A) Gas
- B) Liquid
- C) Solid
- D) Plasma

Correct Option: C) Solid

63. The process of a liquid changing directly into a solid is called:

- A) Freezing
- B) Melting
- C) Sublimation
- D) Deposition

Correct Option: A) Freezing

64. According to the kinetic molecular theory, the pressure of a gas is due to:

- A) The number of gas molecules
- B) The volume of the gas
- C) The temperature of the gas
- D) The collisions of gas molecules with the walls of the container

Correct Option: D) The collisions of gas molecules with the walls of the container

65. The boiling point of a substance increases with:

- A) Decrease in pressure
- B) Increase in pressure
- C) Decrease in temperature
- D) Increase in temperature

Correct Option: B) Increase in pressure

66. In which phase does a substance have both a fixed volume and shape?

- A) Solid
- B) Liquid
- C) Gas
- D) Plasma

Correct Option: A) Solid

67. Which of the following is not an assumption of the ideal gas law?

- A) Gases consist of large numbers of molecules that are far apart
- B) Gases collide with each other elastically
- C) Gas molecules interact with each other
- D) The average kinetic energy of gas molecules is directly proportional to temperature

Correct Option: C) Gas molecules interact with each other

68. The phase change from gas to liquid is called:

- A) Sublimation
- B) Deposition
- C) Condensation
- D) Melting

Correct Option: C) Condensation

69. Which of the following properties increases with the temperature of a substance?

- A) Density
- B) Viscosity
- C) Kinetic energy
- D) Surface tension

Correct Option: C) Kinetic energy

70. What is the shape of the container that holds a liquid?

- A) Fixed shape
- B) Fills the shape of the container
- C) It has a random shape
- D) Fixed volume but not a fixed shape

Correct Option: D) Fixed volume but not a fixed shape

71. In a liquid, the intermolecular forces are:

- A) Stronger than in gases
- B) Weaker than in solids
- C) The same as in gases
- D) Stronger than in solids

Correct Option: A) Stronger than in gases

72. The gas law that relates pressure and temperature is:

- A) Boyle's Law
- B) Charles's Law
- C) Gay-Lussac's Law

D) Avogadro's Law

Correct Option: C) Gay-Lussac's Law

73. What happens when a solid is heated to its melting point?

A) It remains solid

B) It turns into a liquid

C) It turns into gas

D) Its volume decreases

Correct Option: B) It turns into a liquid

74. The volume of a gas is directly proportional to its temperature at constant pressure according to:

A) Boyle's Law

B) Charles's Law

C) Avogadro's Law

D) Ideal Gas Law

Correct Option: B) Charles's Law

75. Which of the following is true for the boiling point of a liquid?

A) It increases with altitude

B) It decreases with pressure

C) It is unaffected by pressure

D) It is always higher than the melting point

Correct Option: B) It decreases with pressure

76. The density of a gas is most affected by:

A) Temperature

B) Pressure

C) Molecular mass

D) Volume

Correct Option: A) Temperature

77. The change from liquid to gas is called:

A) Sublimation

B) Evaporation

C) Condensation

D) Freezing

Correct Option: B) Evaporation

78. In which of the following phase transitions is energy absorbed?

A) Freezing

B) Condensation

C) Melting

D) Deposition

Correct Option: C) Melting

79. A liquid with high viscosity:

A) Flows easily

B) Does not flow easily

C) Has low surface tension

D) Has high vapor pressure

Correct Option: B) Does not flow easily

80. Which of the following is a characteristic of a gas?

A) Fixed shape

B) Fixed volume

C) Expands to fill the container

D) Strong intermolecular forces

Correct Option: C) Expands to fill the container

81. Which of the following statements is true about plasma?

A) It is a positively charged substance

B) It does not have electrical conductivity

C) It is only found at high temperatures

D) It has fixed volume and shape

Correct Option: C) It is only found at high temperatures

82. In which of the following states do particles have the least freedom of movement?

A) Solid

- B) Liquid
- C) Gas
- D) Plasma

Correct Option: A) Solid

83. The temperature at which the liquid and gas phases of a substance are indistinguishable is called:

- A) Boiling point
- B) Melting point
- C) Critical temperature
- D) Sublimation point

Correct Option: C) Critical temperature

84. The phase transition from gas to solid is called:

- A) Sublimation
- B) Deposition
- C) Condensation
- D) Freezing

Correct Option: B) Deposition

Chapter 6: Energetics

1. The enthalpy change of a reaction is the heat absorbed or released under:

- A) Constant volume
- B) Constant temperature
- C) Constant pressure
- D) Varying pressure

Correct Option: C) Constant pressure

2. The unit of enthalpy is:

- A) J/kg
- B) J/mol
- C) J
- D) kcal/mol

Correct Option: B) J/mol

3. The enthalpy change for the formation of one mole of a compound from its elements in their standard states is called:

- A) Standard enthalpy of combustion
- B) Standard enthalpy of formation
- C) Standard enthalpy of reaction
- D) Enthalpy of fusion

Correct Option: B) Standard enthalpy of formation

4. The law of conservation of energy states that:

- A) Energy can be created or destroyed
- B) Energy can only be destroyed
- C) Energy can neither be created nor destroyed
- D) Energy is destroyed in chemical reactions

Correct Option: C) Energy can neither be created nor destroyed

5. If the products of a reaction have higher energy than the reactants, the reaction is:

- A) Exothermic
- B) Endothermic

C) Spontaneous

D) Reversible

Correct Option: B) Endothermic

6. Which of the following is the correct expression for the heat capacity of a substance?

A) Heat absorbed / Temperature change

B) Temperature change / Heat absorbed

C) Heat absorbed \times Temperature change

D) Heat released / Temperature change

Correct Option: A) Heat absorbed / Temperature change

7. The heat of combustion of a substance is:

A) The heat released when one mole of the substance reacts with oxygen

B) The heat absorbed when one mole of the substance reacts with oxygen

C) The energy needed to break bonds in a substance

D) The enthalpy change in an exothermic reaction

Correct Option: A) The heat released when one mole of the substance reacts with oxygen

8. Which of the following is NOT a state function?

A) Temperature

B) Enthalpy

C) Heat

D) Pressure

Correct Option: C) Heat

9. The enthalpy change for a reaction is independent of:

- A) The temperature
- B) The pathway of the reaction
- C) The amount of reactants used
- D) The states of reactants and products

Correct Option: B) The pathway of the reaction

10. Which of the following would increase the rate of an endothermic reaction?

- A) Increasing the temperature
- B) Decreasing the temperature
- C) Adding a catalyst
- D) Both A and C

Correct Option: D) Both A and C

11. The heat released in an exothermic reaction is:

- A) Negative
- B) Positive
- C) Zero
- D) Dependent on the reactants

Correct Option: A) Negative

12. Which of the following processes is exothermic?

- A) Melting of ice
- B) Evaporation of water
- C) Condensation of water vapor
- D) Sublimation of dry ice

Correct Option: C) Condensation of water vapor

13. The enthalpy change for a reaction can be calculated using:

- A) Hess's Law
- B) Boyle's Law
- C) Charles's Law
- D) Raoult's Law

Correct Option: A) Hess's Law

14. The standard enthalpy of formation of a compound is:

- A) Always positive
- B) Always negative
- C) Zero for elements in their standard states
- D) Dependent on the temperature

Correct Option: C) Zero for elements in their standard states

15. The enthalpy of neutralization is the heat change when:

- A) An acid reacts with a base to form water and a salt
- B) A metal reacts with water
- C) A gas dissolves in a liquid
- D) A liquid evaporates

Correct Option: A) An acid reacts with a base to form water and a salt

16. The change in enthalpy for a reaction at constant pressure is equivalent to:

- A) The work done by the system
- B) The heat absorbed or released
- C) The heat capacity
- D) The volume change

Correct Option: B) The heat absorbed or released

17. In an exothermic reaction, the heat of the products is:

- A) Higher than that of the reactants
- B) Equal to that of the reactants
- C) Lower than that of the reactants
- D) Zero

Correct Option: C) Lower than that of the reactants

18. The enthalpy change for a reaction is determined by:

- A) The difference between the heat of the products and the heat of the reactants
- B) The total heat absorbed
- C) The pressure of the system
- D) The temperature of the system

Correct Option: A) The difference between the heat of the products and the heat of the reactants

19. When the temperature of a system increases, the enthalpy of the system:

- A) Decreases
- B) Increases
- C) Remains constant
- D) Becomes negative

Correct Option: B) Increases

20. The specific heat of water is higher than that of most substances because:

- A) Water has a high density
- B) Water molecules are large
- C) Water can absorb more heat per unit mass for a given temperature rise
- D) Water vaporizes easily

Correct Option: C) Water can absorb more heat per unit mass for a given temperature rise

21. The enthalpy change of an endothermic reaction is:

- A) Negative
- B) Zero
- C) Positive
- D) Dependent on pressure

Correct Option: C) Positive

22. According to Hess's Law, the enthalpy change of a reaction is:

- A) Dependent on the pathway
- B) Independent of the pathway
- C) Always negative
- D) Always positive

Correct Option: B) Independent of the pathway

23. In an exothermic reaction, the products have:

- A) Higher energy than reactants
- B) The same energy as reactants
- C) Lower energy than reactants
- D) No energy

Correct Option: C) Lower energy than reactants

24. The heat of formation of an element in its standard state is:

- A) Zero
- B) One

C) Negative

D) Positive

Correct Option: A) Zero

25. The enthalpy of neutralization is the heat change when:

A) A gas is produced

B) An acid reacts with a base

C) A liquid freezes

D) A solid dissolves in water

Correct Option: B) An acid reacts with a base

26. The standard enthalpy of combustion of a substance is always:

A) Zero

B) Negative

C) Positive

D) Undefined

Correct Option: B) Negative

27. The heat capacity of a substance is:

A) Inversely proportional to temperature

B) Directly proportional to temperature

C) Independent of the substance's mass

D) Directly proportional to its mass

Correct Option: D) Directly proportional to its mass

28. The relationship between work, heat, and internal energy is given by:

A) Boyle's Law

- B) Hess's Law
 - C) First Law of Thermodynamics
 - D) Second Law of Thermodynamics
- Correct Option:** C) First Law of Thermodynamics

29. For an ideal gas, the internal energy depends only on:

- A) Pressure
- B) Volume
- C) Temperature
- D) Number of moles

Correct Option: C) Temperature

30. The bond dissociation enthalpy is the enthalpy required to:

- A) Form one mole of a bond
- B) Break one mole of bonds in a substance
- C) Form ions in a substance
- D) Break a liquid into gas

Correct Option: B) Break one mole of bonds in a substance

31. The first law of thermodynamics is also known as:

- A) Law of entropy
- B) Law of energy conservation
- C) Law of conservation of mass
- D) Law of heat transfer

Correct Option: B) Law of energy conservation

32. Which of the following is a state function?

- A) Work
- B) Heat
- C) Internal energy
- D) Distance

Correct Option: C) Internal energy

33. Enthalpy change during a reaction at constant pressure is equal to:

- A) Heat absorbed by the system
- B) Work done by the system
- C) Heat released by the system
- D) Entropy change of the system

Correct Option: A) Heat absorbed by the system

34. In an exothermic reaction, the enthalpy change is:

- A) Positive
- B) Negative
- C) Zero
- D) Independent of temperature

Correct Option: B) Negative

35. The standard enthalpy of formation of an element in its most stable form is:

- A) Zero
- B) 1
- C) 100
- D) Infinite

Correct Option: A) Zero

36. A reaction in which energy is absorbed by the system is called:

- A) Exothermic
- B) Endothermic
- C) Isothermal
- D) Isochoric

Correct Option: B) Endothermic

37. The heat capacity of a substance is defined as the amount of heat required to:

- A) Increase its temperature by one degree Celsius
- B) Change its state
- C) Heat the substance to its boiling point

D) Increase its volume by one liter

Correct Option: A) Increase its temperature by one degree Celsius

38. The heat released or absorbed during a reaction at constant pressure is measured as:

A) Work done

B) Enthalpy change

C) Internal energy change

D) Temperature change

Correct Option: B) Enthalpy change

39. In an isothermal process, the change in internal energy of the system is:

A) Positive

B) Negative

C) Zero

D) Variable

Correct Option: C) Zero

40. The work done by a gas during an expansion is:

A) Positive

B) Negative

C) Zero

D) Undefined

Correct Option: A) Positive

41. The bond dissociation enthalpy is the enthalpy change required to:

A) Dissociate one mole of a compound into its ions

B) Break one mole of bonds in a compound

C) Form one mole of a compound from its elements

D) Break one mole of a gaseous molecule into atoms

Correct Option: B) Break one mole of bonds in a compound

42. The entropy of the universe always tends to:

A) Increase

- B) Decrease
- C) Stay constant
- D) Fluctuate

Correct Option: A) Increase

43. Which of the following statements is true for an exothermic reaction?

- A) Heat is absorbed from the surroundings
- B) The system gains heat
- C) The system loses heat
- D) The enthalpy of the products is higher than the reactants

Correct Option: C) The system loses heat

44. The enthalpy change for a reaction can be calculated using:

- A) Hess's Law
- B) Boyle's Law
- C) Charles's Law
- D) Avogadro's Law

Correct Option: A) Hess's Law

45. The enthalpy change for the reaction $\text{C(s)} + \text{O}_2\text{(g)} \rightarrow \text{CO}_2\text{(g)}$ is called the:

- A) Enthalpy of combustion
- B) Enthalpy of formation
- C) Enthalpy of fusion
- D) Enthalpy of vaporization

Correct Option: A) Enthalpy of combustion

46. The heat required to raise the temperature of a substance by 1°C is called its:

- A) Heat capacity
- B) Specific heat
- C) Molar heat
- D) Latent heat

Correct Option: B) Specific heat

47. When heat is transferred into the system and the volume remains constant, the process is:

- A) Isothermal
- B) Isobaric
- C) Isochoric
- D) Adiabatic

Correct Option: C) Isochoric

48. The change in internal energy is related to heat and work by:

- A) Boyle's Law
- B) Charles's Law
- C) The first law of thermodynamics
- D) Hess's Law

Correct Option: C) The first law of thermodynamics

49. The enthalpy change for the vaporization of a liquid is called:

- A) Latent heat of vaporization
- B) Latent heat of fusion
- C) Enthalpy of formation
- D) Enthalpy of combustion

Correct Option: A) Latent heat of vaporization

50. The change in enthalpy when one mole of a compound is formed from its elements in their standard states is called:

- A) Enthalpy of combustion
- B) Enthalpy of formation
- C) Enthalpy of fusion
- D) Enthalpy of vaporization

Correct Option: B) Enthalpy of formation

51. The second law of thermodynamics states that:

- A) Energy can be created or destroyed
- B) The total energy of the universe is constant
- C) Entropy of the universe tends to increase
- D) Heat flows from colder to hotter objects

Correct Option: C) Entropy of the universe tends to increase

52. In an adiabatic process, the system does not:

- A) Exchange energy as heat
- B) Perform work
- C) Change temperature
- D) Change pressure

Correct Option: A) Exchange energy as heat

53. Which of the following is a spontaneous reaction?

- A) A reaction with positive enthalpy and negative entropy
- B) A reaction with negative enthalpy and negative entropy
- C) A reaction with positive enthalpy and positive entropy
- D) A reaction with negative enthalpy and positive entropy

Correct Option: D) A reaction with negative enthalpy and positive entropy

54. The heat required to change the state of 1 kg of a substance at its melting point without changing its temperature is called:

- A) Specific heat
- B) Latent heat of fusion
- C) Latent heat of vaporization
- D) Specific latent heat

Correct Option: B) Latent heat of fusion

55. The total heat content of a system is represented by its:

- A) Temperature
- B) Enthalpy
- C) Entropy
- D) Internal energy

Correct Option: B) Enthalpy

56. For an exothermic reaction, the enthalpy of products is _____ than that of reactants.

- A) Higher
- B) Lower

- C) Equal
- D) Unchanged

Correct Option: B) Lower

57. The enthalpy change in a reaction is independent of the path followed according to:

- A) Hess's Law
- B) First law of thermodynamics
- C) Le Chatelier's principle
- D) Avogadro's Law

Correct Option: A) Hess's Law

58. The work done in a reversible process is maximum when:

- A) The process is isothermal
- B) The temperature is very high
- C) The process is adiabatic
- D) The pressure is constant

Correct Option: A) The process is isothermal

59. In a spontaneous reaction, the free energy change (ΔG) is:

- A) Positive
- B) Negative
- C) Zero
- D) Unpredictable

Correct Option: B) Negative

60. The temperature at which the entropy of a system becomes maximum is known as the:

- A) Critical point
- B) Absolute zero
- C) Boiling point
- D) Melting point

Correct Option: A) Critical point

61. The heat capacity at constant pressure is denoted as:

- A) C_p
- B) C_v
- C) ΔH
- D) ΔU

Correct Option: A) C_p

62. The standard enthalpy of combustion is:

- A) The enthalpy change when one mole of a substance is burned in oxygen
- B) The enthalpy change when a substance is formed from its elements
- C) The enthalpy change when a gas is liquefied
- D) The enthalpy change when a substance is heated

Correct Option: A) The enthalpy change when one mole of a substance is burned in oxygen

63. The molar heat capacity of a substance is defined as:

- A) The heat required to raise the temperature of 1 mole of a substance by 1°C
- B) The heat required to raise the temperature of 1 gram of a substance by 1°C
- C) The heat required to change the phase of 1 mole of a substance
- D) The heat required to evaporate 1 mole of a liquid

Correct Option: A) The heat required to raise the temperature of 1 mole of a substance by 1°C

64. If the entropy of a system increases, it indicates:

- A) The system is in equilibrium
- B) The system is more disordered
- C) The system is at absolute zero
- D) The system is at maximum order

Correct Option: B) The system is more disordered

65. In an isothermal expansion of an ideal gas, the temperature of the gas:

- A) Increases
- B) Decreases
- C) Remains constant

D) Fluctuates

Correct Option: C) Remains constant

66. The relationship between heat and work in thermodynamics is given by:

A) Heat = Work

B) Heat + Work = Enthalpy

C) Heat + Work = Internal Energy

D) Heat – Work = Entropy

Correct Option: C) Heat + Work = Internal Energy

67. The specific heat of water is highest at:

A) 0°C

B) 100°C

C) 25°C

D) 50°C

Correct Option: A) 0°C

68. The free energy change (ΔG) is negative when the reaction is:

A) Non-spontaneous

B) Spontaneous

C) At equilibrium

D) Endothermic

Correct Option: B) Spontaneous

69. The change in internal energy for an ideal gas undergoing an isothermal process is:

A) Zero

B) Positive

C) Negative

D) Infinite

Correct Option: A) Zero

Chapter 7: Chemical Kinetics

1. The rate of a chemical reaction is defined as the:

- A) Change in concentration of products per unit time
- B) Change in concentration of reactants per unit time
- C) Time taken for the reaction to complete
- D) Time taken for a reactant to be consumed

Correct Option: B) Change in concentration of reactants per unit time

2. The unit of rate constant for a first-order reaction is:

- A) M
- B) s^{-1}
- C) M/s
- D) s

Correct Option: B) s^{-1}

3. The rate law for a reaction can be determined by:

- A) Experimentally measuring the concentration of reactants
- B) Using the stoichiometric coefficients
- C) Theoretical calculations based on molecular behavior
- D) The energy of activation

Correct Option: A) Experimentally measuring the concentration of reactants

4. For a zero-order reaction, the rate of reaction depends on:

- A) Concentration of reactants
- B) Square of the concentration of reactants

- C) Cube of the concentration of reactants
 - D) The rate constant only
- Correct Option:** D) The rate constant only

5. The rate constant of a first-order reaction has units of:

- A) M/s
- B) $M^{-1} s^{-1}$
- C) s^{-1}
- D) M^2/s

Correct Option: C) s^{-1}

6. The rate of a reaction increases with temperature due to:

- A) A decrease in the activation energy
- B) A decrease in the collision frequency
- C) A greater fraction of molecules possessing sufficient energy
- D) A constant rate constant

Correct Option: C) A greater fraction of molecules possessing sufficient energy

7. The activation energy is defined as the:

- A) Energy required to break bonds in the reactants
- B) Energy required to form bonds in the products
- C) Energy required to initiate the reaction
- D) Energy released during the reaction

Correct Option: C) Energy required to initiate the reaction

8. The relationship between rate constant and temperature is given by:

- A) Van't Hoff equation
- B) Arrhenius equation
- C) Nernst equation
- D) Le Chatelier's principle

Correct Option: B) Arrhenius equation

9. In a first-order reaction, the time required for half of the reactant to be consumed is called the:

- A) Rate-determining step
- B) Activation time
- C) Half-life
- D) Reaction time

Correct Option: C) Half-life

10. The unit of the rate constant for a second-order reaction is:

- A) M/s
- B) s^{-1}
- C) $M^{-1} s^{-1}$
- D) M^2/s

Correct Option: C) $M^{-1} s^{-1}$

11. The slope of a concentration vs. time plot for a first-order reaction is:

- A) Positive
- B) Negative
- C) Zero
- D) Dependent on temperature

Correct Option: B) Negative

12. In a second-order reaction, the rate law is proportional to:

- A) The concentration of one reactant raised to the second power
- B) The concentration of one reactant
- C) The square of the concentration of products
- D) The rate constant

Correct Option: A) The concentration of one reactant raised to the second power

13. The rate of a reaction is directly proportional to the concentration of the reactant in a:

- A) Zero-order reaction
- B) First-order reaction
- C) Second-order reaction
- D) Third-order reaction

Correct Option: B) First-order reaction

14. The collision theory states that for a reaction to occur, molecules must:

- A) Collide with sufficient energy and proper orientation
- B) Collide at any energy level
- C) Have similar masses
- D) All of the above

Correct Option: A) Collide with sufficient energy and proper orientation

15. The rate of a reaction is proportional to the concentration of the reactant raised to a power. This power is known as:

- A) The rate constant
- B) The reaction order
- C) The activation energy
- D) The rate-determining step

Correct Option: B) The reaction order

16. A reaction is said to be of "zero order" when:

- A) The rate is directly proportional to the concentration of the reactant
- B) The rate is inversely proportional to the concentration of the reactant
- C) The rate is independent of the concentration of the reactant
- D) The rate is proportional to the square of the concentration

Correct Option: C) The rate is independent of the concentration of the reactant

17. In a reaction, if the temperature increases, the rate constant typically:

- A) Increases
- B) Decreases
- C) Remains constant
- D) Becomes zero

Correct Option: A) Increases

18. The term "activation energy" refers to the:

- A) Energy released during the reaction
- B) Minimum energy required for a reaction to occur
- C) Maximum energy required for a reaction to occur
- D) Energy required to form products

Correct Option: B) Minimum energy required for a reaction to occur

19. The integrated rate law for a first-order reaction is:

- A) $\ln[A] = -kt + \ln[A_0]$
- B) $1/[A] = kt + 1/[A_0]$

C) $[A] = [A_0] - kt$

D) $[A] = [A_0]e^{(-kt)}$

Correct Option: A) $\ln[A] = -kt + \ln[A_0]$

20. For a reaction to be considered a true "elementary reaction," it must:

A) Involve more than one molecular collision

B) Occur in a single step

C) Have an irreversible rate law

D) All of the above

Correct Option: B) Occur in a single step

21. The rate constant of a reaction can be influenced by:

A) Temperature

B) Pressure

C) Catalysts

D) All of the above

Correct Option: D) All of the above

22. In a reaction of order zero, the rate is independent of:

A) Concentration of reactants

B) The temperature

C) The rate constant

D) Time

Correct Option: A) Concentration of reactants

23. The activation energy for a reaction can be determined by:

A) Measuring the rate at various temperatures

- B) Using the equilibrium constant
- C) Measuring the rate of reaction at constant temperature
- D) Determining the rate constant
- Correct Option:** A) Measuring the rate at various temperatures

24. In a reaction, if the rate constant doubles when temperature is increased, the activation energy can be found using:

- A) Van't Hoff equation
- B) Arrhenius equation
- C) Le Chatelier's principle
- D) Gibbs free energy equation
- Correct Option:** B) Arrhenius equation

25. The half-life of a first-order reaction is:

- A) Independent of initial concentration
- B) Directly proportional to the concentration of reactants
- C) Inversely proportional to the rate constant
- D) Directly proportional to the temperature
- Correct Option:** A) Independent of initial concentration

26. The rate of a chemical reaction is directly proportional to the:

- A) Square of the concentration of reactants
- B) First power of the concentration of reactants
- C) Rate constant only
- D) Sum of the concentrations of all reactants
- Correct Option:** B) First power of the concentration of reactants

27. For a reaction with a rate law of $\text{rate} = k[A]^2$, the reaction is:

- A) Zero order
- B) First order
- C) Second order
- D) Third order

Correct Option: C) Second order

28. A reaction's rate constant is dependent on:

- A) The concentration of reactants
- B) The temperature
- C) The pressure of reactants
- D) The type of catalyst

Correct Option: B) The temperature

29. A catalyst works by:

- A) Lowering the activation energy of the reaction
- B) Changing the concentration of reactants
- C) Increasing the number of collisions
- D) Increasing the pressure in the system

Correct Option: A) Lowering the activation energy of the reaction

30. If the rate constant of a reaction decreases with temperature, this suggests that the reaction:

- A) Is endothermic
- B) Is exothermic
- C) Has a very low activation energy
- D) Follows a negative activation energy

Correct Option: B) Is exothermic

31. The rate law of a reaction is determined by:

- A) The concentration of products
- B) The activation energy
- C) The experimental data on how concentration affects the rate
- D) The temperature of the reaction

Correct Option: C) The experimental data on how concentration affects the rate

32. The units of the rate constant for a zero-order reaction are:

- A) M/s
- B) $M^{-1} s^{-1}$
- C) s^{-1}
- D) M^2/s

Correct Option: A) M/s

33. The rate law for a reaction is: $\text{rate} = k[A]^2$. If the concentration of A is doubled, the rate of the reaction will:

- A) Quadruple
- B) Double
- C) Remain the same
- D) Halve

Correct Option: A) Quadruple

34. The concentration-time relationship for a second-order reaction is:

- A) $\ln[A] = -kt + \ln[A_0]$
- B) $1/[A] = kt + 1/[A_0]$

C) $[A] = [A_0]e^{(-kt)}$

D) $[A] = [A_0] - kt$

Correct Option: B) $1/[A] = kt + 1/[A_0]$

35. In a reaction mechanism, the slowest step is called the:

A) Rate-determining step

B) Intermediate step

C) Fastest step

D) Catalytic step

Correct Option: A) Rate-determining step

36. The rate of reaction is defined as:

A) Change in volume per unit time

B) Change in concentration per unit time

C) Change in pressure per unit time

D) Change in mass per unit time

Correct Option: B) Change in concentration per unit time

37. The rate constant of a first-order reaction has units of:

A) $\text{mol/L}\cdot\text{s}$

B) $1/\text{s}$

C) $1/\text{mol}\cdot\text{L}\cdot\text{s}$

D) $\text{mol}\cdot\text{L}/\text{s}$

Correct Option: B) $1/\text{s}$

38. For a reaction to be first-order, the rate law must depend on:

A) The concentration of one reactant raised to the power of 2

B) The concentration of all reactants raised to the power of 1

C) The concentration of one reactant raised to the power of 1

D) The concentration of one reactant raised to the power of 3

Correct Option: C) The concentration of one reactant raised to the power of 1

39. Which of the following is true for the units of rate constant (k) of a second-order reaction?

- A) $\text{mol/L}\cdot\text{s}$
- B) $1/\text{s}$
- C) $1/\text{mol}\cdot\text{L}\cdot\text{s}$
- D) $\text{mol}\cdot\text{L}/\text{s}$

Correct Option: C) $1/\text{mol}\cdot\text{L}\cdot\text{s}$

40. The rate of reaction increases with temperature because:

- A) The activation energy decreases
- B) The activation energy increases
- C) The number of collisions increases
- D) The collision energy decreases

Correct Option: C) The number of collisions increases

41. The integrated rate law for a first-order reaction is:

- A) $\ln[A] = -kt + \ln[A]_0$
- B) $[A] = -kt + [A]_0$
- C) $\ln[A] = kt + \ln[A]_0$
- D) $[A] = k + [A]_0$

Correct Option: A) $\ln[A] = -kt + \ln[A]_0$

42. The half-life of a first-order reaction is:

- A) Independent of the initial concentration
- B) Directly proportional to the initial concentration
- C) Inversely proportional to the initial concentration
- D) Directly proportional to the rate constant

Correct Option: A) Independent of the initial concentration

43. The molecularity of a reaction refers to:

- A) The number of atoms in a molecule
- B) The number of molecules involved in the rate-determining step
- C) The number of molecules involved in the overall reaction
- D) The rate constant of a reaction

Correct Option: B) The number of molecules involved in the rate-determining step

44. In a reaction mechanism, the slowest step is called the:

- A) Rate-determining step
- B) Fastest step
- C) Intermediate step
- D) Final step

Correct Option: A) Rate-determining step

45. Which of the following reactions is zero-order?

- A) $A \rightarrow B$
- B) $2A \rightarrow C$
- C) $A + B \rightarrow C$
- D) $2A \rightarrow 2B$

Correct Option: A) $A \rightarrow B$

46. The rate constant of a reaction is dependent on:

- A) Temperature
- B) Concentration of reactants
- C) The presence of a catalyst
- D) All of the above

Correct Option: A) Temperature

47. The collision theory of chemical reactions states that:

- A) Reactions occur when particles collide with sufficient energy
- B) Reactions occur without any collisions
- C) Reactions require a catalyst to take place
- D) Only gas molecules can react

Correct Option: A) Reactions occur when particles collide with sufficient energy

48. In a second-order reaction, the integrated rate law is:

- A) $1/[A] = kt + 1/[A]_0$
- B) $[A] = kt + [A]_0$

C) $\ln[A] = -kt + \ln[A]_0$

D) $1/[A] = k + [A]_0$

Correct Option: A) $1/[A] = kt + 1/[A]_0$

49. The activation energy of a reaction is the:

A) Energy required to form products from reactants

B) Energy required to start the reaction

C) Energy released during a reaction

D) Energy required to break bonds in reactants

Correct Option: B) Energy required to start the reaction

50. For a reaction to be of first order, the rate of reaction is proportional to:

A) The square of the concentration of the reactant

B) The concentration of the reactant raised to the power of 1

C) The concentration of the reactant raised to the power of 2

D) The concentration of the reactant raised to the power of 3

Correct Option: B) The concentration of the reactant raised to the power of 1

51. The effect of a catalyst on a reaction is to:

A) Increase the activation energy

B) Decrease the activation energy

C) Increase the concentration of reactants

D) Decrease the concentration of reactants

Correct Option: B) Decrease the activation energy

52. The rate constant for a reaction is given by:

A) $k = [\text{products}]/[\text{reactants}]$

B) $k = [\text{reactants}]/[\text{products}]$

C) $k = \text{rate}/[\text{reactant concentration}]$

D) $k = \text{rate} \times [\text{reactant concentration}]$

Correct Option: C) $k = \text{rate}/[\text{reactant concentration}]$

53. The half-life of a zero-order reaction depends on:

A) Initial concentration of reactants

- B) Rate constant
- C) Both A and B
- D) Temperature

Correct Option: C) Both A and B

54. The unit of the rate constant for a zero-order reaction is:

- A) $\text{mol/L}\cdot\text{s}$
- B) $\text{mol/L}\cdot\text{s}^2$
- C) $1/\text{s}$
- D) $1/\text{mol}\cdot\text{L}\cdot\text{s}$

Correct Option: B) $\text{mol/L}\cdot\text{s}^2$

55. In the Arrhenius equation, the pre-exponential factor (A) represents:

- A) The fraction of molecules that have sufficient energy to react
- B) The rate constant at a given temperature
- C) The energy required for the reaction to occur
- D) The total number of collisions per unit time

Correct Option: D) The total number of collisions per unit time

56. The molecularity of a reaction is the number of molecules that:

- A) React in the rate-determining step
- B) Are involved in the overall reaction
- C) Are present in the product
- D) Collide during the reaction

Correct Option: A) React in the rate-determining step

57. The rate law for a reaction is determined experimentally by:

- A) Measuring the change in temperature
- B) Measuring the change in concentration over time
- C) Using the Arrhenius equation
- D) Balancing the reaction

Correct Option: B) Measuring the change in concentration over time

58. For a reaction to be second-order, the rate is proportional to:

- A) The concentration of the reactant

- B) The square of the concentration of the reactant
- C) The third power of the concentration of the reactant
- D) The concentration of products

Correct Option: B) The square of the concentration of the reactant

59. If the rate constant increases, the rate of reaction:

- A) Decreases
- B) Increases
- C) Remains unchanged
- D) Depends on the temperature

Correct Option: B) Increases

60. The integrated rate law for a zero-order reaction is:

- A) $[A] = -kt + [A]_0$
- B) $\ln[A] = -kt + \ln[A]_0$
- C) $1/[A] = kt + 1/[A]_0$
- D) $[A] = kt + [A]_0$

Correct Option: A) $[A] = -kt + [A]_0$

61. The rate constant of a reaction can be determined from:

- A) The half-life of the reaction
- B) The initial rate of the reaction
- C) The concentration of the reactants
- D) All of the above

Correct Option: D) All of the above

62. The rate law for a reaction involving multiple reactants can be determined by:

- A) The reaction mechanism
- B) The concentration of one reactant at a time
- C) The temperature at which the reaction occurs
- D) The change in enthalpy of the reaction

Correct Option: B) The concentration of one reactant at a time

63. The rate-determining step in a reaction mechanism is usually:

- A) The fastest step
- B) The slowest step
- C) The step with the highest activation energy
- D) The step that releases the most energy

Correct Option: B) The slowest step

Chapter 8: Chemical Equilibrium

1. The equilibrium constant (K) depends on:

- A) Concentration of reactants
- B) Pressure
- C) Temperature
- D) Volume

Correct Option: C) Temperature

2. At equilibrium, the rates of the forward and reverse reactions are:

- A) Equal
- B) Zero
- C) Constant
- D) Unpredictable

Correct Option: A) Equal

3. The reaction quotient (Q) is used to compare:

- A) The rate of the forward reaction
- B) The concentrations of reactants and products at any time
- C) The equilibrium constant with the rate constant
- D) The energy of reactants and products

Correct Option: B) The concentrations of reactants and products at any time

4. A reaction at equilibrium will shift towards the products if:

- A) The concentration of reactants is increased
- B) The temperature is decreased
- C) The pressure is increased
- D) The volume is increased

Correct Option: A) The concentration of reactants is increased

5. If the volume of the system is reduced, the equilibrium will shift towards:

- A) More moles of gas
- B) Fewer moles of gas
- C) Equal moles of gas
- D) No shift

Correct Option: B) Fewer moles of gas

6. For the reaction: $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$, if the temperature is increased, the equilibrium will:

- A) Shift to the left
- B) Shift to the right
- C) Remain the same
- D) Become irreversible

Correct Option: A) Shift to the left

7. A catalyst affects the equilibrium by:

- A) Increasing the rate of reaction
- B) Changing the position of equilibrium
- C) Altering the equilibrium constant
- D) Decreasing activation energy

Correct Option: A) Increasing the rate of reaction

8. The equilibrium constant for a reaction only changes when:

- A) The temperature changes
- B) The pressure changes
- C) The volume changes
- D) The concentration of reactants changes

Correct Option: A) The temperature changes

9. Le Chatelier's principle helps predict the direction of shift when:

- A) The temperature changes
- B) A catalyst is added
- C) The pressure remains constant
- D) The concentration of a product is decreased

Correct Option: A) The temperature changes

10. For a system at equilibrium, if the concentration of products is increased, the equilibrium will shift:

- A) To the left
- B) To the right
- C) No shift
- D) Depends on the temperature

Correct Option: A) To the left

11. The equilibrium constant for a reaction is always:

- A) Less than 1
- B) Equal to 1
- C) Greater than 1
- D) Dependent on concentration

Correct Option: D) Dependent on concentration

12. If the concentration of a reactant is decreased, the equilibrium will shift towards:

- A) The products
- B) The reactants
- C) No change
- D) Both reactants and products equally

Correct Option: A) The products

13. If a gas-phase reaction has more moles of reactants than products, increasing the pressure will shift the equilibrium:

- A) To the left
- B) To the right
- C) No shift
- D) Depends on temperature

Correct Option: A) To the left

14. For an exothermic reaction, decreasing the temperature will shift the equilibrium:

- A) To the left
- B) To the right
- C) No change
- D) To produce more heat

Correct Option: B) To the right

15. A system at equilibrium can be disturbed by:

- A) Changing the concentration of reactants or products
- B) Changing the temperature
- C) Changing the pressure
- D) All of the above

Correct Option: D) All of the above

16. If the reaction quotient Q is greater than the equilibrium constant K , the reaction will shift:

- A) To the right
- B) To the left
- C) No shift
- D) Cannot predict

Correct Option: B) To the left

17. The concentration of reactants at equilibrium is:

- A) Always greater than that of products
- B) Always equal to that of products
- C) Less than that of products
- D) Variable, depending on the reaction

Correct Option: D) Variable, depending on the reaction

18. A decrease in the concentration of products will shift the equilibrium towards:

- A) The products
- B) The reactants
- C) No shift
- D) Both reactants and products equally

Correct Option: A) The products

19. If the equilibrium constant for a reaction is large, it means the reaction favors:

- A) The reactants
- B) The products
- C) Neither
- D) Both equally

Correct Option: B) The products

20. The equilibrium constant expression for a reaction is:

- A) Independent of temperature
- B) Based only on the concentrations of solids
- C) Always written in terms of concentrations of gases and solutions
- D) Always written for gases only

Correct Option: C) Always written in terms of concentrations of gases and solutions

21. If the temperature is increased for an exothermic reaction, the equilibrium will shift:

- A) To the left
- B) To the right
- C) No shift
- D) Depends on the pressure

Correct Option: A) To the left

22. The equilibrium constant (K) for a reaction is affected by:

- A) Pressure
- B) Concentration
- C) Temperature
- D) All of the above

Correct Option: C) Temperature

23. For a reaction at equilibrium, if $Q > K$, the reaction will shift:

- A) To the right
- B) To the left
- C) No shift
- D) Depends on the temperature

Correct Option: B) To the left

24. In the reaction:

$N_2 + 3H_2 \rightleftharpoons 2NH_3$, increasing the concentration of N_2 will shift the equilibrium:

- A) To the left
- B) To the right
- C) No shift
- D) Depends on temperature

Correct Option: B) To the right

25. If a catalyst is added to a system at equilibrium, it will:

- A) Increase the reaction rate
- B) Change the equilibrium position
- C) Decrease the equilibrium constant
- D) Decrease the activation energy

Correct Option: A) Increase the reaction rate

26. For a reaction with more moles of gas on the reactant side, decreasing the volume will shift the equilibrium:

- A) To the left
- B) To the right
- C) No shift
- D) Depends on temperature

Correct Option: A) To the left

27. In a system at equilibrium, increasing pressure will shift the equilibrium towards:

- A) More moles of gas
- B) Fewer moles of gas
- C) No shift
- D) Both equally

Correct Option: B) Fewer moles of gas

28. For a reversible reaction at equilibrium, decreasing the concentration of a product will shift the equilibrium:

- A) To the left
- B) To the right
- C) No shift
- D) Depends on temperature

Correct Option: B) To the right

29. The value of the equilibrium constant for a reaction depends on:

- A) The concentration of reactants
- B) The concentration of products
- C) The temperature
- D) The pressure

Correct Option: C) The temperature

30. When $Q = K$ for a reaction, the system is:

- A) At equilibrium
- B) Shifting to the right
- C) Shifting to the left
- D) Incomplete

Correct Option: A) At equilibrium

31. At equilibrium, the rate of the forward reaction is:

- A) Greater than the rate of the reverse reaction
- B) Equal to the rate of the reverse reaction
- C) Zero
- D) None of the above

Correct Option: B) Equal to the rate of the reverse reaction

32. The equilibrium constant (K) for a reversible reaction is dependent on:

- A) The concentration of reactants
- B) The temperature
- C) The presence of a catalyst
- D) The pressure

Correct Option: B) The temperature

33. If the concentration of a reactant is increased, the position of equilibrium will:

- A) Shift to the right
- B) Shift to the left
- C) Remain unaffected
- D) Depends on the type of reaction

Correct Option: A) Shift to the right

34. In an exothermic reaction, increasing the temperature will:

- A) Shift the equilibrium to the left
- B) Shift the equilibrium to the right
- C) Have no effect on the equilibrium
- D) Increase the value of the equilibrium constant

Correct Option: A) Shift the equilibrium to the left

36. A reaction at equilibrium can be disturbed by changing:

- A) The concentration of reactants or products
- B) The temperature
- C) The pressure
- D) All of the above

Correct Option: D) All of the above

37. According to Le Chatelier's Principle, if the pressure is increased in a system with gases, the equilibrium will shift towards:

- A) The side with more moles of gas
- B) The side with fewer moles of gas
- C) The side with equal moles of gas
- D) None of the above

Correct Option: B) The side with fewer moles of gas

38. The equilibrium constant for a reaction that produces solid products is:

- A) Equal to 1
- B) Zero
- C) Dependent on the concentration of solids
- D) Not dependent on the concentration of solids

Correct Option: D) Not dependent on the concentration of solids

39. For a reaction to be in equilibrium, the rates of the forward and reverse reactions must:

- A) Be equal
- B) Be different
- C) Be independent of concentration
- D) None of the above

Correct Option: A) Be equal

40. If the value of the equilibrium constant (K) is very large, the reaction is:

- A) At equilibrium
- B) Not favored
- C) Almost complete, favoring products
- D) Almost complete, favoring reactants

Correct Option: C) Almost complete, favoring products

41. The reaction:

will be favored if the pressure is:

- A) Increased

- B) Decreased
- C) Remains the same
- D) Affected by concentration

Correct Option: A) Increased

42. In a reaction involving gases, decreasing the volume will:

- A) Shift the equilibrium to the side with fewer moles of gas
- B) Shift the equilibrium to the side with more moles of gas
- C) Have no effect on the equilibrium
- D) Increase the concentration of reactants

Correct Option: A) Shift the equilibrium to the side with fewer moles of gas

43. If the equilibrium constant (K) for a reaction is very small, the reaction is:

- A) Product favored
- B) Reactant favored
- C) At equilibrium
- D) Not possible

Correct Option: B) Reactant favored

44. The equilibrium constant is:

- A) Dependent on temperature only
- B) Dependent on pressure only
- C) Dependent on concentration
- D) Independent of temperature

Correct Option: A) Dependent on temperature only

45. In the equilibrium expression, pure solids and liquids:

- A) Are included
- B) Are excluded
- C) Can be included or excluded
- D) Are only included in the denominator

Correct Option: B) Are excluded

47. In an exothermic reaction, increasing the temperature will:

- A) Increase the yield of products
- B) Decrease the yield of products
- C) Not affect the equilibrium
- D) Increase the rate of the reverse reaction

Correct Option: B) Decrease the yield of products

48. The value of the equilibrium constant for a reaction:

- A) Remains constant only at constant temperature
- B) Depends on pressure
- C) Depends on the concentrations of reactants
- D) Is the same for all reactions

Correct Option: A) Remains constant only at constant temperature

49. The equilibrium constant expression for a reaction involving only liquids and gases is:

- A) Concentration of reactants divided by concentration of products
- B) Products divided by reactants
- C) Products divided by reactants raised to their stoichiometric coefficients
- D) The sum of products and reactants

Correct Option: C) Products divided by reactants raised to their stoichiometric coefficients

50. The effect of adding a catalyst to a reaction at equilibrium is:

- A) To increase the rate of the forward reaction only
- B) To increase the rate of the reverse reaction only
- C) To shift the equilibrium towards the products
- D) To increase the rate of both the forward and reverse reactions equally

Correct Option: D) To increase the rate of both the forward and reverse reactions equally

51. A system is at equilibrium. If the concentration of one reactant is increased, the equilibrium will:

- A) Shift to the left
- B) Shift to the right

- C) Stay the same
- D) Increase the rate of the reverse reaction

Correct Option: B) Shift to the right

52. The reaction reaches equilibrium at a given temperature. If the volume is reduced, the equilibrium will shift towards:

- A) The side with fewer moles of gas
- B) The side with more moles of gas
- C) No shift in the equilibrium
- D) The side with more products

Correct Option: A) The side with fewer moles of gas

53. The equilibrium constant is a measure of:

- A) The rate of the forward reaction
- B) The ratio of the rate constants of the forward and reverse reactions
- C) The concentration of reactants and products at equilibrium
- D) The extent to which a reaction occurs

Correct Option: C) The concentration of reactants and products at equilibrium

54. In a reaction, the concentration of reactants and products at equilibrium are:

- A) Always equal
- B) Always constant
- C) Always zero
- D) Not necessarily constant

Correct Option: B) Always constant

55. If the volume of a gas system at equilibrium is increased, the equilibrium will shift towards:

- A) The side with more moles of gas
- B) The side with fewer moles of gas
- C) The side with equal moles of gas
- D) No shift in equilibrium

Correct Option: A) The side with more moles of gas

56. If the pressure is increased in a system at equilibrium, the system will shift to:

- A) The side with more moles of gas
- B) The side with fewer moles of gas
- C) The side with equal moles of gas
- D) The side with the greater volume

Correct Option: B) The side with fewer moles of gas

57. In a chemical equilibrium, if the concentration of products increases, the equilibrium:

- A) Shifts to the left
- B) Shifts to the right
- C) Stays the same
- D) Depends on temperature

Correct Option: A) Shifts to the left

58. If the temperature is decreased in an exothermic reaction, the equilibrium will shift towards:

- A) The products
- B) The reactants
- C) No change
- D) The side with more moles of gas

Correct Option: A) The products

59. The equilibrium constant for a given reaction is always the same:

- A) At high pressure
- B) At high temperature
- C) At constant temperature
- D) At constant concentration

Correct Option: C) At constant temperature

60. The equilibrium constant expression for a reaction involving gases is written in terms of:

- A) Molar concentrations

- B) Partial pressures
- C) Both concentration and pressure
- D) Masses

Correct Option: B) Partial pressures

Chapter 9: Acid Base Chemistry

1. A strong acid dissociates:

- A) Partially
- B) Completely
- C) Slowly
- D) Not at all

Correct Option: B) Completely

2. The pH of a neutral solution at 25°C is:

- A) 0
- B) 7
- C) 14
- D) 1

Correct Option: B) 7

3. The acid dissociation constant (K_a) is a measure of:

- A) Acid strength
- B) Acid concentration
- C) Base strength
- D) Base concentration

Correct Option: A) Acid strength

4. A substance that can donate a proton (H^+) is called a:

- A) Base
- B) Acid
- C) Salt
- D) Neutral

Correct Option: B) Acid

5. In a strong acid-strong base reaction, the pH of the solution will be:

- A) Less than 7
- B) Equal to 7
- C) Greater than 7
- D) Depends on the concentration

Correct Option: B) Equal to 7

6. The pH of a solution can be calculated using:

- A) $\text{pH} = -\log[\text{H}^+]$
- B) $\text{pH} = \log[\text{H}^+]$
- C) $\text{pH} = -\log[\text{OH}^-]$
- D) $\text{pH} = \log[\text{OH}^-]$

Correct Option: A) $\text{pH} = -\log[\text{H}^+]$

7. The conjugate base of HCl is:

- A) Cl^-
- B) H_3O^+
- C) HCl_2
- D) H_2Cl^-

Correct Option: A) Cl^-

8. A buffer solution resists changes in pH when:

- A) Diluted
- B) Acid is added
- C) Base is added
- D) All of the above

Correct Option: D) All of the above

9. Which of the following is a weak acid?

- A) HCl
- B) HNO_3
- C) CH_3COOH
- D) H_2SO_4

Correct Option: C) CH_3COOH

10. The pKa of an acid is the pH at which:

- A) The acid is 100% dissociated
- B) The acid is 50% dissociated
- C) The acid is completely neutralized
- D) The base is neutralized

Correct Option: B) The acid is 50% dissociated

11. A solution with $\text{pH} = 3$ is:

- A) Neutral
- B) Acidic
- C) Basic
- D) Cannot be determined

Correct Option: B) Acidic

12. In a neutralization reaction, an acid reacts with a base to form:

- A) Water and a salt
- B) Water and carbon dioxide
- C) Salt and oxygen
- D) Salt and hydrogen gas

Correct Option: A) Water and a salt

13. The stronger the acid, the:

- A) Lower the pKa
- B) Higher the pKa
- C) Higher the pH
- D) Weaker the conjugate base

Correct Option: A) Lower the pKa

14. Which of the following is a Lewis acid?

- A) NH_3
- B) H_2O
- C) BF_3
- D) CH_4

Correct Option: C) BF_3

15. The conjugate acid of NH_3 is:

- A) NH_2^-
- B) NH_4^+
- C) NH_3
- D) H_2O

Correct Option: B) NH_4^+

16. The pOH of a solution is related to the pH by the equation:

- A) $\text{pOH} = 14 - \text{pH}$
- B) $\text{pOH} = \text{pH} + 14$
- C) $\text{pOH} = \text{pH}$
- D) $\text{pOH} = 7 - \text{pH}$

Correct Option: A) $\text{pOH} = 14 - \text{pH}$

17. A solution with $\text{pOH} = 4$ has a pH of:

- A) 10
- B) 7
- C) 9
- D) 4

Correct Option: C) 9

18. The hydronium ion concentration in a solution with $\text{pH} = 5$ is:

- A) $1 \times 10^{-5} \text{ M}$
- B) $1 \times 10^{-6} \text{ M}$
- C) $1 \times 10^4 \text{ M}$
- D) $1 \times 10^{-3} \text{ M}$

Correct Option: A) $1 \times 10^{-5} \text{ M}$

19. The common ion effect refers to:

- A) The increase in solubility due to a common ion
- B) The decrease in solubility due to a common ion
- C) The neutralization of acids by bases
- D) The dissociation of weak acids in water

Correct Option: B) The decrease in solubility due to a common ion

20. The K_w of water at 25°C is:

- A) 1×10^{-14}

- B) 1×10^{-7}
- C) 1×10^{-9}
- D) 1×10^{-12}

Correct Option: A) 1×10^{-14}

21. The pH of a buffer solution is most affected by:

- A) Acid concentration
- B) Base concentration
- C) Temperature
- D) Volume of the solution

Correct Option: C) Temperature

22. The conjugate base of H_2SO_4 is:

- A) SO_4^{2-}
- B) HSO_4^-
- C) $\text{H}_2\text{SO}_4^{2-}$
- D) SO_4^-

Correct Option: B) HSO_4^-

23. A strong acid in water produces:

- A) Weak conjugate base
- B) Strong conjugate base
- C) No conjugate base
- D) Neutral conjugate base

Correct Option: A) Weak conjugate base

24. In a titration of a weak acid with a strong base, the pH at the equivalence point is:

- A) Less than 7
- B) Equal to 7
- C) Greater than 7

D) Depends on the acid

Correct Option: C) Greater than 7

25. The buffer capacity is strongest when:

A) The pH equals pKa

B) The acid concentration is much higher than the base

C) The base concentration is much higher than the acid

D) The concentration of buffer components is low

Correct Option: A) The pH equals pKa

26. Which of the following is a strong base?

A) NH_3

B) NaOH

C) CH_3NH_2

D) $\text{C}_2\text{H}_5\text{OH}$

Correct Option: B) NaOH

27. The conjugate base of H_2CO_3 is:

A) HCO_3^-

B) CO_3^{2-}

C) H_2CO_3^-

D) CO_2

Correct Option: A) HCO_3^-

28. A weak base among the following is:

A) KOH

B) $\text{Ba}(\text{OH})_2$

C) NH_3

D) NaOH

Correct Option: C) NH_3

29. When an acid reacts with a base, the products are:

A) Salt and water

- B) Water only
- C) Salt only
- D) Gas only

Correct Option: A) Salt and water

30. Which of the following is an amphoteric species?

- A) OH^-
- B) HCO_3^-
- C) Cl^-
- D) SO_4^{2-}

Correct Option: B) HCO_3^-

31. The stronger the acid, the _____ its conjugate base.

- A) Stronger
- B) Weaker
- C) More reactive
- D) Less reactive

Correct Option: B) Weaker

32. Which of these is NOT a characteristic of bases?

- A) Slippery touch
- B) Sour taste
- C) Bitter taste
- D) Turns red litmus blue

Correct Option: B) Sour taste

33. Which acid is present in vinegar?

- A) Hydrochloric acid
- B) Nitric acid
- C) Acetic acid
- D) Sulfuric acid

Correct Option: C) Acetic acid

34. In self-ionization of water, one water molecule acts as:

- A) Only an acid

- B) Only a base
- C) Both acid and base
- D) Neither acid nor base

Correct Option: C) Both acid and base

35. The strength of an acid is determined by:

- A) The number of hydrogen atoms
- B) Its ability to donate protons
- C) Its molecular size
- D) Its color

Correct Option: B) Its ability to donate protons

36. An acid which partially dissociates in water is called:

- A) Strong acid
- B) Weak acid
- C) Concentrated acid
- D) Dilute acid

Correct Option: B) Weak acid

37. The unit of pH is:

- A) Molarity
- B) Mole
- C) No unit
- D) Pascal

Correct Option: C) No unit

38. Which of the following acids is dibasic?

- A) HCl
- B) H_2SO_4
- C) HNO_3
- D) CH_3COOH

Correct Option: B) H_2SO_4

39. Which of the following bases is weak?

- A) NaOH

- B) KOH
- C) $\text{Ca}(\text{OH})_2$
- D) NH_3

Correct Option: D) NH_3

40. The ion responsible for acidic character is:

- A) OH^-
- B) Cl^-
- C) H^+
- D) Na^+

Correct Option: C) H^+

41. What happens to the pH of an acidic solution when it is diluted?

- A) Increases
- B) Decreases
- C) Remains same
- D) Becomes neutral

Correct Option: A) Increases

42. An acid which contains more than one replaceable hydrogen ion is called:

- A) Monobasic acid
- B) Dibasic acid
- C) Polyprotic acid
- D) Non-protic acid

Correct Option: C) Polyprotic acid

43. The acid used in car batteries is:

- A) Hydrochloric acid
- B) Sulfuric acid
- C) Acetic acid
- D) Nitric acid

Correct Option: B) Sulfuric acid

44. Neutralization reaction is:

- A) Endothermic
- B) Exothermic
- C) Neither
- D) Both

Correct Option: B) Exothermic

45. Which of the following substances can act both as an acid and a base?

- A) H_2SO_4
- B) NH_3
- C) H_2O
- D) HCl

Correct Option: C) H_2O

46. The base used in the manufacture of soap is:

- A) NaOH
- B) HCl
- C) H_2SO_4
- D) CH_3COOH

Correct Option: A) NaOH

47. The acid rain is mainly due to:

- A) CO_2
- B) SO_2 and NO_2
- C) CH_4
- D) O_2

Correct Option: B) SO_2 and NO_2

48. What color does blue litmus paper turn in an acid?

- A) Blue
- B) Red
- C) Yellow
- D) Green

Correct Option: B) Red

49. Bronsted-Lowry definition of base involves:

- A) Accepting a proton
- B) Donating a proton
- C) Accepting an electron
- D) Donating an electron

Correct Option: A) Accepting a proton

50. The strength of a base depends on its ability to:

- A) Accept protons
- B) Donate protons
- C) Accept electrons
- D) Donate electrons

Correct Option: A) Accept protons

51. Which of these is a property of acids?

- A) Slippery feel
- B) Turns blue litmus red
- C) Bitter taste
- D) Produces OH^- ions in solution

Correct Option: B) Turns blue litmus red

52. The ion responsible for basicity is:

- A) H^+
- B) OH^-
- C) Na^+
- D) Cl^-

Correct Option: B) OH^-

53. A solution with pH 9 is:

- A) Neutral
- B) Weakly acidic
- C) Strongly basic
- D) Weakly basic

Correct Option: D) Weakly basic

54. A very strong base among the following is:

- A) NH_3
- B) $\text{Ca}(\text{OH})_2$
- C) NaOH
- D) $\text{Mg}(\text{OH})_2$

Correct Option: C) NaOH

55. Which of these is a monoprotic acid?

- A) H_2SO_4
- B) H_3PO_4
- C) HNO_3
- D) H_2CO_3

Correct Option: C) HNO_3

56. In the reaction $\text{HCl} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{Cl}^-$, H_2O acts as:

- A) Acid
- B) Base
- C) Salt
- D) Oxidizing agent

Correct Option: B) Base

57. The name of H_2SO_4 is:

- A) Sulfuric acid
- B) Sulfurous acid
- C) Hydrochloric acid
- D) Nitric acid

Correct Option: A) Sulfuric acid

58. The acid found in lemon is:

- A) Citric acid
- B) Acetic acid
- C) Oxalic acid
- D) Formic acid

Correct Option: A) Citric acid

59. A strong acid has:

- A) High pH
- B) High concentration of H^+ ions
- C) Low H^+ ionization
- D) Weak conjugate base strength

Correct Option: B) High concentration of H^+ ions

Chapter 10: Periodic Table

1. The periodic law states that the properties of elements are a periodic function of their:

- A) Atomic mass
- B) Atomic number
- C) Electron configuration
- D) Ionization energy

Correct Option: B) Atomic number

2. Which of the following groups contains only non-metals?

- A) Group 1
- B) Group 17
- C) Group 2
- D) Group 18

Correct Option: B) Group 17

3. Which of the following elements has the largest atomic radius?

- A) Na

- B) Mg
- C) Al
- D) K

Correct Option: D) K

4. Which group of elements is known as the halogens?

- A) Group 1
- B) Group 17
- C) Group 18
- D) Group 2

Correct Option: B) Group 17

5. Which of the following elements is a noble gas?

- A) Oxygen
- B) Nitrogen
- C) Argon
- D) Chlorine

Correct Option: C) Argon

6. The ionization energy generally increases across a period due to:

- A) Decreasing nuclear charge
- B) Increasing nuclear charge
- C) Decreasing atomic size
- D) Increasing electron shielding

Correct Option: B) Increasing nuclear charge

7. Which element has the highest electronegativity?

- A) Lithium
- B) Fluorine

- C) Oxygen
- D) Chlorine

Correct Option: B) Fluorine

8. The atomic number of an element corresponds to the number of:

- A) Electrons
- B) Neutrons
- C) Protons
- D) Neurons

Correct Option: C) Protons

9. Which of the following elements is a metalloid?

- A) Aluminum
- B) Silicon
- C) Iron
- D) Sodium

Correct Option: B) Silicon

10. The elements in the same group of the periodic table have similar:

- A) Atomic number
- B) Ionization energies
- C) Electron configurations
- D) Atomic mass

Correct Option: C) Electron configurations

11. The transition elements are located in which block of the periodic table?

- A) s-block
- B) p-block
- C) d-block
- D) f-block

Correct Option: C) d-block

12. Which of the following elements has the smallest atomic radius?

- A) Li
- B) Na
- C) K
- D) Rb

Correct Option: A) Li

13. Which element in Period 3 has the highest ionization energy?

- A) Sodium
- B) Magnesium
- C) Silicon
- D) Chlorine

Correct Option: D) Chlorine

14. Which of the following trends occurs as you move down a group in the periodic table?

- A) Atomic radius decreases
- B) Electronegativity increases
- C) Ionization energy decreases
- D) Electron affinity increases

Correct Option: C) Ionization energy decreases

15. The periodic table was first arranged by:

- A) Dalton
- B) Mendeleev
- C) Moseley
- D) Rutherford

Correct Option: B) Mendeleev

16. The Lanthanides and Actinides are placed separately in the periodic table because:

- A) They are radioactive
- B) They are transition metals
- C) Their properties do not fit in any other group
- D) They are non-metals

Correct Option: C) Their properties do not fit in any other group

17. Which of the following is a characteristic of noble gases?

- A) They are highly reactive
- B) They have low ionization energy
- C) They have complete outer electron shells
- D) They readily form compounds

Correct Option: C) They have complete outer electron shells

18. Which of the following elements is in Group 2 of the periodic table?

- A) Calcium
- B) Carbon
- C) Nitrogen
- D) Oxygen

Correct Option: A) Calcium

19. Which of the following elements has the highest atomic number?

- A) Carbon
- B) Oxygen
- C) Neon
- D) Sodium

Correct Option: D) Sodium

20. Which of the following is a property of alkali metals?

- A) They are non-reactive
- B) They have high ionization energies
- C) They are good conductors of heat and electricity
- D) They form acidic oxides

Correct Option: C) They are good conductors of heat and electricity

21. As you move across a period, the ionization energy of elements generally:

- A) Increases
- B) Decreases
- C) Remains constant
- D) Fluctuates

Correct Option: A) Increases

22. Which of the following has the largest atomic radius?

- A) O
- B) F
- C) Ne

D) C

Correct Option: A) O

23. The electronegativity of an element increases as you move:

- A) Down a group
- B) Across a period from left to right
- C) From right to left in a period
- D) From left to right in a group

Correct Option: B) Across a period from left to right

24. Which group of elements has the smallest atomic radius?

- A) Alkali metals
- B) Halogens
- C) Noble gases
- D) Transition metals

Correct Option: B) Halogens

25. Which of the following is true for elements across a period?

- A) Atomic radius increases
- B) Electronegativity decreases
- C) Ionization energy decreases
- D) Electron affinity increases

Correct Option: D) Electron affinity increases

26. The first ionization energy of oxygen is higher than that of sulfur because:

- A) Oxygen has fewer electrons
- B) Oxygen has a smaller atomic radius

C) Sulfur has more shielding electrons

D) Sulfur is a noble gas

Correct Option: B) Oxygen has a smaller atomic radius

27. As you move down Group 17, the atomic radius of halogens:

A) Increases

B) Decreases

C) Remains constant

D) First increases, then decreases

Correct Option: A) Increases

28. Which element has the smallest ionization energy in Period 3?

A) Na

B) Mg

C) Si

D) P

Correct Option: A) Na

29. The trend of increasing atomic radius down a group is mainly due to:

A) Increased electron shielding

B) Decreased nuclear charge

C) Increased effective nuclear charge

D) Decreased electron-electron repulsion

Correct Option: A) Increased electron shielding

30. The effective nuclear charge increases as you move:

A) Down a group

B) Across a period

C) From left to right within a group

D) Both A and B

Correct Option: B) Across a period

31. Which of the following elements has the highest electron affinity?

A) Cl

B) Br

C) F

D) I

Correct Option: C) F

32. Which element in Period 2 has the highest ionization energy?

A) Li

B) Be

C) B

D) C

Correct Option: D) C

33. The electron configuration of a noble gas is:

A) ns^2

B) ns^2np^6

C) $ns^2np^6nd^{10}$

D) $ns^2np^6n^0$

Correct Option: B) ns^2np^6

34. Which of the following elements is most likely to have a high electronegativity?

A) Na

B) Mg

C) F

D) K

Correct Option: C) F

35. Which trend in the periodic table increases as you move across a period from left to right?

A) Atomic radius

B) Ionization energy

C) Electron shielding

D) Electron affinity

Correct Option: B) Ionization energy

36. As you move from left to right across a period, the atomic radius of the elements:

A) Decreases

B) Increases

C) First increases, then decreases

D) Remains constant

Correct Option: A) Decreases

37. Which of the following has the highest electronegativity?

A) Lithium

B) Neon

C) Oxygen

D) Chlorine

Correct Option: D) Chlorine

38. Which of the following is the correct order of atomic radius from smallest to largest?

- A) $O < F < N$
- B) $N < O < F$
- C) $F < N < O$
- D) $N < F < O$

Correct Option: B) $N < O < F$

39. Which of the following elements has the smallest ionization energy?

- A) Be
- B) B
- C) N
- D) O

Correct Option: B) B

40. Which trend occurs as you move down a group in the periodic table?

- A) Atomic radius decreases
- B) Ionization energy increases
- C) Electronegativity decreases
- D) Electron affinity increases

Correct Option: C) Electronegativity decreases

41. Element with highest electronegativity is:

- A) Oxygen
- B) Fluorine
- C) Nitrogen
- D) Chlorine

Correct Option: B) Fluorine

42. Atomic radius across a period:

- A) Increases
- B) Decreases
- C) Remains same

D) Doubles

Correct Option: B) Decreases

43. Group 1 elements are called:

A) Halogens

B) Noble gases

C) Alkali metals

D) Alkaline earth metals

Correct Option: C) Alkali metals

44. Element with highest ionization energy:

A) Hydrogen

B) Helium

C) Neon

D) Fluorine

Correct Option: B) Helium

45. Metallic character down a group:

A) Decreases

B) Increases

C) Remains same

D) Doubles

Correct Option: B) Increases

46. Period number indicates:

A) Number of electrons

B) Number of shells

C) Atomic mass

D) Number of neutrons

Correct Option: B) Number of shells

47. Which group has complete outer shells?

A) Group 1

B) Group 2

C) Group 17

D) Group 18

Correct Option: D) Group 18

48. Valency of nitrogen is:

A) 2

B) 3

C) 4

D) 5

Correct Option: B) 3

49. Which is the most reactive halogen?

A) Iodine

B) Chlorine

C) Bromine

D) Fluorine

Correct Option: D) Fluorine

50. Across a period, ionization energy generally:

A) Increases

B) Decreases

C) Stays constant

D) Drops then rises

Correct Option: A) Increases

51. Elements in the same group have:

A) Same mass

B) Same valence electrons

C) Same size

D) Same density

Correct Option: B) Same valence electrons

52. Which block contains transition metals?

A) s-block

B) p-block

C) d-block

D) f-block

Correct Option: C) d-block

53. Elements in period 3 have how many shells?

A) 1

B) 2

C) 3

D) 4

Correct Option: C) 3

54. Which property decreases down a group?

A) Metallic character

B) Atomic radius

C) Electronegativity

D) Reactivity

Correct Option: C) Electronegativity

55. Non-metals are mostly found on:

A) Left side

B) Center

C) Right side

D) Bottom

Correct Option: C) Right side

56. The least reactive noble gas is:

A) Xenon

B) Neon

C) Argon

D) Helium

Correct Option: D) Helium

57. Mendeleev's periodic table was arranged by:

A) Atomic number

B) Atomic mass

C) Density

D) Number of neutrons

Correct Option: B) Atomic mass

58. Modern periodic law is based on:

A) Atomic mass

B) Atomic number

C) Isotopes

D) Mass number

Correct Option: B) Atomic number

59. Which group contains halogens?

A) Group 15

B) Group 16

C) Group 17

D) Group 18

Correct Option: C) Group 17

60. Which element has the smallest atomic radius in period 2?

A) Lithium

B) Carbon

C) Oxygen

D) Neon

Correct Option: D) Neon

Chapter 11: Nitrogen And Sulphur

1. The most common oxidation state of nitrogen in its compounds is:

A) -3

B) +3

C) +5

D) +1

Correct Option: A) -3

2. The molecule N_2 is held together by:

- A) Ionic bond
- B) Covalent bond
- C) Hydrogen bond
- D) Metallic bond

Correct Option: B) Covalent bond

3. Which of the following is a property of nitrogen gas?

- A) It is highly reactive
- B) It is a colorless, odorless, and tasteless gas
- C) It supports combustion
- D) It is a liquid at room temperature

Correct Option: B) It is a colorless, odorless, and tasteless gas

4. Nitrogen fixation is the process of converting atmospheric nitrogen into:

- A) Ammonia
- B) Nitric acid
- C) Nitrous oxide
- D) Nitrogen dioxide

Correct Option: A) Ammonia

5. Ammonia (NH_3) has a bond angle of:

- A) 90°
- B) 107°
- C) 120°

D) 180°

Correct Option: B) 107°

6. Sulfur dioxide (SO_2) is primarily used in:

A) Fertilizers

B) Soaps

C) Food preservation

D) Dyes

Correct Option: C) Food preservation

7. Which of the following compounds is formed when nitrogen reacts with oxygen at high temperatures?

A) N_2O

B) NO

C) N_2O_4

D) NO_2

Correct Option: B) NO

8. Which of the following is an allotrope of sulfur?

A) Ozone

B) Graphene

C) Rhombic sulfur

D) Nitrous oxide

Correct Option: C) Rhombic sulfur

9. The primary use of sulfuric acid (H_2SO_4) is in:

A) Cleaning agents

B) Fertilizer production

C) Water purification

D) Paint production

Correct Option: B) Fertilizer production

10. The electron configuration of nitrogen is:

A) $1s^2 2s^2 2p^3$

B) $1s^2 2s^2 2p^4$

C) $1s^2 2s^2 2p^5$

D) $1s^2 2s^2 2p^2$

Correct Option: A) $1s^2 2s^2 2p^3$

11. Which of the following is the most common oxidation state of sulfur in its compounds?

A) -2

B) +2

C) +4

D) +6

Correct Option: D) +6

12. Which compound is formed when sulfur dioxide reacts with oxygen?

A) SO

B) SO₃

C) SO₂₂

D) S₂O₃

Correct Option: B) SO₃

13. Nitrogen trichloride (NCl₃) is formed by the reaction of nitrogen with:

- A) Hydrogen chloride
- B) Chlorine
- C) Hydrochloric acid
- D) Oxygen

Correct Option: B) Chlorine

14. Sulfuric acid is a strong acid because it:

- A) Has a high pH
- B) Has a low pH
- C) Is highly concentrated
- D) Can ionize in two steps

Correct Option: D) Can ionize in two steps

15. Which of the following is the correct molecular shape of sulfur hexafluoride (SF_6)?

- A) Tetrahedral
- B) Octahedral
- C) Linear
- D) Trigonal planar

Correct Option: B) Octahedral

16. The reaction between ammonia (NH_3) and hydrochloric acid (HCl) produces:

- A) Ammonium chloride
- B) Nitric acid
- C) Nitrogen gas
- D) Nitrous oxide

Correct Option: A) Ammonium chloride

17. The solubility of sulfur in water is:

- A) High
- B) Low
- C) Moderate
- D) None of the above

Correct Option: B) Low

18. The main source of sulfur for industrial purposes is:

- A) Water
- B) Air
- C) Sulfur ores
- D) Coal

Correct Option: C) Sulfur ores

19. Which of the following is an important use of nitric acid (HNO_3)?

- A) Fertilizer production
- B) Disinfectants
- C) Explosives
- D) Water purification

Correct Option: C) Explosives

20. In the Haber process, nitrogen reacts with hydrogen to form:

- A) Ammonia
- B) Nitric acid
- C) Nitrogen dioxide
- D) Nitrous oxide

Correct Option: A) Ammonia

21. Which of the following is a correct statement about the bonding in ammonia (NH_3)?

- A) Ammonia has ionic bonds

- B) Ammonia has covalent bonds with hydrogen
- C) Nitrogen forms a triple bond with each hydrogen in ammonia
- D) Ammonia has metallic bonds

Correct Option: B) Ammonia has covalent bonds with hydrogen

22. The oxidation number of sulfur in H_2SO_4 is:

- A) +4
- B) +6
- C) -2
- D) 0

Correct Option: B) +6

23. Nitrogen monoxide (NO) acts as a:

- A) Oxidizing agent
- B) Reducing agent
- C) Catalyst
- D) Both A and B

Correct Option: D) Both A and B

24. Which of the following compounds contains sulfur in the +2 oxidation state?

- A) SO_2
- B) SO_3
- C) H_2SO_4
- D) H_2S

Correct Option: A) SO_2

25. Nitrogen fixation primarily occurs in:

- A) Soil bacteria
- B) Atmospheric nitrogen
- C) Plant roots
- D) Water

Correct Option: A) Soil bacteria

26. The decomposition of ammonium dichromate results in the formation of:

- A) Ammonia
- B) Chromium oxide
- C) Nitrogen gas
- D) All of the above

Correct Option: D) All of the above

27. Which of the following is NOT a compound of sulfur?

- A) Sulfur dioxide
- B) Sulfur hexafluoride
- C) Sulfur trioxide
- D) Nitric acid

Correct Option: D) Nitric acid

28. In the contact process for producing sulfuric acid, which catalyst is commonly used?

- A) Iron
- B) Platinum
- C) Vanadium pentoxide
- D) Copper

Correct Option: C) Vanadium pentoxide

29. The formation of nitrogen dioxide (NO_2) in the atmosphere primarily contributes to:

- A) Acid rain
- B) Greenhouse effect
- C) Ozone depletion
- D) Smog formation

Correct Option: A) Acid rain

30. Which of the following is a characteristic of the allotropes of sulfur?

- A) Rhombic sulfur is stable at higher temperatures
- B) Monoclinic sulfur has a higher melting point than rhombic sulfur
- C) Allotropes of sulfur are gaseous at room temperature
- D) Sulfur has only one allotrope

Correct Option: B) Monoclinic sulfur has a higher melting point than rhombic sulfur

Chapter 12: Halogens

1. Which of the following is the most electronegative halogen?

- A) Chlorine
- B) Bromine
- C) Fluorine
- D) Iodine

Correct Option: C) Fluorine

2. The atomic radius of halogens:

- A) Decreases as you go down the group
- B) Increases as you go down the group
- C) Remains the same across the group
- D) Varies irregularly

Correct Option: B) Increases as you go down the group

3. Which of the following halogens is a liquid at room temperature?

- A) Chlorine
- B) Fluorine
- C) Iodine
- D) Bromine

Correct Option: D) Bromine

4. The boiling point of halogens:

- A) Increases as you go down the group
- B) Decreases as you go down the group
- C) Remains constant down the group
- D) Depends on the atomic number

Correct Option: A) Increases as you go down the group

5. The most reactive halogen is:

- A) Chlorine
- B) Bromine
- C) Fluorine
- D) Iodine

Correct Option: C) Fluorine

6. Which of the following halogen compounds is used in water treatment?

- A) NaCl
- B) Cl₂
- C) I₂
- D) NaF

Correct Option: B) Cl₂

7. The color of fluorine gas is:

- A) Yellow
- B) Greenish-yellow
- C) Purple
- D) Red

Correct Option: B) Greenish-yellow

8. When chlorine reacts with water, it forms:

- A) Hydrochloric acid and oxygen
- B) Hydrochloric acid and hydrogen
- C) Hydrofluoric acid
- D) Chlorine dioxide

Correct Option: A) Hydrochloric acid and oxygen

9. Which of the following halogens is most commonly used in the preparation of PVC (Polyvinyl chloride)?

- A) Chlorine
- B) Fluorine
- C) Iodine
- D) Bromine

Correct Option: A) Chlorine

10. The halogen with the largest atomic size is:

- A) Fluorine
- B) Chlorine
- C) Bromine
- D) Iodine

Correct Option: D) Iodine

11. Which of the following halogens does NOT form an acid when dissolved in water?

- A) Fluorine
- B) Chlorine
- C) Bromine
- D) Astatine

Correct Option: D) Astatine

12. Halogens exhibit which kind of bonding in their diatomic form?

- A) Ionic bonding
- B) Covalent bonding
- C) Metallic bonding
- D) Hydrogen bonding

Correct Option: B) Covalent bonding

13. Which halogen is used in the manufacture of iodine tincture?

- A) Chlorine
- B) Fluorine
- C) Bromine
- D) Iodine

Correct Option: C) Bromine

14. The common oxidation state of halogens in most of their compounds is:

- A) +1
- B) -1
- C) +2
- D) +3

Correct Option: B) -1

15. The most stable halogen oxides are formed by:

- A) Fluorine
- B) Chlorine
- C) Bromine
- D) Iodine

Correct Option: A) Fluorine

16. The most electronegative element is:

- A) Oxygen
- B) Fluorine
- C) Chlorine
- D) Iodine

Correct Option: B) Fluorine

17. Which halogen is purple in color?

- A) Fluorine
- B) Chlorine
- C) Bromine
- D) Iodine

Correct Option: D) Iodine

18. Which halogen has the highest boiling point?

- A) Fluorine
- B) Chlorine
- C) Bromine
- D) Iodine

Correct Option: D) Iodine

19. Halogens react with metals to form:

- A) Oxides
- B) Halides
- C) Nitrates
- D) Sulphates

Correct Option: B) Halides

20. Group number of halogens is:

- A) 16
- B) 17
- C) 18
- D) 15

Correct Option: B) 17

21. Down the group, halogen reactivity:

- A) Increases
- B) Decreases
- C) Remains same
- D) Doubles

Correct Option: B) Decreases

22. Chlorine gas is:

- A) Red
- B) Greenish yellow
- C) Blue
- D) Purple

Correct Option: B) Greenish yellow

23. Displacement reactions of halogens are due to:

- A) Size
- B) Mass
- C) Electronegativity
- D) Bond energy

Correct Option: C) Electronegativity

24. Fluorine is more reactive than:

- A) Chlorine
- B) Bromine
- C) Iodine
- D) All of these

Correct Option: D) All of these

25. Halogens exist as:

- A) Monatomic
- B) Diatomic
- C) Triatomic
- D) Polyatomic

Correct Option: B) Diatomic

26. Most soluble halogen in water:

- A) Fluorine
- B) Chlorine
- C) Bromine
- D) Iodine

Correct Option: B) Chlorine

27. State of iodine at room temperature:

- A) Gas
- B) Liquid
- C) Solid
- D) Plasma

Correct Option: C) Solid

28. Fluorine has the:

- A) Highest density
- B) Lowest reactivity
- C) Highest reactivity
- D) Lowest electronegativity

Correct Option: C) Highest reactivity

29. Colour of bromine in water:

- A) Yellow
- B) Orange-brown
- C) Green
- D) Violet

Correct Option: B) Orange-brown

30. Use of chlorine in industry:

- A) Rocket fuel
- B) Disinfection
- C) Batteries
- D) Alloys

Correct Option: B) Disinfection

31. Fluorine is stored in:

- A) Plastic containers
- B) Glass bottles
- C) Iron tanks
- D) Rubber bags

Correct Option: A) Plastic containers

32. Halogens show oxidation state of:

- A) +1
- B) -1
- C) +2
- D) +3

Correct Option: B) -1

33. Which halogen is most volatile?

- A) Fluorine
- B) Chlorine
- C) Bromine
- D) Iodine

Correct Option: A) Fluorine

34. Hydrogen halides dissolve in water to form:

- A) Alkalis
- B) Salts
- C) Acids
- D) Bases

Correct Option: C) Acids

35. Halogen used in water treatment:

- A) Bromine
- B) Fluorine
- C) Chlorine
- D) Iodine

Correct Option: C) Chlorine

36. Halogens form covalent compounds with:

- A) Noble gases
- B) Non-metals
- C) Metalloids
- D) Metals

Correct Option: B) Non-metals

37. Colour of fluorine gas:

- A) Colorless
- B) Yellow
- C) Blue
- D) Brown

Correct Option: B) Yellow

38. Iodine can sublime to form:

- A) Liquid iodine
- B) Purple vapors
- C) White mist
- D) Black smoke

Correct Option: B) Purple vapors

39. Halogen with strongest bond in its molecule:

- A) Fluorine
- B) Chlorine
- C) Bromine
- D) Iodine

Correct Option: B) Chlorine

40. Fluoride ions are added to:

- A) Drinking water
- B) Petrol
- C) Soil
- D) Detergents

Correct Option: A) Drinking water

41. Oxidation state of chlorine in NaCl:

- A) +1
- B) -1
- C) 0
- D) +2

Correct Option: B) -1

42. Bromine is mainly obtained from:

- A) Sea water
- B) Rocks
- C) Atmosphere
- D) Soil

Correct Option: A) Sea water

43. Most reactive non-metal halogen:

- A) Chlorine
- B) Fluorine
- C) Bromine
- D) Iodine

Correct Option: B) Fluorine

44. Displacement of bromine from solution is by:

- A) Fluorine
- B) Chlorine
- C) Iodine
- D) Oxygen

Correct Option: A) Fluorine

45. Chlorine reacts with cold NaOH to form:

- A) NaCl only
- B) NaClO only
- C) NaCl and NaClO
- D) NaCl and NaClO₃

Correct Option: C) NaCl and NaClO

46. Fluorine is more reactive due to:

- A) High atomic radius
- B) High electronegativity
- C) High mass
- D) Low density

Correct Option: B) High electronegativity

47. Halogens act as:

- A) Oxidizing agents
- B) Reducing agents
- C) Catalysts
- D) Bases

Correct Option: A) Oxidizing agents

48. Chlorine reacts with water to form:

- A) Hydrochloric acid
- B) Sodium chloride
- C) Oxygen
- D) Hydrochloric acid and hypochlorous acid

Correct Option: D) Hydrochloric acid and hypochlorous acid

49. Astatine is:

- A) Liquid halogen
- B) Solid halogen
- C) Gas halogen
- D) Unknown phase

Correct Option: B) Solid halogen

50. Trend of boiling point in halogens down the group:

- A) Decreases
- B) Increases
- C) Remains constant
- D) Irregular

Correct Option: B) Increases

Chapter 13: Environmental Chemistry: Air

1. The major component of air is:

- A) Nitrogen
- B) Oxygen
- C) Carbon dioxide
- D) Argon

Correct Option: A) Nitrogen

2. Which of the following gases is primarily responsible for global warming?

- A) Oxygen
- B) Carbon dioxide
- C) Nitrogen
- D) Neon

Correct Option: B) Carbon dioxide

3. The ozone layer is found in which part of the atmosphere?

- A) Troposphere
- B) Stratosphere
- C) Mesosphere
- D) Thermosphere

Correct Option: B) Stratosphere

4. Which of the following is a major cause of ozone depletion?

- A) Carbon dioxide
- B) Chlorofluorocarbons (CFCs)
- C) Nitrogen oxides
- D) Methane

Correct Option: B) Chlorofluorocarbons (CFCs)

5. The greenhouse effect is caused by the trapping of heat by:

- A) Carbon monoxide
- B) Water vapour
- C) Greenhouse gases
- D) Oxygen

Correct Option: C) Greenhouse gases

6. Which of the following is a major air pollutant released by vehicles?

- A) Nitrogen oxides
- B) Sulfur dioxide
- C) Ozone
- D) Carbon dioxide

Correct Option: A) Nitrogen oxides

7. The process by which plants take in carbon dioxide and release oxygen is known as:

- A) Respiration
- B) Photosynthesis
- C) Combustion
- D) Oxidation

Correct Option: B) Photosynthesis

8. Acid rain is mainly caused by the emission of:

- A) Carbon dioxide
- B) Nitrogen oxides and sulfur dioxide
- C) Oxygen and nitrogen
- D) Methane

Correct Option: B) Nitrogen oxides and sulfur dioxide

9. Which of the following is a consequence of air pollution?

- A) Ozone depletion
- B) Global warming
- C) Acid rain
- D) All of the above

Correct Option: D) All of the above

10. The harmful effects of carbon monoxide are mainly due to its:

- A) Ability to deplete the ozone layer
- B) Ability to react with hemoglobin in blood
- C) Reactivity with oxygen
- D) Toxicity to aquatic life

Correct Option: B) Ability to react with hemoglobin in blood

11. Which of the following is responsible for the formation of photochemical smog?

- A) Sulfur dioxide
- B) Nitrogen oxides and volatile organic compounds
- C) Carbon monoxide
- D) Methane

Correct Option: B) Nitrogen oxides and volatile organic compounds

12. The term "acid rain" refers to rainwater that is:

- A) Alkaline
- B) Neutral
- C) Slightly acidic
- D) Strongly acidic

Correct Option: D) Strongly acidic

13. Which of the following is NOT a source of indoor air pollution?

- A) Tobacco smoke
- B) Cleaning agents
- C) Vehicle emissions
- D) Wood stoves

Correct Option: C) Vehicle emissions

14. The pH of acid rain is generally below:

- A) 7
- B) 5
- C) 4
- D) 6

Correct Option: A) 7

15. The formation of ozone at ground level is a result of the reaction between:

- A) Oxygen and sulfur dioxide
- B) Nitrogen oxides and volatile organic compounds
- C) Carbon dioxide and methane
- D) Oxygen and carbon monoxide

Correct Option: B) Nitrogen oxides and volatile organic compounds

16. Which of the following gases is commonly used to treat air pollutants in industrial processes?

- A) Oxygen
- B) Nitrogen
- C) Sulfur dioxide
- D) Ammonia

Correct Option: D) Ammonia

17. Which of the following is a non-renewable source of energy that contributes to air pollution?

- A) Solar energy
- B) Wind energy
- C) Coal
- D) Geothermal energy

Correct Option: C) Coal

18. Which of the following is a major contributor to indoor air pollution?

- A) Volatile organic compounds (VOCs)
- B) Carbon dioxide
- C) Water vapor
- D) Nitrogen oxides

Correct Option: A) Volatile organic compounds (VOCs)

19. Which of the following is NOT a component of the air we breathe?

- A) Oxygen
- B) Nitrogen
- C) Carbon dioxide
- D) Helium

Correct Option: D) Helium

20. The Clean Air Act is a regulation aimed at:

- A) Reducing the levels of air pollution
- B) Protecting the ozone layer
- C) Reducing global warming
- D) Increasing industrial emissions

Correct Option: A) Reducing the levels of air pollution

21. The greenhouse effect is primarily caused by:

- A) Water vapour
- B) Methane
- C) Carbon dioxide
- D) Nitrogen

Correct Option: C) Carbon dioxide

22. Which of the following is a major source of nitrogen oxides in the atmosphere?

- A) Industrial processes
- B) Automobile emissions
- C) Forest fires
- D) All of the above

Correct Option: B) Automobile emissions

23. Which compound is responsible for the depletion of the ozone layer?

- A) Nitrogen oxides
- B) Methane
- C) Chlorofluorocarbons (CFCs)
- D) Carbon monoxide

Correct Option: C) Chlorofluorocarbons (CFCs)

24. What is the main component of photochemical smog?

- A) Ozone
- B) Nitrogen oxides
- C) Sulfur dioxide
- D) Both A and B

Correct Option: D) Both A and B

25. The term "acid rain" refers to rain that has a pH of less than:

- A) 7
- B) 5
- C) 6
- D) 4

Correct Option: A) 7

26. Which of the following is a consequence of increased air pollution?

- A) Ozone layer formation
- B) Acid rain
- C) Decreased CO₂ levels
- D) Decreased global temperature

Correct Option: B) Acid rain

27. What type of radiation does the ozone layer primarily protect the Earth from?

- A) Alpha radiation
- B) Beta radiation
- C) Ultraviolet radiation
- D) Gamma radiation

Correct Option: C) Ultraviolet radiation

28. Which of the following gases is mainly responsible for global warming?

- A) Oxygen
- B) Nitrogen

- C) Methane
- D) Carbon dioxide

Correct Option: D) Carbon dioxide

29. The highest concentration of ozone is found in which part of the atmosphere?

- A) Troposphere
- B) Stratosphere
- C) Mesosphere
- D) Thermosphere

Correct Option: B) Stratosphere

30. What does the term "air quality index" (AQI) represent?

- A) The percentage of oxygen in the air
- B) The level of pollutants in the air
- C) The concentration of greenhouse gases
- D) The air pressure

Correct Option: B) The level of pollutants in the air

31. The combustion of fossil fuels primarily leads to the release of:

- A) Carbon dioxide
- B) Water vapour
- C) Methane
- D) Sulfur dioxide

Correct Option: A) Carbon dioxide

32. Which of the following contributes to the formation of ground-level ozone?

- A) Nitrogen oxides
- B) Volatile organic compounds
- C) Both A and B

D) Carbon dioxide

Correct Option: C) Both A and B

33. The major effect of acid rain is:

- A) Damage to aquatic ecosystems
- B) Increased agricultural productivity
- C) Formation of smog
- D) Reduction in greenhouse gases

Correct Option: A) Damage to aquatic ecosystems

34. Which of the following is a method used to control air pollution?

- A) Electrostatic precipitators
- B) Scrubbers
- C) Catalytic converters
- D) All of the above

Correct Option: D) All of the above

35. The main cause of the increase in carbon dioxide levels in the atmosphere is:

- A) Industrial emissions
- B) Deforestation
- C) Combustion of fossil fuels
- D) All of the above

Correct Option: D) All of the above

36. Which of the following is NOT a consequence of ozone depletion?

- A) Increased UV radiation reaching Earth's surface
- B) Increased skin cancers
- C) Decreased photosynthesis in plants
- D) Increased air temperature

Correct Option: D) Increased air temperature

37. The primary source of methane in the atmosphere is:

- A) Automobile exhaust
- B) Livestock farming
- C) Industrial waste
- D) Forest fires

Correct Option: B) Livestock farming

38. Which of the following gases is NOT a major component of natural air pollution?

- A) Carbon monoxide
- B) Nitrogen oxides
- C) Methane
- D) Chlorofluorocarbons (CFCs)

Correct Option: D) Chlorofluorocarbons (CFCs)

39. Which of the following is a primary greenhouse gas?

- A) Nitrogen
- B) Oxygen
- C) Carbon dioxide
- D) Neon

Correct Option: C) Carbon dioxide

40. Which of the following can help reduce the levels of particulate matter in the air?

- A) Using cleaner fuels
- B) Increasing vehicle emissions
- C) Reducing industrial waste
- D) Increasing the use of coal

Correct Option: A) Using cleaner fuels

41. The primary source of sulfur dioxide in the air is:

- A) Industrial processes
- B) Forest fires
- C) Agricultural activities
- D) Automobile emissions

Correct Option: A) Industrial processes

42. Which gas is a major contributor to the greenhouse effect?

- A) Carbon dioxide
- B) Nitrogen
- C) Oxygen
- D) Argon

Correct Option: A) Carbon dioxide

43. The depletion of the ozone layer is mainly caused by:

- A) Methane
- B) Nitrogen oxides
- C) Chlorofluorocarbons
- D) Carbon dioxide

Correct Option: C) Chlorofluorocarbons

44. Which gas is primarily responsible for the formation of acid rain?

- A) Carbon dioxide
- B) Sulfur dioxide
- C) Nitrogen oxides
- D) Methane

Correct Option: B) Sulfur dioxide

45. What is the main effect of ozone layer depletion?

- A) Increased UV radiation

- B) Reduced smog formation
- C) Lower temperatures
- D) Decreased pollution
- Correct Option:** A) Increased UV radiation

Chapter 14: Environmental Chemistry: Water

1. The primary source of water pollution is:

- A) Industrial waste
- B) Domestic sewage
- C) Agricultural runoff
- D) All of the above

Correct Option: D) All of the above

2. Which of the following is responsible for the contamination of groundwater?

- A) Pesticides
- B) Industrial chemicals
- C) Waste disposal
- D) All of the above

Correct Option: D) All of the above

3. What is the main cause of eutrophication in water bodies?

- A) Increased dissolved oxygen
- B) Excess nutrients like nitrogen and phosphorus
- C) Increased water temperature
- D) Lack of sunlight

Correct Option: B) Excess nutrients like nitrogen and phosphorus

4. The chemical oxygen demand (COD) in water is a measure of:

- A) Total organic material
 - B) The ability of water to support life
 - C) The concentration of heavy metals
 - D) The amount of dissolved oxygen
- Correct Option:** A) Total organic material

5. Which process is used to remove large particles and debris from water?

- A) Filtration
- B) Distillation
- C) Sedimentation
- D) Chlorination

Correct Option: C) Sedimentation

6. The primary cause of water acidification is:

- A) Carbon dioxide
- B) Sulfur dioxide
- C) Nitrogen oxides
- D) All of the above

Correct Option: D) All of the above

7. Which of the following pollutants is commonly found in industrial wastewater?

- A) Heavy metals
- B) Radioactive substances
- C) Organic compounds
- D) All of the above

Correct Option: D) All of the above

8. What is the main method used for disinfecting drinking water?

- A) Boiling
- B) Filtration

C) Chlorination

D) Distillation

Correct Option: C) Chlorination

9. Which of the following causes waterborne diseases?

A) Contamination by fecal matter

B) Heavy metal pollution

C) High concentration of oxygen

D) Pesticide runoff

Correct Option: A) Contamination by fecal matter

10. Which of the following is a non-point source of water pollution?

A) Industrial discharge

B) Agricultural runoff

C) Sewage treatment plants

D) Landfills

Correct Option: B) Agricultural runoff

11. Which water treatment method removes dissolved minerals?

A) Filtration

B) Distillation

C) Reverse osmosis

D) Chlorination

Correct Option: C) Reverse osmosis

12. What is the primary concern with high levels of nitrogen in water bodies?

A) Algal blooms

B) Reduced oxygen levels

C) Contamination of drinking water

D) All of the above

Correct Option: D) All of the above

13. What does Biological Oxygen Demand (BOD) measure in water?

- A) Oxygen needed for bacteria growth
- B) The presence of dissolved oxygen
- C) The total amount of organic pollutants
- D) The concentration of harmful bacteria

Correct Option: A) Oxygen needed for bacteria growth

14. Which of the following can lead to the depletion of the ozone layer in water bodies?

- A) Chlorine
- B) Nitrogen oxides
- C) Sulfur compounds
- D) None of the above

Correct Option: A) Chlorine

15. What is the main effect of wastewater on aquatic ecosystems?

- A) Increased biodiversity
- B) Decreased oxygen levels
- C) Increased sunlight penetration
- D) Decreased temperature

Correct Option: B) Decreased oxygen levels

16. The process of converting salty water to fresh water is called:

- A) Desalination
- B) Filtration
- C) Reverse osmosis
- D) Distillation

Correct Option: A) Desalination

17. Which of the following is NOT a consequence of water pollution?

- A) Decreased fish populations
- B) Increased agricultural yield
- C) Spread of diseases
- D) Eutrophication

Correct Option: B) Increased agricultural yield

18. The presence of which of the following in water can cause a blue-green color?

- A) Iron
- B) Phosphates
- C) Algae
- D) Pesticides

Correct Option: C) Algae

19. Which of the following is used to remove harmful microorganisms from water in a water treatment plant?

- A) Filtration
- B) Boiling
- C) Ultraviolet (UV) treatment
- D) Chlorination

Correct Option: C) Ultraviolet (UV) treatment

20. What is the primary goal of wastewater treatment?

- A) To remove solid waste
- B) To kill bacteria
- C) To remove toxic chemicals
- D) To restore water for safe reuse

Correct Option: D) To restore water for safe reuse

21. Which of the following is an important method for removing heavy metals from contaminated water?

- A) Filtration
- B) Coagulation
- C) Adsorption
- D) Distillation

Correct Option: C) Adsorption

22. The process in which water evaporates from plants and returns to the atmosphere is called:

- A) Precipitation
- B) Evaporation
- C) Transpiration
- D) Condensation

Correct Option: C) Transpiration

23. Which element is a major component of the pollutants causing acid rain?

- A) Nitrogen
- B) Sulfur
- C) Carbon
- D) Oxygen

Correct Option: B) Sulfur

24. Which of the following water treatment processes is used to remove dissolved salts from water?

- A) Filtration
- B) Reverse osmosis

C) Chlorination

D) Boiling

Correct Option: B) Reverse osmosis

25. Which of the following is an indicator of organic pollution in water?

A) High BOD

B) High dissolved oxygen

C) High temperature

D) High pH

Correct Option: A) High BOD

26. The presence of which compound in drinking water is most commonly linked to "blue baby syndrome"?

A) Nitrate

B) Sulfate

C) Chlorine

D) Fluoride

Correct Option: A) Nitrate

27. Which of the following compounds is primarily responsible for the eutrophication of water bodies?

A) Nitrogen oxides

B) Phosphates

C) Methane

D) Oxygen

Correct Option: B) Phosphates

28. Which of the following methods is most effective in removing chlorine from water?

- A) Boiling
- B) Filtration
- C) Reverse osmosis
- D) Activated carbon adsorption

Correct Option: D) Activated carbon adsorption

29. Which of the following is a characteristic of primary treated wastewater?

- A) High biochemical oxygen demand
- B) Free from all pathogens
- C) Clear and colorless
- D) Removed dissolved chemicals

Correct Option: A) High biochemical oxygen demand

30. The term "water hardness" refers to the concentration of which ions in water?

- A) Sodium and chloride
- B) Calcium and magnesium
- C) Nitrogen and sulfur
- D) Fluoride and iodine

Correct Option: B) Calcium and magnesium

31. Which of the following is the main cause of high nitrate concentration in groundwater?

- A) Industrial runoff
- B) Agricultural fertilizer
- C) Urban waste
- D) Volcanic activity

Correct Option: B) Agricultural fertilizer

32. The term "biomagnification" refers to:

- A) Increased biodiversity in water bodies
- B) The increase in concentration of pollutants up the food chain
- C) The removal of contaminants from water
- D) The oxygenation of water by algae

Correct Option: B) The increase in concentration of pollutants up the food chain

33. Which process is responsible for the removal of suspended solids from water during treatment?

- A) Coagulation
- B) Distillation
- C) Filtration
- D) Adsorption

Correct Option: A) Coagulation

34. Which of the following is a non-chemical method for disinfecting water?

- A) Chlorination
- B) Ozonation
- C) UV radiation
- D) Fluoridation

Correct Option: C) UV radiation

35. Which chemical process causes the release of toxic methylmercury in aquatic systems?

- A) Nitrogen fixation
- B) Bioaccumulation
- C) Ammonification
- D) Eutrophication

Correct Option: B) Bioaccumulation

Chapter 15 :Organic Chemistry

1. The simplest alkane is:

- A) Ethane
- B) Propane
- C) Methane
- D) Butane

Correct Option: C) Methane

2. The functional group of alcohols is:

- A) -COOH
- B) -CHO
- C) -OH
- D) -CO-

Correct Option: C) -OH

3. The IUPAC name of $\text{CH}_3\text{CH}_2\text{OH}$ is:

- A) Methanol
- B) Ethanol
- C) Propanol
- D) Butanol

Correct Option: B) Ethanol

4. Isomers have:

- A) Same chemical formula, different structures
- B) Different chemical formula

- C) Same structure
- D) Same formula and structure

Correct Option: A) Same chemical formula, different structures

5. Which hybridization is present in ethyne (C_2H_2)?

- A) sp^3
- B) sp^2
- C) sp
- D) sp^3d

Correct Option: C) sp

6. Which type of reaction involves the addition of hydrogen to alkenes?

- A) Oxidation
- B) Reduction
- C) Substitution
- D) Elimination

Correct Option: B) Reduction

7. Alkanes mainly undergo:

- A) Addition reactions
- B) Substitution reactions
- C) Elimination reactions
- D) Redox reactions

Correct Option: B) Substitution reactions

8. Which reagent is used for the bromination of alkanes?

- A) HCl
- B) Br_2 with UV light
- C) HBr

D) Br_2 without light

Correct Option: B) Br_2 with UV light

9. Which of the following is a saturated hydrocarbon?

A) Ethene

B) Ethyne

C) Methane

D) Benzene

Correct Option: C) Methane

10. Markovnikov's rule applies to:

A) Alkanes

B) Alkenes

C) Alkynes

D) Arenes

Correct Option: B) Alkenes

11. Which of the following is an aromatic compound?

A) Ethane

B) Propane

C) Benzene

D) Butene

Correct Option: C) Benzene

12. Which element must be present in all organic compounds?

A) Nitrogen

B) Carbon

C) Oxygen

D) Sulfur

Correct Option: B) Carbon

13. In nucleophilic substitution, a nucleophile replaces:

- A) Proton
- B) Leaving group
- C) Metal ion
- D) Radical

Correct Option: B) Leaving group

14. What is the general formula for alkenes?

- A) C_nH_{2n+2}
- B) C_nH_{2n}
- C) C_nH_{2n-2}
- D) C_nH_{2nO}

Correct Option: B) C_nH_{2n}

15. In a primary carbon atom, the carbon is attached to:

- A) Three other carbons
- B) Two other carbons
- C) One other carbon
- D) No carbon

Correct Option: C) One other carbon

16. Tetrahedral geometry is shown by carbon with which hybridization?

- A) sp
- B) sp^2
- C) sp^3

D) dsp^3

Correct Option: C) sp^3

17. Which is a secondary alcohol?

A) Methanol

B) Ethanol

C) Isopropanol

D) Butanol

Correct Option: C) Isopropanol

18. Which series of compounds differ by a CH_2 group?

A) Functional group isomers

B) Chain isomers

C) Homologous series

D) Structural isomers

Correct Option: C) Homologous series

19. The reaction of alkene with water in the presence of acid is called:

A) Hydrolysis

B) Hydration

C) Dehydration

D) Hydroboration

Correct Option: B) Hydration

20. In free radical substitution, which step is chain initiating?

A) Termination

B) Propagation

C) Initiation

D) Elimination

Correct Option: C) Initiation

21. Which of the following compounds is an alkene?

- A) C_2H_6
- B) C_2H_4
- C) C_2H_2
- D) C_6H_6

Correct Option: B) C_2H_4

22. Which hydrocarbon has a triple bond?

- A) Ethene
- B) Ethyne
- C) Propane
- D) Butane

Correct Option: B) Ethyne

23. Which compound shows cis-trans isomerism?

- A) Alkanes
- B) Alkenes
- C) Alkynes
- D) Alkanols

Correct Option: B) Alkenes

24. What type of bond is present in benzene?

- A) Single only
- B) Double only
- C) Resonance
- D) Triple

Correct Option: C) Resonance

25. Which catalyst is used in hydrogenation of alkenes?

- A) Ni
- B) Fe
- C) Zn
- D) Ag

Correct Option: A) Ni

26. Which of the following is a tertiary carbon atom?

- A) Carbon attached to three other carbons
- B) Carbon attached to two carbons
- C) Carbon attached to one carbon
- D) Carbon attached to no carbon

Correct Option: A) Carbon attached to three other carbons

27. Alkynes undergo which type of reactions mostly?

- A) Substitution
- B) Addition
- C) Elimination
- D) Combustion

Correct Option: B) Addition

28. Which is the first member of the alkyne series?

- A) Ethyne
- B) Methyne
- C) Propane
- D) Butyne

Correct Option: A) Ethyne

29. The formula of benzene is:

- A) C_6H_6
- B) C_6H_{12}
- C) C_5H_{10}
- D) C_6H_{10}

Correct Option: A) C_6H_6

30. Which halogenation reaction needs sunlight?

- A) Addition
- B) Substitution in alkanes
- C) Dehydration
- D) Combustion

Correct Option: B) Substitution in alkanes

31. A molecule with $C=C$ bond reacts with HBr to form:

- A) Alkane
- B) Alkene
- C) Alcohol
- D) Haloalkane

Correct Option: D) Haloalkane

32. An organic compound with $-COOH$ group is:

- A) Alcohol
- B) Ketone
- C) Carboxylic acid
- D) Aldehyde

Correct Option: C) Carboxylic acid

33. Which hybridization is found in benzene?

- A) sp^3
- B) sp^2
- C) sp
- D) sp^3d

Correct Option: B) sp^2

34. What is the product when ethanol is oxidized?

- A) Methane
- B) Ethene
- C) Ethanoic acid
- D) Propane

Correct Option: C) Ethanoic acid

35. Addition of Cl_2 to ethene gives:

- A) Ethane
- B) 1,2-Dichloroethane
- C) Chloroethane
- D) Ethyne

Correct Option: B) 1,2-Dichloroethane

36. The general formula for alkynes is:

- A) C_nH_{2n}
- B) C_nH_{2n-2}
- C) C_nH_{2n+2}
- D) $C_nH_{2n}O$

Correct Option: B) C_nH_{2n-2}

37. Which compound is prepared by the Wurtz reaction?

- A) Alkyne
- B) Alkane
- C) Alkene
- D) Alcohol

Correct Option: B) Alkane

38. An example of an electrophile is:

- A) OH^-
- B) H_2O
- C) H^+
- D) Cl^-

Correct Option: C) H^+

39. In a dehydration reaction, which molecule is removed?

- A) CO_2
- B) H_2O
- C) H_2
- D) O_2

Correct Option: B) H_2O

40. The most reactive hydrocarbon is:

- A) Alkane
- B) Alkene
- C) Alkyne
- D) Benzene

Correct Option: C) Alkyne

Chapter 16: Hydrocarbons

1. Which of the following is a saturated hydrocarbon?

- A) Ethene
- B) Ethyne
- C) Ethane
- D) Benzene

Correct Option: C) Ethane

2. Alkynes have how many π -bonds?

- A) One
- B) Two
- C) Three
- D) Zero

Correct Option: B) Two

3. Which hydrocarbon undergoes substitution reactions?

- A) Alkene
- B) Alkyne
- C) Alkane
- D) All of these

Correct Option: C) Alkane

4. Which gas is known as marsh gas?

- A) Ethane
- B) Methane
- C) Propane
- D) Butane

Correct Option: B) Methane

5. In which reaction, hydrogen is added to an unsaturated hydrocarbon?

- A) Halogenation
- B) Hydrogenation
- C) Polymerization
- D) Combustion

Correct Option: B) Hydrogenation

6. The simplest alkyne is:

- A) Ethyne
- B) Methyne
- C) Propyne
- D) Butyne

Correct Option: A) Ethyne

7. Cracking is used to break:

- A) Short chain hydrocarbons
- B) Long chain hydrocarbons
- C) Aromatic compounds
- D) None of these

Correct Option: B) Long chain hydrocarbons

8. Which hydrocarbon is aromatic?

- A) Propane
- B) Ethane
- C) Benzene
- D) Butane

Correct Option: C) Benzene

9. Which hybridization is found in alkanes?

- A) sp
- B) sp^2
- C) sp^3
- D) sp^3d

Correct Option: C) sp^3

10. The product of complete combustion of hydrocarbons is:

- A) CO_2 and H_2O
- B) CO and H_2O
- C) C and H_2O
- D) C and H_2

Correct Option: A) CO_2 and H_2O

11. Alkynes have the general formula:

- A) C_nH_{2n+2}
- B) C_nH_{2n}
- C) C_nH_{2n-2}
- D) C_nH_{2n+1}

Correct Option: C) C_nH_{2n-2}

12. Which alkane has three carbon atoms?

- A) Ethane
- B) Propane
- C) Butane
- D) Pentane

Correct Option: B) Propane

13. Dehydration of alcohol produces:

- A) Alkane
- B) Alkene
- C) Alkyne
- D) Aromatic hydrocarbon

Correct Option: B) Alkene

14. Alkenes are more reactive than:

- A) Alkynes
- B) Alkanes
- C) Benzene
- D) All of these

Correct Option: B) Alkanes

15. In alkanes, the bond angle is:

- A) 90°
- B) 109.5°
- C) 120°
- D) 180°

Correct Option: B) 109.5°

16. Which reaction is characteristic of alkenes?

- A) Addition
- B) Substitution
- C) Elimination

D) Decomposition

Correct Option: A) Addition

17. What is the molecular formula of propane?

A) C_3H_6

B) C_3H_8

C) C_2H_6

D) C_2H_4

Correct Option: B) C_3H_8

18. What is the first member of the alkene series?

A) Ethene

B) Methene

C) Propene

D) Butene

Correct Option: A) Ethene

19. The term "unsaturated hydrocarbon" refers to:

A) Alkanes

B) Alkenes and Alkynes

C) Aromatic hydrocarbons only

D) Alcohols

Correct Option: B) Alkenes and Alkynes

20. Which hydrocarbon burns with a sooty flame?

A) Alkane

B) Alkene

- C) Alkyne
- D) Aromatic hydrocarbon

Correct Option: D) Aromatic hydrocarbon

21. Which alkene is used in making polythene?

- A) Ethene
- B) Propene
- C) Butene
- D) Pentene

Correct Option: A) Ethene

22. What is the hybridization of carbon in ethane?

- A) sp
- B) sp^2
- C) sp^3
- D) sp^3d

Correct Option: C) sp^3

23. Alkynes have how many pi bonds?

- A) One
- B) Two
- C) Three
- D) Four

Correct Option: B) Two

24. The chemical formula for propane is:

- A) C_2H_4
- B) C_3H_8

C) C_4H_{10}

D) C_5H_{12}

Correct Option: B) C_3H_8

25. Which reagent decolorizes bromine water?

A) Alkane

B) Alkene

C) Benzene

D) Cyclohexane

Correct Option: B) Alkene

26. Cracking of hydrocarbons produces:

A) Larger molecules

B) Smaller molecules

C) Water

D) CO_2

Correct Option: B) Smaller molecules

27. What is the general formula of alkenes?

A) C_nH_{2n}

B) C_nH_{2n+2}

C) C_nH_{2n-2}

D) C_nH_n

Correct Option: A) C_nH_{2n}

28. Benzene undergoes mainly:

A) Addition

B) Substitution

C) Elimination

D) Hydrolysis

Correct Option: B) Substitution

29. What is the bond order of benzene?

A) 1

B) 1.5

C) 2

D) 3

Correct Option: B) 1.5

30. Alkanes are also called:

A) Paraffins

B) Olefins

C) Acetylenes

D) Arenes

Correct Option: A) Paraffins

31. The first member of alkene family is:

A) Methene

B) Ethene

C) Propene

D) Butene

Correct Option: B) Ethene

32. Which compound contains a triple bond?

A) Methane

B) Ethyne

- C) Ethene
- D) Propane

Correct Option: B) Ethyne

33. Number of sigma bonds in ethene molecule is:

- A) 3
- B) 4
- C) 5
- D) 6

Correct Option: C) 5

34. A saturated hydrocarbon has only:

- A) Double bonds
- B) Triple bonds
- C) Single bonds
- D) Pi bonds

Correct Option: C) Single bonds

35. The process used to separate hydrocarbons is:

- A) Filtration
- B) Distillation
- C) Crystallization
- D) Centrifugation

Correct Option: B) Distillation

36. Which of the following is an aromatic hydrocarbon?

- A) Ethene
- B) Propene
- C) Benzene

D) Butene

Correct Option: C) Benzene

37. Hydrogenation of ethyne produces:

A) Ethane

B) Ethene

C) Propane

D) Butane

Correct Option: B) Ethene

38. What is the main source of hydrocarbons?

A) Water

B) Petroleum

C) Air

D) Soil

Correct Option: B) Petroleum

39. What is the hybridization of carbon atoms in benzene?

A) sp

B) sp^2

C) sp^3

D) sp^3d

Correct Option: B) sp^2

40. Alkenes show:

A) Addition reactions

B) Substitution reactions

C) Elimination reactions

D) Oxidation reactions

Correct Option: A) Addition reactions

41. Alkanes are soluble in:

- A) Water
- B) Alcohol
- C) Organic solvents
- D) Acids

Correct Option: C) Organic solvents

42. Unsaturation in hydrocarbons is detected by:

- A) Red litmus
- B) Bromine water
- C) Limewater
- D) Sodium hydroxide

Correct Option: B) Bromine water

43. Which hydrocarbon burns with a smoky flame?

- A) Alkanes
- B) Alkenes
- C) Aromatic hydrocarbons
- D) Alkynes

Correct Option: C) Aromatic hydrocarbons

44. The reaction of alkane with halogen is called:

- A) Addition
- B) Substitution
- C) Elimination
- D) Polymerization

Correct Option: B) Substitution

45. Propene reacts with hydrogen to form:

- A) Propane
- B) Propanol
- C) Propyne
- D) Propanone

Correct Option: A) Propane

46. What type of bonds exist in benzene?

- A) Single only
- B) Double only
- C) Alternate single and double
- D) Triple only

Correct Option: C) Alternate single and double

47. The catalyst used in hydrogenation of alkenes is:

- A) Zn
- B) Fe
- C) Ni
- D) Cu

Correct Option: C) Ni

48. What is the functional group of alkenes?

- A) -OH
- B) -COOH
- C) C=C
- D) C≡C

Correct Option: C) C=C

49. How many isomers are possible for butene?

- A) 1
- B) 2

C) 3

D) 4

Correct Option: B) 2

50. The hydrocarbon used in manufacture of PVC is:

A) Ethene

B) Ethyne

C) Chloroethene

D) Propene

Correct Option: C) Chloroethene

Chapter 17: Halogenoalkanes

1. What is the general formula for mono halogenoalkanes?

A) $C_nH_{2n+1}X$

B) $C_nH_{2n}X$

C) $C_nH_{2n-2}X$

D) C_nH_nX

Correct Option: A) $C_nH_{2n+1}X$

2. Which type of bond is present between carbon and halogen?

A) Ionic

B) Covalent

C) Metallic

D) Coordinate

Correct Option: B) Covalent

3. Which halogenoalkane reacts fastest in $SN1$ mechanism?

- A) Primary
- B) Secondary
- C) Tertiary
- D) Methyl

Correct Option: C) Tertiary

4. What is the product when bromoethane reacts with aqueous KOH?

- A) Ethanol
- B) Ethene
- C) Ethanoic acid
- D) Acetaldehyde

Correct Option: A) Ethanol

5. Halogenoalkanes are insoluble in:

- A) Organic solvents
- B) Water
- C) Alcohol
- D) Ether

Correct Option: B) Water

6. Which halogen atom forms the strongest C-X bond?

- A) Fluorine
- B) Chlorine
- C) Bromine
- D) Iodine

Correct Option: A) Fluorine

7. Which halogenoalkane undergoes elimination easily?

- A) Primary
- B) Secondary
- C) Tertiary
- D) Methyl

Correct Option: C) Tertiary

8. The reaction of halogenoalkanes with alcoholic KOH gives:

- A) Alcohol
- B) Alkene
- C) Aldehyde
- D) Ether

Correct Option: B) Alkene

9. Which reagent is used for nucleophilic substitution?

- A) Alcoholic KOH
- B) Aqueous KOH
- C) H_2SO_4
- D) HNO_3

Correct Option: B) Aqueous KOH

10. Which halogenoalkane reacts fastest in $\text{S}_\text{N}2$ reaction?

- A) Primary
- B) Secondary
- C) Tertiary
- D) Benzyl

Correct Option: A) Primary

11. What is the hybridization of carbon in halogenoalkanes?

- A) sp
- B) sp^2
- C) sp^3
- D) sp^3d

Correct Option: C) sp^3

12. Hydrolysis of halogenoalkane produces:

- A) Ether
- B) Alcohol
- C) Aldehyde
- D) Ketone

Correct Option: B) Alcohol

13. The leaving group in nucleophilic substitution is:

- A) Carbon
- B) Hydrogen
- C) Halide ion
- D) Hydroxide ion

Correct Option: C) Halide ion

14. Which bond is broken in $SN1$ reaction?

- A) C-H
- B) C-C
- C) C-X

D) C-O

Correct Option: C) C-X

15. In SN₂, the rate depends on:

A) Only substrate

B) Only nucleophile

C) Both

D) Neither

Correct Option: C) Both

16. Best solvent for SN₁ reaction is:

A) Polar protic

B) Polar aprotic

C) Non-polar

D) Ionic

Correct Option: A) Polar protic

17. Which halogenoalkane gives racemic mixture in SN₁?

A) Primary

B) Secondary

C) Tertiary

D) Methyl

Correct Option: C) Tertiary

18. Which is the best leaving group?

A) F⁻

B) Cl⁻

C) Br^-

D) I^-

Correct Option: D) I^-

19. In $\text{S}_\text{N}2$ reaction, inversion of configuration is called:

A) Walden inversion

B) E-Z isomerism

C) Racemization

D) Epimerization

Correct Option: A) Walden inversion

20. Which factor increases the rate of $\text{S}_\text{N}2$ reaction?

A) Bulky groups

B) Small groups

C) Polar protic solvent

D) Weak nucleophile

Correct Option: B) Small groups

21. $\text{S}_\text{N}1$ mechanism proceeds through formation of:

A) Carbanion

B) Carbocation

C) Free radical

D) Neutral molecule

Correct Option: B) Carbocation

22. Which halogenoalkane is most reactive in $\text{S}_\text{N}1$?

A) Methyl chloride

B) 1-chlorobutane

C) 2-chlorobutane

D) 2-chloro-2-methylpropane

Correct Option: D) 2-chloro-2-methylpropane

23. In halogenoalkanes, the carbon atom is:

A) Nucleophilic

B) Electrophilic

C) Neutral

D) Reducing

Correct Option: B) Electrophilic

24. Reaction of halogenoalkane with CN^- ion forms:

A) Amine

B) Alcohol

C) Nitrile

D) Ether

Correct Option: C) Nitrile

25. Which order of $\text{S}_{\text{N}}2$ reaction rate is correct?

A) Tertiary > Secondary > Primary

B) Secondary > Tertiary > Primary

C) Primary > Secondary > Tertiary

D) Secondary > Primary > Tertiary

Correct Option: C) Primary > Secondary > Tertiary

26. Which halide is least reactive in substitution?

A) R-F

B) R-Cl

C) R-Br

D) R-I

Correct Option: A) R-F

27. Polar aprotic solvents favor:

- A) SN1
- B) SN2
- C) E1
- D) E2

Correct Option: B) SN2

28. The boiling point of halogenoalkanes is higher due to:

- A) Ionic bonds
- B) Hydrogen bonds
- C) Dipole interactions
- D) London forces

Correct Option: C) Dipole interactions

29. Which halogen atom makes best leaving group?

- A) F
- B) Cl
- C) Br
- D) I

Correct Option: D) I

30. Which compound will undergo elimination easily?

- A) Primary halide
- B) Secondary halide
- C) Tertiary halide
- D) Methyl halide

Correct Option: C) Tertiary halide

31. In SN2, nucleophile attacks from:

- A) Front side
- B) Back side
- C) Above
- D) Below

Correct Option: B) Back side

32. Which will react faster with aqueous KOH?

- A) 1-chlorobutane
- B) 1-bromobutane
- C) 1-iodobutane
- D) 1-fluorobutane

Correct Option: C) 1-iodobutane

33. Hydrolysis of 1-chloropropane gives:

- A) Propanol
- B) Propanoic acid
- C) Propene
- D) Propanone

Correct Option: A) Propanol

34. Dehydrohalogenation is a type of:

- A) Addition
- B) Substitution
- C) Elimination
- D) Oxidation

Correct Option: C) Elimination

35. The S_N1 reaction rate depends on:

- A) Nucleophile only
- B) Substrate only
- C) Both

D) Solvent only

Correct Option: B) Substrate only

36. Reaction with KCN converts halogenoalkane to:

A) Amine

B) Alkane

C) Nitrile

D) Alcohol

Correct Option: C) Nitrile

37. Which halogenoalkane reacts fastest with NaOH?

A) 1-chlorobutane

B) 1-bromobutane

C) 1-iodobutane

D) 1-fluorobutane

Correct Option: C) 1-iodobutane

38. In S_N1 , carbocation stability is:

A) Primary > Secondary > Tertiary

B) Tertiary > Secondary > Primary

C) Secondary > Primary > Tertiary

D) Equal for all

Correct Option: B) Tertiary > Secondary > Primary

39. Which of the following undergoes fastest S_N2 reaction?

A) 1-bromobutane

B) 2-bromobutane

C) 2-bromo-2-methylpropane

D) Bromomethane

Correct Option: D) Bromomethane

40. A better nucleophile favors:

- A) SN_1
- B) SN_2
- C) E_1
- D) E_2

Correct Option: B) SN_2

41. Which solvent is best for SN_2 reaction?

- A) Ethanol
- B) Water
- C) Acetone
- D) Methanol

Correct Option: C) Acetone

42. Which one forms carbocation easily?

- A) CH_3Cl
- B) $\text{C}_2\text{H}_5\text{Cl}$
- C) $(\text{CH}_3)_3\text{CCl}$
- D) $\text{C}_6\text{H}_5\text{Cl}$

Correct Option: C) $(\text{CH}_3)_3\text{CCl}$

43. Which halogenoalkane is used as anesthetic?

- A) Chloroform
- B) Bromoform
- C) Iodoform
- D) Fluoroform

Correct Option: A) Chloroform

44. In SN_2 , transition state has:

- A) Partial bonds

- B) Full bonds
- C) No bonds
- D) Ionic bonds

Correct Option: A) Partial bonds

45. Dehydrohalogenation leads to formation of:

- A) Alkanes
- B) Alkenes
- C) Alkynes
- D) Alcohols

Correct Option: B) Alkenes

46. SN1 reaction is favored by:

- A) Strong nucleophile
- B) Weak nucleophile
- C) Neutral nucleophile
- D) No nucleophile

Correct Option: B) Weak nucleophile

47. In SN2, rate law is:

- A) First order
- B) Second order
- C) Zero order
- D) Third order

Correct Option: B) Second order

48. Which increases nucleophilicity?

- A) Decrease in size
- B) Increase in size
- C) Increase in electronegativity
- D) Decrease in electronegativity

Correct Option: D) Decrease in electronegativity

49. Bromomethane reacts with AgNO_3 to form:

- A) Precipitate of AgCl
- B) Precipitate of AgBr
- C) Precipitate of AgI
- D) No precipitate

Correct Option: B) Precipitate of AgBr

50. Which factor increases elimination over substitution?

- A) High temperature
- B) Low temperature
- C) Polar solvent
- D) Weak base

Correct Option: A) High temperature

Chapter 18: Alcohols

1. Alcohol functional group is:

- A) $-\text{CHO}$
- B) $-\text{COOH}$
- C) $-\text{OH}$
- D) $-\text{CO}$

Correct Option: C) $-\text{OH}$

2. Primary alcohol on oxidation gives:

- A) Ketone
- B) Carboxylic acid
- C) Aldehyde
- D) Alkane

Correct Option: C) Aldehyde

3. Dehydration of alcohol forms:

- A) Alkane
- B) Alkene
- C) Aldehyde
- D) Acid

Correct Option: B) Alkene

4. Which alcohol is most soluble in water?

- A) Pentanol
- B) Propanol
- C) Ethanol
- D) Butanol

Correct Option: C) Ethanol

5. Lucas test is used to distinguish:

- A) Aldehydes
- B) Alcohols
- C) Ketones
- D) Acids

Correct Option: B) Alcohols

6. Which alcohol reacts fastest in Lucas test?

- A) Primary
- B) Secondary
- C) Tertiary
- D) All same

Correct Option: C) Tertiary

7. The dehydration of ethanol produces:

- A) Methane
- B) Ethane
- C) Ethene
- D) Ethyne

Correct Option: C) Ethene

8. Oxidation of secondary alcohol gives:

- A) Ketone
- B) Aldehyde
- C) Carboxylic acid
- D) Ester

Correct Option: A) Ketone

9. Reaction of alcohol with carboxylic acid gives:

- A) Aldehyde
- B) Ester
- C) Ether
- D) Acid anhydride

Correct Option: B) Ester

10. Ethanol can be converted to ethanoic acid by:

- A) Reduction
- B) Oxidation
- C) Hydrolysis
- D) Dehydration

Correct Option: B) Oxidation

11. Which alcohol is least acidic?

- A) Methanol
- B) Ethanol
- C) Propanol

D) Tertiary butanol

Correct Option: D) Tertiary butanol

12. Reaction of alcohol with Na metal releases:

A) H_2 gas

B) CO_2 gas

C) Cl_2 gas

D) O_2 gas

Correct Option: A) H_2 gas

13. In Williamson synthesis, alcohol reacts with:

A) Alkene

B) Alkyl halide

C) Acid

D) Ketone

Correct Option: B) Alkyl halide

14. Glycerol is an example of:

A) Monohydric alcohol

B) Dihydric alcohol

C) Trihydric alcohol

D) Polyacidic acid

Correct Option: C) Trihydric alcohol

15. Which alcohol forms two products on dehydration?

A) 2-propanol

B) 1-propanol

C) Ethanol

D) Methanol

Correct Option: A) 2-propanol

16. Boiling point of alcohols is high due to:

- A) Dipole forces
- B) Hydrogen bonding
- C) Van der Waals forces
- D) Ionic bonds

Correct Option: B) Hydrogen bonding

17. Alcohols are generally:

- A) Basic
- B) Acidic
- C) Amphoteric
- D) Neutral

Correct Option: D) Neutral

18. Alcohol can be prepared by hydration of:

- A) Alkane
- B) Alkene
- C) Alkyne
- D) Amine

Correct Option: B) Alkene

19. Which alcohol gives a yellow precipitate with iodine?

- A) Ethanol
- B) Methanol
- C) 2-propanol
- D) 1-propanol

Correct Option: C) 2-propanol

20. Oxidation of methanol gives:

- A) Formaldehyde

- B) Acetaldehyde
- C) Acetic acid
- D) Methanoic acid

Correct Option: A) Formaldehyde

21. Which alcohol on oxidation gives acetone?

- A) 1-propanol
- B) 2-propanol
- C) Ethanol
- D) Methanol

Correct Option: B) 2-propanol

22. IUPAC name of $\text{CH}_3\text{CH}_2\text{OH}$ is:

- A) Ethanol
- B) Methanol
- C) Propanol
- D) Butanol

Correct Option: A) Ethanol

23. Reaction of alcohol with HCl gives:

- A) Alkene
- B) Alkyl halide
- C) Aldehyde
- D) Ketone

Correct Option: B) Alkyl halide

24. Alcohol reacts with PCl_5 to form:

- A) Acid
- B) Chloride
- C) Amine
- D) Ether

Correct Option: B) Chloride

25. Which reagent is used to oxidize primary alcohols?

- A) H_2/Pt
- B) KMnO_4
- C) HCl
- D) NaOH

Correct Option: B) KMnO_4

26. Dehydration of tertiary alcohol requires:

- A) Cold H_2SO_4
- B) Hot H_2SO_4
- C) NaOH
- D) H_2

Correct Option: B) Hot H_2SO_4

27. Boiling point of alcohols increases with:

- A) Decrease in chain length
- B) Increase in chain length
- C) Aromaticity
- D) Isomerism

Correct Option: B) Increase in chain length

28. Alcohols behave as nucleophiles due to:

- A) Lone pair on oxygen
- B) Lone pair on hydrogen
- C) π -bond electrons
- D) Positive charge on oxygen

Correct Option: A) Lone pair on oxygen

29. Alcohol reacts with carboxylic acid in presence of:

- A) Base
- B) Acid catalyst
- C) Heat only
- D) Light

Correct Option: B) Acid catalyst

30. Which alcohol shows least reactivity towards Lucas reagent?

- A) Methanol
- B) 2-propanol
- C) 2-methyl-2-propanol
- D) 3-pentanol

Correct Option: A) Methanol

31. Primary alcohols resist:

- A) Oxidation
- B) Dehydration
- C) Substitution
- D) Esterification

Correct Option: B) Dehydration

32. 1-propanol is classified as:

- A) Primary alcohol
- B) Secondary alcohol
- C) Tertiary alcohol
- D) Aromatic alcohol

Correct Option: A) Primary alcohol

33. The acidic character of alcohols is due to:

- A) Polar C–O bond
- B) Polar O–H bond

C) Polar C—C bond

D) Non-polar bonds

Correct Option: B) Polar O—H bond

34. Which alcohol is used as an antiseptic?

A) Methanol

B) Ethanol

C) Propanol

D) Butanol

Correct Option: B) Ethanol

35. Which alcohol gives blue color with anhydrous CuSO_4 ?

A) Ethanol

B) Methanol

C) Propanol

D) All

Correct Option: D) All

36. Alcohols act as:

A) Oxidizing agents

B) Reducing agents

C) Catalysts

D) Oxidants

Correct Option: B) Reducing agents

37. Strong acid catalyst for dehydration of alcohol is:

A) HCl

B) HNO_3

C) H_2SO_4

D) CH_3COOH

Correct Option: C) H_2SO_4

38. Ethanol is industrially prepared by:

- A) Fermentation
- B) Reduction
- C) Oxidation
- D) Hydrolysis

Correct Option: A) Fermentation

39. Hydroboration of alkenes gives:

- A) Aldehyde
- B) Ketone
- C) Alcohol
- D) Ether

Correct Option: C) Alcohol

40. Oxidation of secondary alcohol involves:

- A) Loss of 1 hydrogen atom
- B) Loss of 2 hydrogen atoms
- C) Gain of oxygen only
- D) No change

Correct Option: B) Loss of 2 hydrogen atoms

41. Alcohols with more than one hydroxyl group are called:

- A) Monohydric alcohols
- B) Dihydric alcohols
- C) Polyhydric alcohols
- D) None of these

Correct Option: C) Polyhydric alcohols

42. Which alcohol is used as an industrial solvent?

- A) Ethanol

- B) Methanol
- C) Butanol
- D) Isopropanol

Correct Option: D) Isopropanol

43. Alcohols have a higher boiling point compared to alkanes due to:

- A) Hydrogen bonding
- B) Van der Waals forces
- C) Dipole-dipole interaction
- D) Ionic bonding

Correct Option: A) Hydrogen bonding

44. Which is a characteristic reaction of alcohols?

- A) Nucleophilic substitution
- B) Elimination reaction
- C) Oxidation
- D) All of the above

Correct Option: D) All of the above

45. Ethanol is dehydrated to form:

- A) Ethyne
- B) Ethene
- C) Methane
- D) Acetone

Correct Option: B) Ethene

46. Reaction of alcohol with $K_2Cr_2O_7$ results in:

- A) Alkyl halide
- B) Aldehyde
- C) Ketone
- D) Carboxylic acid

Correct Option: D) Carboxylic acid

47. Which alcohol is produced in the fermentation of sugars?

- A) Ethanol
- B) Methanol
- C) Propanol
- D) Butanol

Correct Option: A) Ethanol

48. Tertiary alcohols are resistant to:

- A) Substitution
- B) Dehydration
- C) Oxidation
- D) Elimination

Correct Option: C) Oxidation

49. The reagent Lucas's test involves:

- A) ZnCl_2
- B) HCl
- C) H_2SO_4
- D) NaOH

Correct Option: A) ZnCl_2

50. Alcohols can be distinguished from phenols by:

- A) Reaction with FeCl_3
- B) Oxidation
- C) Reaction with Na metal
- D) None of the above

Correct Option: A) Reaction with FeCl_3

51. Which alcohol is a major component of antifreeze?

- A) Ethanol
- B) Methanol
- C) Propanol
- D) Ethylene glycol

Correct Option: D) Ethylene glycol

52. The alcohol group (-OH) makes alcohols:

- A) Hydrophobic
- B) Hydrophilic
- C) Non-polar
- D) Inert

Correct Option: B) Hydrophilic

53. Which alcohol is used in the preparation of perfumes?

- A) Methanol
- B) Ethanol
- C) Propanol
- D) Isopropanol

Correct Option: B) Ethanol

54. The IUPAC name of $\text{CH}_3\text{CH}_2\text{OH}$ is:

- A) Ethanol
- B) Methanol
- C) Propanol
- D) Butanol

Correct Option: A) Ethanol

55. Which of the following is a secondary alcohol?

- A) Ethanol
- B) Butanol

C) 2-Propanol

D) Methanol

Correct Option: C) 2-Propanol

56. Phenols are:

A) Alcohols

B) Aromatic compounds

C) Aldehydes

D) Ketones

Correct Option: B) Aromatic compounds

57. Which is a characteristic reaction of phenols?

A) Esterification

B) Oxidation

C) Electrophilic substitution

D) All of the above

Correct Option: D) All of the above

58. The functional group in phenol is:

A) -OH

B) -COOH

C) -CHO

D) -C=O

Correct Option: A) -OH

59. Phenol is a weaker acid than:

A) Carboxylic acid

B) Alcohol

C) Hydrochloric acid

D) Alkali

Correct Option: A) Carboxylic acid

60. When phenol reacts with NaOH, it forms:

- A) Sodium phenoxide
- B) Sodium ethoxide
- C) Sodium acetate
- D) None of the above

Correct Option: A) Sodium phenoxide

61. Which of the following is used as a disinfectant?

- A) Phenol
- B) Methanol
- C) Ethanol
- D) Propanol

Correct Option: A) Phenol

62. Which alcohol undergoes oxidation to form acetone?

- A) 1-Propanol
- B) 2-Propanol
- C) Methanol
- D) Ethanol

Correct Option: B) 2-Propanol

63. Which of the following alcohols is most reactive in dehydration reactions?

- A) Primary alcohol
- B) Secondary alcohol
- C) Tertiary alcohol
- D) None

Correct Option: C) Tertiary alcohol

64. Which alcohol undergoes oxidation to form formaldehyde?

- A) Methanol
- B) Ethanol
- C) Propanol
- D) Butanol

Correct Option: A) Methanol

65. The test for alcohols involves:

- A) Reacting with NaOH
- B) Reaction with PCl_5
- C) Reaction with Tollen's reagent
- D) Both B and C

Correct Option: B) Reaction with PCl_5

66. Phenol can undergo electrophilic substitution with:

- A) Bromine
- B) Chlorine
- C) Nitric acid
- D) All of the above

Correct Option: D) All of the above

67. The compound that undergoes esterification with phenol is:

- A) Acetic acid
- B) Acetone
- C) Methanol
- D) Butanol

Correct Option: A) Acetic acid

68. The hydroxyl group in phenol makes it:

- A) Hydrophobic
- B) Hydrophilic

- C) Inert
- D) Aromatic

Correct Option: B) Hydrophilic

69. When phenol reacts with bromine in the presence of water, it forms:

- A) Bromophenol
- B) Bromoform
- C) Polybromophenol
- D) None

Correct Option: A) Bromophenol

70. Phenol is more acidic than alcohols due to:

- A) Delocalization of the phenoxide ion
- B) Presence of an alkyl group
- C) Formation of hydrogen bonds
- D) Presence of a carboxyl group

Correct Option: A) Delocalization of the phenoxide ion

Chapter 19: Carbonyl and Compounds

1. The functional group of aldehydes is:

- A) -OH
- B) -COOH
- C) -CHO
- D) -C=O

Correct Option: C) -CHO

2. Which of the following is an example of a ketone?

- A) Methanal
- B) Ethanol

- C) Acetone
- D) Butanoic acid

Correct Option: C) Acetone

3. The carbonyl group in aldehydes and ketones is polar because of:

- A) The difference in electronegativity between carbon and oxygen
- B) The difference in electronegativity between carbon and hydrogen
- C) The resonance between the carbon and oxygen atoms
- D) None of the above

Correct Option: A) The difference in electronegativity between carbon and oxygen

4. Aldehydes are oxidized to form:

- A) Alcohols
- B) Ketones
- C) Carboxylic acids
- D) Esters

Correct Option: C) Carboxylic acids

5. Ketones can be reduced to:

- A) Aldehydes
- B) Alcohols
- C) Acids
- D) Esters

Correct Option: B) Alcohols

6. Which of the following is a characteristic reaction of aldehydes?

- A) Nucleophilic addition
- B) Electrophilic substitution
- C) Elimination reaction
- D) Reduction

Correct Option: A) Nucleophilic addition

7. Which of the following is a reagent used for the reduction of carbonyl compounds?

- A) NaBH_4
- B) $\text{K}_2\text{Cr}_2\text{O}_7$
- C) KMnO_4
- D) H_2SO_4

Correct Option: A) NaBH_4

8. Aldehydes undergo nucleophilic addition with:

- A) Alcohols
- B) Hydrogen cyanide
- C) Ammonia
- D) All of the above

Correct Option: D) All of the above

9. The simplest aldehyde is:

- A) Methanal
- B) Ethanal
- C) Propan-2-one
- D) Butanal

Correct Option: A) Methanal

10. The IUPAC name for CH_3CHO is:

- A) Methanol
- B) Acetaldehyde
- C) Ethanol
- D) Methanal

Correct Option: B) Acetaldehyde

11. The functional group in a ketone is:

- A) -OH
- B) -COOH
- C) -CHO
- D) -C=O

Correct Option: D) -C=O

12. Ketones undergo nucleophilic addition with:

- A) Alcohols
- B) Hydrogen cyanide
- C) Grignard reagents
- D) All of the above

Correct Option: D) All of the above

13. Which of the following compounds is used to distinguish between aldehydes and ketones?

- A) Tollens' reagent
- B) Fehling's solution
- C) Both A and B
- D) None of the above

Correct Option: C) Both A and B

14. Which of the following is not a product of the oxidation of aldehydes?

- A) Alcohols
- B) Carboxylic acids
- C) Ketones
- D) None of the above

Correct Option: C) Ketones

15. Which of the following reagents is used to test the presence of an aldehyde group?

- A) Benedict's reagent
- B) Tollens' reagent
- C) Fehling's solution
- D) All of the above

Correct Option: D) All of the above

16. Ketones are less reactive than aldehydes due to:

- A) Presence of an additional alkyl group
- B) Greater steric hindrance
- C) Presence of a hydroxyl group
- D) All of the above

Correct Option: B) Greater steric hindrance

17. The product of the reduction of aldehydes is:

- A) Alcohol
- B) Acid
- C) Ketone
- D) Ester

Correct Option: A) Alcohol

18. Which of the following is the IUPAC name for CH_3COCH_3 ?

- A) Acetaldehyde
- B) Acetone
- C) Propan-2-one
- D) Ethyl ketone

Correct Option: B) Acetone

19. Which of the following is an example of a condensation reaction with carbonyl compounds?

- A) Addition of HCN to an aldehyde
- B) Aldol condensation
- C) Nucleophilic substitution
- D) Both A and B

Correct Option: D) Both A and B

20. In the reaction of carbonyl compounds with alcohols, the product is:

- A) Ether
- B) Ester
- C) Alcohol
- D) Aldehyde

Correct Option: B) Ester

21. Which of the following compounds is formed by the oxidation of ethanol?

- A) Acetone
- B) Methanal
- C) Acetic acid
- D) Propan-2-one

Correct Option: C) Acetic acid

22. What type of reaction occurs when an aldehyde reacts with sodium bisulfite?

- A) Reduction
- B) Nucleophilic addition
- C) Condensation
- D) Electrophilic substitution

Correct Option: C) Condensation

23. Which reagent is used to reduce a carbonyl group to a primary alcohol?

A) $\text{K}_2\text{Cr}_2\text{O}_7$

B) NaBH_4

C) HCl

D) NaOH

Correct Option: B) NaBH_4

24. In the IUPAC nomenclature, the suffix for aldehydes is:

A) -al

B) -one

C) -ene

D) -ol

Correct Option: A) -al

25. Which of the following is true for ketones?

A) They have two alkyl groups attached to the carbonyl carbon

B) They are more reactive than aldehydes

C) They cannot be reduced

D) They do not undergo nucleophilic substitution

Correct Option: A) They have two alkyl groups attached to the carbonyl carbon

26. The reaction between an aldehyde and hydrogen cyanide produces:

A) A carboxylic acid

B) A cyanohydrin

C) An alcohol

D) An ester

Correct Option: B) A cyanohydrin

27. The compound formed when an aldehyde is treated with ammonia and sodium bisulfite is:

A) Ammonium salt

- B) Aldehyde bisulfite adduct
- C) Ammonium acetate
- D) Hydrazone

Correct Option: B) Aldehyde bisulfite adduct

28. Which of the following will reduce a carbonyl group without affecting the rest of the molecule?

- A) $K_2Cr_2O_7$
- B) $NaBH_4$
- C) H_2SO_4
- D) Fehling's solution

Correct Option: B) $NaBH_4$

29. The test for aldehydes using Tollens' reagent produces:

- A) A red precipitate
- B) A silver mirror
- C) A blue precipitate
- D) No change

Correct Option: B) A silver mirror

30. In nucleophilic addition to an aldehyde, the nucleophile typically adds to which carbon?

- A) The carbonyl carbon
- B) The oxygen atom
- C) The hydrogen atom
- D) The alkyl group

Correct Option: A) The carbonyl carbon

31. Which of the following is the correct IUPAC name for CH_3CH_2CHO ?

- A) Propan-2-al

- B) Propan-1-al
- C) Acetaldehyde
- D) Ethanal

Correct Option: B) Propan-1-al

32. The oxidation of a secondary alcohol produces:

- A) An aldehyde
- B) A carboxylic acid
- C) A ketone
- D) An ester

Correct Option: C) A ketone

33. Aldehydes can be distinguished from ketones by the use of:

- A) Tollen's reagent
- B) Bromine water
- C) Sodium bisulfite
- D) Both A and C

Correct Option: D) Both A and C

34. In the reaction of aldehydes with Grignard reagents, the product formed is:

- A) A ketone
- B) An alcohol
- C) A carboxylic acid
- D) A cyanohydrin

Correct Option: B) An alcohol

35. Which of the following compounds is an example of a carbonyl compound?

- A) Methanol
- B) Ethene

C) Formaldehyde

D) Toluene

Correct Option: C) Formaldehyde

36. The reagent used in the Tollens' test for aldehydes is:

A) Silver nitrate

B) Sodium bisulfite

C) Copper sulfate

D) Hydrogen cyanide

Correct Option: A) Silver nitrate

37. When an aldehyde is treated with Fehling's solution, it produces a:

A) Red precipitate

B) Blue precipitate

C) Yellow precipitate

D) No reaction

Correct Option: A) Red precipitate

38. The Brady's reagent test for carbonyl compounds results in the formation of:

A) A red-orange precipitate

B) A green solution

C) A blue precipitate

D) A colorless solution

Correct Option: A) A red-orange precipitate

39. 2,4-DNP is used to detect:

A) Alcohols

B) Carbonyl compounds

C) Carboxylic acids

D) Amines

Correct Option: B) Carbonyl compounds

40. The reaction of carbonyl compounds with Tollens' reagent produces:

- A) A yellow precipitate
- B) A silver mirror
- C) A blue precipitate
- D) No change

Correct Option: B) A silver mirror

Chapter 20: Nitrogen Compounds Amines

1. The functional group of amines is:

- A) -OH
- B) -COOH
- C) -NH_2
- D) -CHO

Correct Option: C) -NH_2

2. The simplest amine is:

- A) Methylamine
- B) Aniline
- C) Ammonia
- D) Ethylamine

Correct Option: C) Ammonia

3. Which of the following is a primary amine?

- A) Aniline
- B) Methylamine
- C) Dimethylamine
- D) Trimethylamine

Correct Option: B) Methylamine

4. The IUPAC name for CH_3NH_2 is:

- A) Methylamine
- B) Ethylamine
- C) Ammonia
- D) Methanamine

Correct Option: D) Methanamine

5. Which of the following is the correct structure for a secondary amine?

- A) CH_3NH_2
- B) $(\text{CH}_3)_2\text{NH}$
- C) $(\text{CH}_3)_3\text{N}$
- D) NH_3

Correct Option: B) $(\text{CH}_3)_2\text{NH}$

6. Which of the following is an example of a tertiary amine?

- A) Methylamine
- B) Aniline
- C) Trimethylamine
- D) Dimethylamine

Correct Option: C) Trimethylamine

7. The basicity of amines is due to the lone pair of electrons on the nitrogen atom.

- A) True
- B) False

Correct Option: A) True

8. Amine groups are commonly found in:

- A) Carboxylic acids
- B) Alcohols
- C) Proteins
- D) Esters

Correct Option: C) Proteins

9. Which of the following reactions involves the formation of an amide?

- A) Amination
- B) Hydrolysis
- C) Nitration
- D) Reaction with carboxylic acid

Correct Option: D) Reaction with carboxylic acid

10. Which of the following is the reagent used for the detection of primary amines?

- A) Benzene
- B) Fehling's solution
- C) Ninhydrin
- D) Tollen's reagent

Correct Option: C) Ninhydrin

11. Which of the following is a feature of amines?

- A) They are acidic
- B) They are neutral
- C) They are basic
- D) They are highly reactive

Correct Option: C) They are basic

12. The boiling point of amines is higher than that of alkanes due to:

- A) Hydrogen bonding
- B) Van der Waals forces

- C) Ionic bonding
- D) None of the above

Correct Option: A) Hydrogen bonding

13. The reaction of amines with nitrous acid forms:

- A) Diazonium salt
- B) Alcohols
- C) Amides
- D) Nitro compounds

Correct Option: A) Diazonium salt

14. Which amine is commonly used as a local anesthetic?

- A) Methylamine
- B) Dimethylamine
- C) Procaine
- D) Aniline

Correct Option: C) Procaine

15. The basicity of an amine decreases as:

- A) The size of the alkyl group increases
- B) The electron-donating groups increase
- C) The nitrogen atom becomes more substituted
- D) The nitrogen atom becomes less substituted

Correct Option: C) The nitrogen atom becomes more substituted

16. Aniline ($\text{C}_6\text{H}_5\text{NH}_2$) is:

- A) A primary amine
- B) A secondary amine
- C) A tertiary amine
- D) A quaternary amine

Correct Option: A) A primary amine

17. The reaction of an amine with an alkyl halide forms:

- A) An amide
- B) A tertiary amine
- C) A quaternary ammonium salt
- D) An amine oxide

Correct Option: C) A quaternary ammonium salt

18. Which of the following is the correct IUPAC name for CH_3NHCH_3 ?

- A) Dimethylamine
- B) Methylamine
- C) Ethylamine
- D) Methanamine

Correct Option: A) Dimethylamine

19. The process of forming amines from nitro compounds is called:

- A) Reduction
- B) Dehydration
- C) Oxidation
- D) Substitution

Correct Option: A) Reduction

20. Aniline can undergo reaction with bromine water to form:

- A) 2,4,6-Tribromoaniline
- B) 1,2,3-Tribromoaniline
- C) 4-Bromoaniline
- D) 2-Bromoaniline

Correct Option: A) 2,4,6-Tribromoaniline

21. The reaction of amines with carbonyl compounds results in the formation of:

- A) Alcohols
- B) Amines
- C) Imides
- D) Imines

Correct Option: D) Imines

22. Which of the following amines is used in the preparation of rubber vulcanization?

- A) Methylamine
- B) Aniline
- C) Dimethylamine
- D) Diphenylamine

Correct Option: D) Diphenylamine

23. Aniline can undergo electrophilic substitution at the:

- A) Para position
- B) Ortho position
- C) Meta position
- D) Both ortho and para positions

Correct Option: D) Both ortho and para positions

24. Which of the following statements is true for the basicity of amines in aqueous solution?

- A) Amines are less basic than alcohols
- B) Amines are more basic than ammonia
- C) Amines form weaker bases than amides
- D) Amines do not affect the pH of water

Correct Option: C) Amines form weaker bases than amides

25. The amine group in aniline (-NH_2) is:

- A) Electron-withdrawing
- B) Electron-donating
- C) Non-polar
- D) Inert to reactions

Correct Option: B) Electron-donating

26. Which of the following reactions involves the conversion of a primary amine to a diazonium salt?

- A) Reactions with nitric acid
- B) Reaction with nitrous acid
- C) Reaction with alkyl halides
- D) Reduction reactions

Correct Option: B) Reaction with nitrous acid

27. Which of the following is true for the boiling points of amines?

- A) Tertiary amines have higher boiling points than secondary amines
- B) Primary amines have higher boiling points than tertiary amines
- C) Amines have lower boiling points than alcohols
- D) Amines have no effect on boiling points

Correct Option: B) Primary amines have higher boiling points than tertiary amines

28. Which of the following compounds is an example of a cyclic amine?

- A) Aniline
- B) Pyridine
- C) Trimethylamine
- D) Methylamine

Correct Option: B) Pyridine

29. Which of the following amines is most likely to be a strong base in water?

- A) Aniline
- B) Methylamine
- C) Dimethylamine
- D) Triethylamine

Correct Option: B) Methylamine

30. The basicity of amines decreases in the order:

- A) Primary > Secondary > Tertiary
- B) Tertiary > Secondary > Primary
- C) Tertiary > Primary > Secondary
- D) Secondary > Primary > Tertiary

Correct Option: B) Tertiary > Secondary > Primary

31. Which of the following methods can be used to prepare amines?

- A) Reduction of nitro compounds
- B) Oxidation of alcohols
- C) Halogenation of alkanes
- D) Nitration of benzene

Correct Option: A) Reduction of nitro compounds

32. The preparation of aniline from nitrobenzene involves:

- A) Reduction with zinc and hydrochloric acid
- B) Reaction with sodium nitrite
- C) Alkylation with methyl chloride
- D) Reduction with hydrogen gas

Correct Option: A) Reduction with zinc and hydrochloric acid

33. Which of the following is the product of the reaction between an amine and a carboxylic acid?

- A) Ester
- B) Ammonium salt
- C) Amide
- D) Aldehyde

Correct Option: C) Amide

34. The nitrogen atom in amines is:

- A) sp hybridized
- B) sp^2 hybridized
- C) sp^3 hybridized
- D) sp^3d hybridized

Correct Option: C) sp^3 hybridized

35. Which of the following amines is a commonly used solvent in laboratory work?

- A) Aniline
- B) Pyridine
- C) Trimethylamine
- D) Ethylamine

Correct Option: B) Pyridine

36. The reaction between an amine and an acyl halide leads to the formation of:

- A) Ammonium salt
- B) An amide
- C) A nitrile
- D) A diazonium salt

Correct Option: B) An amide

37. The electrophilic aromatic substitution reaction in aniline takes place at the:

- A) Ortho and para positions
- B) Only at the meta position
- C) Para position only
- D) Ortho position only

Correct Option: A) Ortho and para positions

38. Which of the following amines has the strongest basicity in aqueous solution?

- A) Aniline
- B) Dimethylamine
- C) Pyridine
- D) Trimethylamine

Correct Option: B) Dimethylamine

39. Which of the following is a characteristic property of aromatic amines?

- A) They are easily soluble in water
- B) They have a strong acidic character
- C) They undergo electrophilic substitution
- D) They are non-basic

Correct Option: C) They undergo electrophilic substitution

40. Which of the following amines is most likely to undergo oxidation to form a carboxylic acid?

- A) Aniline
- B) Methylamine
- C) Trimethylamine
- D) Ammonia

Correct Option: A) Aniline

Chapter 21: Organic Synthesis

1. The process of synthesizing alcohol from an alkene involves:

- A) Hydration
- B) Hydrogenation
- C) Halogenation
- D) Dehydrohalogenation

Correct Option: A) Hydration

2. Which of the following reagents is used to convert an alkene to an alkane?

- A) Hydrogen and palladium catalyst
- B) Bromine water
- C) Sodium metal
- D) Potassium permanganate

Correct Option: A) Hydrogen and palladium catalyst

3. The Friedel–Crafts alkylation reaction requires:

- A) A strong base
- B) A strong acid
- C) A free radical initiator
- D) An electron-withdrawing group

Correct Option: B) A strong acid

4. Which reagent is used to convert an alcohol to an alkene?

- A) Sulfuric acid
- B) Sodium hydroxide
- C) Hydrogen chloride
- D) Sodium metal

Correct Option: A) Sulfuric acid

5. The conversion of an alkene to a vicinal diol can be achieved by:

- A) Ozonolysis
- B) Hydroboration-oxidation
- C) Hydrohalogenation
- D) Alkylation

Correct Option: B) Hydroboration-oxidation

6. The preparation of an amine from an alkyl halide requires which reagent?

- A) Sodium amide
- B) Lithium aluminium hydride
- C) Sodium hydroxide
- D) Sodium acetate

Correct Option: A) Sodium amide

7. Which of the following is used to reduce a carboxylic acid to an aldehyde?

- A) Lithium aluminium hydride
- B) Hydrogen gas with palladium
- C) Diborane
- D) Sodium borohydride

Correct Option: A) Lithium aluminium hydride

8. Which reagent can be used to form an aldehyde from a primary alcohol?

- A) CrO_3
- B) NaBH_4
- C) H_2/Pd
- D) O_3

Correct Option: A) CrO_3

9. The process of adding a halogen to an alkene is called:

- A) Addition reaction
- B) Substitution reaction
- C) Elimination reaction
- D) Condensation reaction

Correct Option: A) Addition reaction

10. Which of the following reagents is used in the preparation of a Grignard reagent?

- A) Methyl chloride and magnesium
- B) Magnesium and an alkyl halide
- C) Sodium and an alkyl halide
- D) Hydrogen chloride and magnesium

Correct Option: B) Magnesium and an alkyl halide

11. To synthesize a ketone from an alkene, which of the following reagents would be most effective?

- A) Ozone
- B) Hydrogen peroxide
- C) Potassium permanganate
- D) Sodium borohydride

Correct Option: C) Potassium permanganate

12. Which reaction is used to prepare an alkene from an alkyl halide?

- A) Dehydrohalogenation
- B) Hydration
- C) Hydrogenation
- D) Nucleophilic substitution

Correct Option: A) Dehydrohalogenation

13. Which of the following is a characteristic of a Wittig reaction?

- A) Formation of an alkene from a carbonyl compound
- B) Reduction of a carboxylic acid to an alcohol
- C) Substitution of a halogen with an alkyl group
- D) Formation of a diol from an alkene

Correct Option: A) Formation of an alkene from a carbonyl compound

14. Which of the following reagents is used for the oxidation of primary alcohols to aldehydes?

- A) Potassium permanganate
- B) CrO_3 in dilute sulfuric acid
- C) Sodium hydroxide
- D) Hydrogen chloride

Correct Option: B) CrO_3 in dilute sulfuric acid

15. In the synthesis of amides, which of the following reagents is typically used?

- A) Alcohol
- B) Acyl chloride
- C) Halogen
- D) Bromine water

Correct Option: B) Acyl chloride

16. In the preparation of an alkyl halide from an alcohol, what reagent is used?

- A) HCl
- B) NaOH
- C) KOH
- D) H_2SO_4

Correct Option: A) HCl

17. Which reagent is used for the reduction of an aldehyde to a primary alcohol?

- A) Sodium borohydride
- B) Lithium aluminium hydride
- C) Hydrogen with a palladium catalyst
- D) All of the above

Correct Option: D) All of the above

18. Which of the following is used to synthesize an ester from an alcohol and carboxylic acid?

- A) HCl
- B) H_2SO_4
- C) NaOH
- D) NaHCO_3

Correct Option: B) H_2SO_4

19. The reaction of a carboxylic acid with an alcohol in the presence of an acid catalyst produces:

- A) Ketone
- B) Aldehyde
- C) Ester
- D) Alkene

Correct Option: C) Ester

20. Which of the following is a method to synthesize a cyclohexene from a cyclohexanol?

- A) Using H_2SO_4 and heat
- B) Using NaOH
- C) Using LiAlH_4
- D) Using NaBH_4

Correct Option: A) Using H_2SO_4 and heat

Chapter 22

1. Main component of petroleum gas is:

- A) Ethane
- B) Methane
- C) Propane
- D) Butane

Correct Option: B) Methane

2. Petroleum is formed by the decay of:

- A) Plants
- B) Animals
- C) Both plants and animals
- D) Rocks

Correct Option: C) Both plants and animals

3. Which fraction has the lowest boiling point?

- A) Diesel
- B) Petrol
- C) Kerosene
- D) Refinery gas

Correct Option: D) Refinery gas

4. Which fraction is used as jet fuel?

- A) Petrol
- B) Diesel
- C) Kerosene
- D) Bitumen

Correct Option: C) Kerosene

5. Cracking is used to:

- A) Produce kerosene

- B) Break large hydrocarbons
- C) Purify crude oil
- D) Remove impurities

Correct Option: B) Break large hydrocarbons

6. Main use of bitumen is:

- A) Lubricants
- B) Fuel
- C) Road surfacing
- D) Gas production

Correct Option: C) Road surfacing

7. Fraction used in domestic heating:

- A) Diesel
- B) Gas oil
- C) Refinery gas
- D) Fuel oil

Correct Option: C) Refinery gas

8. Petrol mainly contains:

- A) C_5-C_{10} hydrocarbons
- B) $C_{10}-C_{15}$ hydrocarbons
- C) C_1-C_4 hydrocarbons
- D) $C_{15}-C_{20}$ hydrocarbons

Correct Option: A) C_5-C_{10} hydrocarbons

9. Lighter fractions have:

- A) High boiling points
- B) Low boiling points
- C) High viscosity
- D) High density

Correct Option: B) Low boiling points

10. Cracking produces:

- A) Alkanes only

- B) Alkenes only
- C) Alkanes and alkenes
- D) Aromatic compounds

Correct Option: C) Alkanes and alkenes

11. Thermal cracking requires:

- A) Low temperature
- B) High temperature
- C) No catalyst
- D) Acid catalyst

Correct Option: B) High temperature

12. Catalytic cracking uses:

- A) Light
- B) Zeolite catalyst
- C) Water
- D) Metal catalyst

Correct Option: B) Zeolite catalyst

13. First step in refining petroleum is:

- A) Distillation
- B) Cracking
- C) Polymerization
- D) Hydrogenation

Correct Option: A) Distillation

14. LPG is mainly composed of:

- A) Methane
- B) Propane and butane
- C) Ethane
- D) Hydrogen

Correct Option: B) Propane and butane

15. Naphtha is mainly used to make:

- A) Plastics

- B) Roads
- C) Fertilizers
- D) Lubricants

Correct Option: A) Plastics

16. Fraction with highest viscosity:

- A) Diesel
- B) Bitumen
- C) Petrol
- D) Kerosene

Correct Option: B) Bitumen

17. More carbon atoms in hydrocarbon means:

- A) Lower boiling point
- B) Higher boiling point
- C) Lower viscosity
- D) Higher volatility

Correct Option: B) Higher boiling point

18. A product of catalytic cracking:

- A) Ethene
- B) Ethane
- C) Butane
- D) Propane

Correct Option: A) Ethene

19. Gasoline is another name for:

- A) Diesel
- B) Petrol
- C) Kerosene
- D) LPG

Correct Option: B) Petrol

20. High demand for petrol leads to:

- A) Distillation

- B) Cracking
- C) Extraction
- D) Condensation

Correct Option: B) Cracking

21. Diesel is obtained from:

- A) Top of fractionating column
- B) Bottom of fractionating column
- C) Middle of fractionating column
- D) None

Correct Option: C) Middle of fractionating column

22. Kerosene contains hydrocarbons of:

- A) C_1-C_4
- B) C_5-C_{10}
- C) $C_{10}-C_{15}$
- D) $C_{20}-C_{25}$

Correct Option: C) $C_{10}-C_{15}$

23. Cracking helps to increase the yield of:

- A) Diesel
- B) Petrol
- C) Bitumen
- D) Kerosene

Correct Option: B) Petrol

24. Octane rating is related to:

- A) Bitumen quality
- B) Petrol quality
- C) Diesel quality
- D) Kerosene purity

Correct Option: B) Petrol quality

25. Heaviest fraction in fractional distillation:

- A) Diesel

- B) Lubricating oil
- C) Bitumen
- D) Petrol

Correct Option: C) Bitumen

26. Which fraction is used in ships?

- A) Petrol
- B) Diesel
- C) Fuel oil
- D) Refinery gas

Correct Option: C) Fuel oil

27. Fractionating column works on the principle of:

- A) Crystallization
- B) Boiling points
- C) Solubility
- D) Density

Correct Option: B) Boiling points

28. Residue from distillation is:

- A) Refinery gas
- B) Petrol
- C) Diesel
- D) Bitumen

Correct Option: D) Bitumen

29. Gasoline boiling range is approximately:

- A) 40–200°C
- B) 200–300°C
- C) 300–400°C
- D) 400–500°C

Correct Option: A) 40–200°C

30. Which process breaks large molecules into smaller ones?

- A) Polymerization

- B) Cracking
- C) Distillation
- D) Filtration

Correct Option: B) Cracking

31. Catalytic cracking produces more:

- A) Alkanes
- B) Alkenes
- C) Aromatic hydrocarbons
- D) Paraffins

Correct Option: B) Alkenes

32. Cracking produces mainly:

- A) Saturated hydrocarbons
- B) Unsaturated hydrocarbons
- C) Alcohols
- D) Aldehydes

Correct Option: B) Unsaturated hydrocarbons

33. Zeolites used in cracking are:

- A) Organic compounds
- B) Natural minerals
- C) Synthetic catalysts
- D) Liquid metals

Correct Option: C) Synthetic catalysts

34. Main reason for cracking is to:

- A) Produce kerosene
- B) Increase petrol supply
- C) Produce heavy oils
- D) Make solid fuels

Correct Option: B) Increase petrol supply

35. Lighter hydrocarbons are more:

- A) Viscous

- B) Volatile
- C) Dense
- D) Solid

Correct Option: B) Volatile

36. Refinery gas includes:

- A) Hydrogen
- B) Hydrocarbons with C_1-C_4
- C) Hydrocarbons with $C_{10}-C_{15}$
- D) Oxygen

Correct Option: B) Hydrocarbons with C_1-C_4

37. Diesel is used in:

- A) Aeroplanes
- B) Tractors
- C) Bicycles
- D) Ships only

Correct Option: B) Tractors

38. Fraction used in making lubricants:

- A) Diesel
- B) Fuel oil
- C) Lubricating oil
- D) Refinery gas

Correct Option: C) Lubricating oil

39. Bitumen is:

- A) Gas
- B) Liquid
- C) Semi-solid
- D) Solid

Correct Option: C) Semi-solid

40. Gasoline is mainly composed of hydrocarbons with:

- A) High boiling points

- B) Low boiling points
- C) Medium boiling points
- D) Extremely high viscosity

Correct Option: B) Low boiling points

41. Cracking is essential because:

- A) Long hydrocarbons are less useful
- B) Short hydrocarbons are less useful
- C) It produces water
- D) It produces impurities

Correct Option: A) Long hydrocarbons are less useful

42. Fractionating column separates hydrocarbons by:

- A) Filtering
- B) Boiling point
- C) Color
- D) Density

Correct Option: B) Boiling point

43. Residue of distillation mainly includes:

- A) Refinery gas
- B) Lubricating oil
- C) Bitumen
- D) Petrol

Correct Option: C) Bitumen

44. Short-chain hydrocarbons are used mainly as:

- A) Solid fuels
- B) Liquid fuels
- C) Lubricants
- D) Fertilizers

Correct Option: B) Liquid fuels

45. Diesel hydrocarbons are mainly:

- A) C_1-C_4

B) $C_{10}-C_{20}$

C) $C_{20}-C_{30}$

D) C_5-C_{10}

Correct Option: B) $C_{10}-C_{20}$

46. LPG stands for:

A) Low Pressure Gas

B) Liquid Petroleum Gas

C) Light Paraffin Gas

D) Long-chain Petroleum Gas

Correct Option: B) Liquid Petroleum Gas

47. Most volatile petroleum fraction is:

A) Petrol

B) Diesel

C) Refinery gas

D) Bitumen

Correct Option: C) Refinery gas

48. Catalytic cracking is better because it:

A) Increases bitumen

B) Produces more valuable products

C) Uses more fuel

D) Produces solid hydrocarbons

Correct Option: B) Produces more valuable products

49. Hydrocarbons produced in cracking are:

A) Heavier

B) Lighter

C) More viscous

D) Less volatile

Correct Option: B) Lighter

50. Main goal of petroleum refining is to:

A) Make polymers

- B) Separate useful fractions
- C) Decompose hydrocarbons
- D) Create heavy oils

Correct Option: B) Separate useful fractions

Past Paper MCQs

Stoichiometry

- 1) The number of atoms present in a molecule determines its: (MP 2019)
- a) Molecularity
 - b) Basicity
 - c) Acidity
 - d) Atomicity

Correct Answer: d) Atomicity

- 2) 22.4 dm^3 of CO_2 is _____ 22.4 dm^3 of SO_2 . (MP 2019)
- a) Heavier than
 - b) Lighter than
 - c) Equal to
 - d) None of these

Correct Answer: c) Equal to

- 3) If the amount of a product obtained in a chemical reaction is 250 g while its theoretical yield is 500 g, its percentage yield will be: (FBISE 2018)

- a) 25%
- b) 35%
- c) 45%
- d) 50%

Correct Answer: d) 50%

4) Number of Hydrogen atoms in 1 mole of H_2O is: (FBISE 2018)

- a) 6.022×10^{23}
- b) $2 \times 6.022 \times 10^{23}$
- c) $3 \times 6.022 \times 10^{23}$
- d) $4 \times 6.022 \times 10^{23}$

Correct Answer: b) $2 \times 6.022 \times 10^{23}$

5) Which of the following gases will occupy the highest volume at STP? (FBISE 2018)

- a) 2 moles of H_2
- b) 1.0 mole of CO_2
- c) 1.5 moles of O_2
- d) 0.5 mole of NH_3

Correct Answer: a) 2 moles of H_2

6) A necklace has 6 g of diamond. How many atoms of carbon are present in it? (FBISE 2018)

- a) 6.022×10^{23}
- b) $(2/3) \times 6.022 \times 10^{23}$
- c) $(1/2) \times 6.022 \times 10^{23}$
- d) $2 \times 6.022 \times 10^{23}$

Correct Answer: b) $(2/3) \times 6.022 \times 10^{23}$

7) The number of covalent bonds present in 8 g CH_4 are: (FBISE 2017)

- a) 1.2×10^{24}
- b) 3.1×10^{23}
- c) 6.02×10^{23}
- d) 6.02×10^{24}

Correct Answer: d) 6.02×10^{24}

8) The number of H^+ ions produced by complete ionization of 9.8 g H_3PO_4 is: (FBISE 2017)

- a) 6.022×10^{22}
- b) 1.24×10^{23}
- c) 1.806×10^{23}
- d) 2.4×10^{22}

Correct Answer: c) 1.806×10^{23}

9) The volume occupied by 14 g N_2 gas at STP is: (FBISE 2017)

- a) 1.12 dm^3
- b) 2.24 dm^3
- c) 11.2 dm^3
- d) 22.4 dm^3

Correct Answer: c) 11.2 dm^3

10) The mass in grams of 0.5 moles of chlorine gas is: (FBISE 2016)

- a) 35.5 grams
- b) 18.75 grams
- c) 142 grams
- d) 71 grams

Correct Answer: a) 35.5 grams

11) Which sample contains the greatest number of molecules? (FBISE 2015)

- a) 1.0 g of CH_4
- b) 1.0 g of H_2O
- c) 1.0 g of HNO_3
- d) 1.0 g of N_2O_4

Correct Answer: a) 1.0 g of CH_4

12) Three one-liter flasks labeled A (NO), B (NO_2), C (N_2O) at STP: which contains the fewest molecules? (FBISE 2015)

- a) Flask A
- b) Flask B
- c) All are same
- d) Flask C

Correct Answer: c) All are same

13) Stoichiometric calculation of a chemical reaction results in: (FBISE 2015)

- a) Actual yield

- b) Percentage yield
- c) Theoretical yield
- d) None of these

Correct Answer: c) Theoretical yield

14) The total number of atoms in 64 g of SO_2 is: (FBISE 2015)

- a) 1.806×10^{23} atoms
- b) 1.806×10^{24} atoms
- c) 3.608×10^{23} atoms
- d) 3.608×10^{24} atoms

Correct Answer: b) 1.806×10^{24} atoms

15) Mass of 6.02×10^{23} electrons is: (FBISE 2014)

- a) 1.008 mg
- b) 0.55 mg
- c) 0.184 mg
- d) 1.673 mg

Correct Answer: c) 0.184 mg

16) The largest number of molecules is present in: (FBISE 2014)

- a) 3.6 g of H_2O
- b) 2.8 g of CO
- c) 5.4 g of N_2O_5

Correct Answer: a) 3.6 g of H_2O

17) Number of molecules in one dm^3 of water is close to: (FBISE 2014)

- a) $(6.02/22.4) \times 10^{23}$

- b) $(12.04/22.4) \times 10^{23}$
- c) $(18/12.4) \times 10^{23}$
- d) $55.6 \times 6.02 \times 10^{23}$

Correct Answer: d) $55.6 \times 6.02 \times 10^{23}$

18) The volume occupied by 1 gram of H_2 at STP is: (FBISE 2014)

- a) 22.4 dm^3
- b) 24 dm^3
- c) 11.2 dm^3
- d) 22.4 cm^3

Correct Answer: c) 11.2 dm^3

19) Which of the following has least mass? (FBISE 2013)

- a) 1 mol of O_2
- b) 3.01×10^{23} atoms of C
- c) 7 grams of Ag
- d) 2-gram atoms of N

Correct Answer: d) 2-gram atoms of N

20) How many moles of oxygen atoms are there in 0.2 moles of $Ca(ClO_3)_2$? (FBISE 2013)

- a) 3 moles
- b) 6 moles
- c) 0.5 moles
- d) 1 mole

Correct Answer: b) 6 moles

21) The volume occupied by a sample of CO_2 at STP which contains 8 grams of oxygen is: (FBISE 2013)

- a) 11.20 dm^3
- b) 5.60 dm^3
- c) 56.0 cm^3
- d) 112 cm^3

Correct Answer: a) 11.20 dm^3

22) Select a quantity that contains one mole of Hydrogen atoms: (FBISE 2016S)

- a) 1.0 mol H_2
- b) 0.5 mol CH_4
- c) $0.5 \text{ mol H}_2\text{O}$
- d) 1.0 mol H_2

Correct Answer: a) 1.0 mol H_2

23) Mass of 2 moles of Hydrogen atoms will be equal to: (FBISE 2016S)

- a) 2.016 g
- b) 4.032 g
- c) 2.00 g
- d) 1.008 g

Correct Answer: b) 4.032 g

24) In a volume of 11.207 dm^3 of CO_2 at STP, the mass of Oxygen atoms will be: (FBISE 2016S)

- a) 32 g
- b) 16 g
- c) 48 g
- d) 26 g

Correct Answer: c) 48 g

25) Which of the following factors does not affect actual yield? (FBISE 2016S)

- a) Side reaction
- b) Separation techniques
- c) Temperature
- d) Human error

Correct Answer: b) Separation techniques

26) Which of the following contains the largest number of particles? (FBISE 2016S)

- a) 18g H_2O
- b) 196g H_2SO_4
- c) 22g CO_2
- d) 342g $\text{C}_{12}\text{H}_{22}\text{O}_{11}$

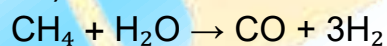
Correct Answer: a) 18g H_2O

27) When one mole of each of the following is completely burnt in oxygen, which will give the largest mass of CO_2 ? (FBISE 2017S)

- a) Carbon monoxide
- b) Diamond
- c) Ethane
- d) Methane

Correct Answer: c) Ethane

28) Methane reacts with steam to form H_2 and CO as shown:



What volume of H_2 can be obtained from 100 cm^3 of methane at STP? (FBISE 2017S)

- a) 300 cm^3
- b) 200 cm^3
- c) 150 cm^3
- d) 100 cm^3

Correct Answer: a) 300 cm^3

29) The volume occupied by 2.8 grams of nitrogen gas at STP is: (FBISE 2017S)

- a) 2.24 dm^3
- b) 22.4 dm^3
- c) 1.12 dm^3
- d) 224 dm^3

Correct Answer: c) 1.12 dm^3

30) On comparing the masses of 0.4 moles of ozone and 0.4 moles of oxygen atoms, it is observed that: (FBISE 2017S)

- a) Mass of ozone is greater than oxygen atom
- b) Mass of oxygen atom is greater than ozone
- c) Both have equal masses
- d) Both contain different numbers of molecules

Correct Answer: a) Mass of ozone is greater than oxygen atom

31) How many moles of oxygen are needed for complete combustion of two moles of methane? (FBISE 2018S)

- a) 3
- b) 10
- c) 4
- d) 6

Correct Answer: c) 4

32. What volume of SO_2 at room temperature and pressure is produced on heating 3 moles of zinc sulphide (ZnS) if reaction takes place as follows: $2\text{ZnS} + 3\text{O}_2 \rightarrow 2\text{ZnO} + 2\text{SO}_2$ (FBISE 2018S)

- a) 60 dm^3
- b) 67.24 dm^3
- c) 22.414 dm^3
- d) 57.2 dm^3

Correct Answer: a) 60 dm^3

33. The Avogadro's Constant is the number of: (FBISE 2018S)

- a) Electrons needed to deposit 24g of Mg
- b) Atoms in 24g of Mg
- c) Atoms in 1g of He

d) Molecules in 35.5g of chlorine

Correct Answer: b) Atoms in 24g of Mg

34. The mass of 11.2 dm^3 of CO_2 enclosed in a container at STP is: (FBISE 2019)

a) 22g

b) 11g

c) 33g

d) 44g

Correct Answer: d) 44g

35. Which of the following has the highest number of molecules in it? (FBISE 2019)

a) 10g of NO

b) 10g of NO_2

c) 10g of N_2O_4

d) 10g of N_2O

Correct Answer: a) 10g of NO

36. How many moles of O_2 are needed for the complete combustion of one mole of Butane (C_4H_{10})? (FBISE 2019)

a) 8

b) 6.5

c) 13

d) 4.5

Correct Answer: d) 4.5

Atomic Structure

1) Three quantum numbers have been derived from the equation of: (MP 2019)

- a) de-Broglie's equation
- b) Schrödinger
- c) Planck's equation
- d) Heisenberg

Correct Answer: b) Schrödinger

2) Splitting of spectral lines when an atom is subjected to a magnetic field is called: (MP 2019)

- a) Zeeman's effect
- b) Photoelectric effect
- c) Stark's effect
- d) Compton effect

Correct Answer: a) Zeeman's effect

3) According to Bohr's atomic theory, the angular momentum (mvr) of an electron is equal to: (FBISE 2018)

- a) nh
- b) π
- c) $2nh$
- d) $3nh$

Correct Answer: a) nh

4) Indicate the inappropriate set of quantum numbers. (FBISE 2018)

- a) $n = 2, l = 0, s = -1/2$
- b) $n = 2, l = 1, m = 0, s = 1/2$
- c) $n = 2, l = 0, s = 1/2$
- d) $n = 1, l = 1, m = 0, s = -1/2$

Correct Answer: d) $n = 1, l = 1, m = 0, s = -1/2$

5) Paschen series of spectral lines is produced due to the transition of electrons from a higher orbit to the: (FBISE 2017)

- a) 4th orbit
- b) 1st orbit

- c) 2nd orbit
- d) 3rd orbit

Correct Answer: d) 3rd orbit

6) The radius of the 1st orbit of Lithium is: (FBISE 2017)

- a) 0.176 \AA
- b) 0.2645 \AA
- c) 0.5294 \AA
- d) 2.116 \AA

Correct Answer: c) 0.5294 \AA

7) Which of the following sets of quantum numbers is not permissible? (FBISE 2015)

- a) $n = 1, l = 0, m = 0, s = 1/2$
- b) $n = 4, l = 3, m = 0, s = 1/2$
- c) $n = 4, l = 0, m = 0, s = 1/2$
- d) $n = 2, l = 1, m = 1, s = -1/2$

Correct Answer: b) $n = 4, l = 3, m = 0, s = 1/2$

8) Which form of energy has the highest energy? (FBISE 2015)

- a) Microwaves (wavelength = 10^2 m)
- b) Infrared (wavelength = 10^{-2} m)
- c) X-rays (wavelength = 10^{-1} m)
- d) Ultraviolet (wavelength = 10^{-6} m)

Correct Answer: c) X-rays (wavelength = 10^{-1} m)

9) The Aufbau principle states that: (FBISE 2015)

- a) Only two electrons can occupy an orbital
- b) Electrons enter the lowest available energy level
- c) Electrons remain unpaired if possible
- d) Orbitals are regions in space where one is likely to find an electron

Correct Answer: b) Electrons enter the lowest available energy level

10) Quantum number values for 3d orbitals are: (FBISE 2014)

a) $n = 3, l = 2$

b) $n = 3, l = 3$

c) $n = 2, l = 3$

d) $n = 2, l = 2$

Correct Answer: a) $n = 3, l = 2$

11) Bohr Model of Atom is contradicted by: (FBISE 2014)

a) Planck's quantum theory

b) Heisenberg's uncertainty principle

c) Dual nature of matter

d) All of these

Correct Answer: d) All of these

12) The wave number of the light emitted by a certain source is $2 \times 10^6 \text{ m}^{-1}$. The wavelength of this light will be: (FBISE 2014)

a) 500 nm

b) 500 m

c) 200 nm

d) $5 \times 10^7 \text{ m}$

Correct Answer: c) 200 nm

13) In the ground state of an atom, the electron is present: (FBISE 2014)

a) In the nucleus

b) Nearest to the nucleus

c) In the second shell

d) Farthest from the nucleus

Correct Answer: b) Nearest to the nucleus

14) $n + 1$ value for an orbital A is $2 + 1$, while for B it is $3 + 0 = 3$. The energy order is: (FBISE 2013)*

a) $A > B$

b) $B > A$

c) $A = B$

d) Cannot be predicted

Correct Answer: b) $B > A$

15) The frequency of X-rays having a wavelength of 4.4 \AA is: (FBISE 2013)

- a) $1.33 \times 10^{18} \text{ Hz}$
- b) $2 \times 10^{18} \text{ Hz}$
- c) $7.5 \times 10^{17} \text{ Hz}$
- d) $2.6 \times 10^{10} \text{ Hz}$

Correct Answer: a) $1.33 \times 10^{18} \text{ Hz}$

16) The permissible set of four quantum numbers for the electron in 3d orbital of Fe is: (FBISE 2013)

- a) $n = 3, l = 1, m = 0, s = 1/2$
- b) $n = 3, l = 2, m = -1, s = -1/2$
- c) $s = -1/2, m = 3, n = 3, l = 2$
- d) $s = 1/2, m = 3, n = 3, l = 3$

Correct Answer: a) $n = 3, l = 1, m = 0, s = 1/2$

17) Which of the following wave numbers of first line and limiting line in the Lyman series is? (FBISE 2013)

- a) 1:2
- b) 4:3
- c) 20:27
- d) 3:4

Correct Answer: d) 3:4

18) What will be the charge on 10g of electrons? (FBISE 2016S)

- a) $1.7588 \times 10^{11} \text{ C}$
- b) $1.7588 \times 10^9 \text{ C}$
- c) $1.602 \times 10^{-19} \text{ C}$
- d) $9.65 \times 10^4 \text{ C}$

Correct Answer: a) $1.7588 \times 10^{11} \text{ C}$

19) Which of the following series fall in the UV region of the H-spectrum? (FBISE 2016S)

- a) Bracket series
- b) Lyman series

c) Paschen series

d) Balmer series

Correct Answer: b) Lyman series

20) Quantum number values for 2P orbital are: (FBISE 2016S)

a) $n = 2, l = 1$

b) $n = 1$

c) $n = 1, l = 0$

d) $n = 2, l = 0$

Correct Answer: a) $n = 2, l = 1$

21) The maximum number of electrons in a subshell for which $l = 3$ is: (FBISE 2017S)

a) 14

b) 10

c) 8

d) 4

Correct Answer: a) 14

22) The energy of an electron in the first orbit of hydrogen is: (FBISE 2017S)

a) $-0.544 \times 10^{-18} \text{ J}$

b) $-2.18 \times 10^{-18} \text{ J}$

c) $-0.242 \times 10^{-18} \text{ J}$

d) $-0.136 \times 10^{-18} \text{ J}$

Correct Answer: b) $-2.18 \times 10^{-18} \text{ J}$

23) The quantum number values for 4d orbital are: (FBISE 2017S)

a) $n = 4, l = 1$

b) $n = 4, l = 0$

c) $n = 4$

d) $n = 4, l = 3$

Correct Answer: a) $n = 4, l = 1$

24) The number of nodes in p orbitals are: (FBISE 2018S)

- a) 2
- b) 4
- c) 3

Correct Answer: a) 2

25) Which series of spectral lines is present in the visible region of the electromagnetic spectrum? (FBISE 2019)

- a) Balmer series
- b) Paschen series

Correct Answer: a) Balmer series

26) Which of the following orbitals has greater energy? (FBISE 2015)

- a) 4d
- b) 6s
- c) 4f
- d) 5p

Correct Answer: c) 4f

27) The wavelength of green light is 500 nm. Its frequency is equal to:

- a) 6×10^{14} Hz
- b) 600 Hz
- c) 1.5 Hz
- d) 1.5×10^{15} Hz

Correct Answer: a) 6×10^{14} Hz

THEORIES OF COVALENT BONDING AND SHAPES OF MOLECULES

1) According to VSEPR model, the geometry of a molecule having 5 bond pairs in the outermost shell will be: (Fbise 2019)

- a) Triangular

- b) Trigonal bipyramidal
- c) Square planar
- d) Octahedral

Correct Answer: b) Trigonal bipyramidal

2) The geometry of a molecule will be pyramidal when the number of electron pairs in the outermost shell of the central atom is:(Fbise 2019)

- a) 3 bond pairs, one lone pair
- b) 1 bond pair, 3 lone pairs
- c) 2 bond pairs, 2 lone pairs
- d) 3 lone pairs, 1 bond pair

Correct Answer: a) 3 bond pairs, one lone pair

3) In H_2O molecule, there are two bond pairs and two lone pairs around the central atom. Its molecular shape will be:(Fbise 2018)

- a) Tetrahedral
- b) V-shaped
- c) Trigonal planar
- d) Trigonal pyramidal

Correct Answer: b) V-shaped

4) What could be the geometrical shape of SF_6 according to VSEPR theory?(Fbise 2018)

- a) Trigonal pyramidal
- b) Octahedral
- c) Tetrahedral
- d) Trigonal bipyramidal

Correct Answer: b) Octahedral

5) The bond order of nitrogen molecule ($\text{N}\equiv\text{N}$)₂ is:(Fbise 2018)

- a) 0
- b) 1
- c) 2

d) 3

Correct Answer: d) 3

6) In AB_4 molecule, there are four bond pairs and no lone pairs around the central atom. Its molecular shape will be:(Fbise 2018)

a) Tetrahedral

b) V-shaped

c) Trigonal planar

d) Trigonal pyramidal

Correct Answer: a) Tetrahedral

7) The central atom is sp^2 hybridized in:(Fbise 2017)

a) CH_4

b) $BeCl_2$

c) BF_3

d) H_2O

Correct Answer: c) BF_3

8) The molecular geometry is determined by the repulsion between only the bond pairs in:(Fbise 2017)

a) $SnCl_2$

b) SO_2

c) O_3

d) BeF_2

Correct Answer: b) SO_2

9) According to VSEPR theory, the shape of AB_3E type molecule is:(Fbise 2018)

a) Triangular pyramidal

b) Trigonal planar

c) Octahedral

d) Tetrahedral

Correct Answer: a) Triangular pyramidal

10) On the basis of VSEPR theory, a molecule with three bond pairs and no lone pair of electrons will have a structure:(Fbise 2018)

- a) Trigonal pyramidal
- b) Trigonal planar
- c) Tetrahedral
- d) Octahedral

Correct answer:

- b) Trigonal planar

11. According to MO theory, the species O_2^{1-} possesses: (FBISE 2015)

- a) Bond order of 2.5
- b) Diamagnetic character
- c) Three unpaired electrons
- d) Stability more than O_2

Correct answer: a) Bond order of 2.5

12. Which of the following hybrid orbitals is/are used by carbon atoms to form the C=C and C-H bonds in ethene (C_2H_4)? (FBISE 2015)

- a) sp^2 and sp^3 hybrid orbitals
- b) sp^3 hybrid orbitals
- c) sp hybrid orbitals
- d) sp^2 hybrid orbitals

Correct answer: a) sp^2 and sp^3 hybrid orbitals

13. In Methane molecule, carbon atom undergoes: (FBISE 2014)

- a) dsp Hybridization
- b) sp Hybridization
- c) sp^2 Hybridization
- d) sp^3 Hybridization

Correct answer: d) sp^3 Hybridization

14. Which of the following molecules is paramagnetic in nature? (FBISE 2013)

- a) Li_2
- b) Be_2
- c) B_2
- d) C_2

Correct answer: c) B_2

15. The maximum number of unpaired electrons is present in: (FBISE 2013)

- a) O_2
- b) O_2^{2-}
- c) O
- d) O_2

Correct answer: a) O_2

16. According to Molecular orbital theory, electrons in the molecular orbitals are filled according to: (FBISE 2014)

- a) Aufbau's Principle
- b) Hund's rule
- c) Pauli's exclusion principle
- d) All of these

Correct answer: d) All of these

17. According to M.O.T, which of the following species resemble He_2 w.r.t filling of molecular orbitals? (FBISE 2016)

- a) Be_2
- b) B_2
- c) Li_2
- d) C_2

Correct answer: a) Be_2

18. For a particular molecule, its molecular formula is like AB_2E type, its possible geometry may be: (FBISE 2016S)

- a) Linear
- b) Angular
- c) Trigonal Planar
- d) Tetrahedral

Correct answer: b) Angular

19. Which of the following molecules is polar? (FBISE 2016S)

- a) CCl_4
- b) SO_2
- c) SO_3
- d) BF_3

Correct answer: b) SO_2

20. H-O-H bond angle in H_2O is 104.5° and not 109.28° because of: (FBISE 2017S)

- a) High electronegativity of oxygen
- b) Bond pair-bond pair repulsion
- c) Lone pair-lone pair repulsion
- d) Lone pair-bond pair repulsion

Correct answer: d) Lone pair-bond pair repulsion

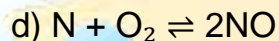
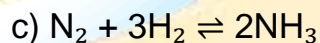
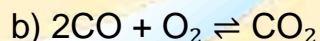
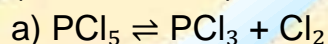
21. In the formation of N_2 , the electron is removed from: (FBISE 2018S)

- a) 2s orbital
- b) 2p orbital
- c) 3p orbital
- d) 3s orbital

Correct answer: b) 2p orbital

Chemical equilibrium

1. In which of the following equilibria will K_c and K_p have the same value? (FBISE 2018)



Correct answer: a) $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$

2. These constants can be equal when $\Delta n = 0$. (FBISE 2018)

a) $\Delta n = 0$

b) $\Delta n = 1$

c) $\Delta n = 2$

d) $\Delta n = 3$

Correct answer: a) $\Delta n = 0$

3. To obtain maximum yield in the given reaction $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$, indicate the appropriate reaction conditions: (FBISE 2018)

a) High pressure, High temperature, Removal of He from the reaction mixture

b) High pressure, low temperature, Removal of NH_3 from the reaction mixture

c) Low pressure, Low temperature, Removal of N_2 from the reaction mixture

d) Low pressure, High temperature, Removal of H_2 from the reaction mixture

Correct answer: b) High pressure, low temperature, Removal of NH_3 from the reaction mixture

4. The unit of K_e for the given reaction can be: (FBISE 2018)

- a) Mol/dm^3
- b) Mol/dm^2
- c) Mol^2/dm^3
- d) No unit

Correct answer: d) No unit

5. At equilibrium state: (FBISE 2016)

- a) Concentration of products becomes zero
- b) Concentrations of reactants and products become constant
- c) Concentration of reactants becomes zero
- d) Concentration of reactants and products become equal

Correct answer: b) Concentrations of reactants and products become constant

6. If a reaction does not proceed appreciably in the forward direction, it shows: (FBISE 2016)

- a) Zero K_e value
- b) Very large K_e value
- c) Very large K_p value
- d) Very small K_c value

Correct answer: d) Very small K_c value

7. Consider the following reaction: $\text{C(g)} + \text{D(g)} \rightleftharpoons \text{C(g)} + 2\text{(g)}$, which statement is true? (FBISE 2015)

- a) $K_p = K_c$
- b) $K_c = K_p \cdot (RT)^2$
- c) $K_c = K_p \cdot (RT)^{-2}$
- d) $K_c = K_p \cdot (RT)$

Correct answer: b) $K_c = K_p \cdot (RT)^2$

8. Consider the following reaction: $2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3$, $\Delta H = -197 \text{ kJ/mol}$. Which of the following will not shift the equilibrium to the right? (FBISE 2015)

- a) Adding more O_2
- b) Increasing the pressure
- c) Adding a catalyst
- d) Decreasing the temperature

Correct answer: c) Adding a catalyst

9. For the reaction $\text{H}_2 + \text{I}_2 \rightleftharpoons 2\text{HI}$, if the volume of the container is reduced to half of its original volume, the value of K_c is: (FBISE 2013)

- a) 48
- b) 16
- c) 64
- d) 32

Correct answer: d) 32

10. The reaction for the synthesis of ammonia is $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$. For the reason: (FBISE 2013)

- a) $K_c < K_p$
- b) $K_c = K_p$
- c) $K_p > K_c$
- d) None of these

Correct answer: b) $K_c = K_p$

11. The reaction for the synthesis of ammonia is $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$. For the reason: (FBISE 2013)

- a) $K_c < K_p$
- b) $K_c = K_p$
- c) $K_p > K_c$
- d) None of these

Correct answer: b) $K_c = K_p$

12. Units of K_c for the reaction $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ will be:

- a) moles/dm³
- b) no units
- c) moles
- d) moles/dm²

Correct answer: b) no units

13. For which of the following reactions K_c has no units of concentration?

- a) $A \rightleftharpoons B$
- b) $3A \rightleftharpoons 2B$
- c) $A \rightleftharpoons 2C$
- d) $3A \rightleftharpoons 3C$

Correct answer: d) $3A \rightleftharpoons 3C$

14. For the reaction: $NO_2(g) \rightleftharpoons NO(g) + O_2(g)$, which statement is true?

- a) $K_p = K_c \cdot (RT)$
- b) $K_c = K_p \cdot (RT)$
- c) $K_p = K_c \cdot (RT)^2$
- d) $K_c = K_p$

Correct answer: b) $K_c = K_p \cdot (RT)$

15. The value of K_c for the reaction $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ is increased by:

- a) Decreasing the temperature
- b) Decreasing the pressure
- c) Increasing the pressure

d) Increasing the temperature

Correct answer: c) Increasing the pressure

16. A reaction will proceed in the forward direction in order to attain equilibrium when: (Q = reaction quotient, K_e = equilibrium constant)

- a) $Q < K$
- b) $Q = K$
- c) $Q > K$
- d) $Q = 0$

Correct answer: a) $Q < K$

20. For the reaction $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ $\Delta H = -92 \text{ kJ/mol}$, which of the following gives the greatest yield of NH_3 ?

- a) Decreasing the temperature and increasing the pressure
- b) Increasing the temperature and decreasing the pressure
- c) Adding a catalyst
- d) Decreasing the temperature and pressure

Correct answer: a) Decreasing the temperature and increasing the pressure

Acids, Bases, and Salts

1. In a buffer solution, the concentration of acid is 10 times the concentration of salt added. The pH of this solution is:

- a) $pK_a + 1$
- b) $pK_a - 1$
- c) $pK_a + 2$
- d) $pK_a - 2$

Correct answer: b) $pK_a - 1$

2. If pK_a values of different acids are given below, indicate the strongest acid among them:

- a) $pK_a = -10.0$
- b) $pK_a = -9.0$
- c) $pK_a = -7.0$
- d) $pK_a = -3.0$

Correct answer: a) $pK_a = -10.0$

3. The solution in which pH is maintained when a small amount of acid or base is added to it, is known as:

- a) Aqueous solution
- b) Concentrated solution
- c) Dilute solution
- d) Buffer solution

Correct answer: d) Buffer solution

4. Which of the following acids has the highest pH value if their acidic strengths are as under?

- a) $HCl > H_2SO_4 > CH_3COOH$
- b) $H_2SO_4 > HCl > CH_3COOH$
- c) $CH_3COOH > H_2SO_4 > HCl$
- d) $CH_3COOH > HCl > H_2SO_4$

Correct answer: a) $HCl > H_2SO_4 > CH_3COOH$

5. pH of 0.001 M $Ca(OH)_2$ is:

- a) 3
- b) 2.7
- c) 11
- d) 11.3

Correct answer: d) 11.3

6) Which one of the following is not a Lewis Base?

- a) NF_3
- b) BF_3
- c) NH_3
- d) H_2O

Correct answer: b) BF_3

7) If a liquid has pH of 7 then:

- a) It must be colorless
- b) It must be a solution
- c) Its boiling point must be 100°C
- d) It must be neutral

Correct answer: d) It must be neutral

8) Which one of the following oxides is an amphoteric oxide?

- a) CO_2
- b) SO_2
- c) CO
- d) ZnO

Correct answer: d) ZnO

9) Which one of the following oxides dissolves in water to form an acidic solution?

- a) MgO
- b) Na_2O
- c) SO_2

Correct answer: c) SO_2

10) The buffer solution of pH 4.76 is prepared by mixing: (pKa of acetic acid 4.76)

- a) Equal quantities of CH_3COOH & CH_3COONa
- b) Different quantities of CH_3COOH & CH_3COONa
- c) Two moles of CH_3COOH & one mole of CH_3COONa
- d) Two moles of CH_3COOH & half mole of CH_3COONa

Correct answer: a) Equal quantities of CH_3COOH & CH_3COONa

11) In the Bronsted-Lowry system, a base is defined as:

- a) A proton donor
- b) An electron-pair acceptor
- c) A hydroxide donor
- d) A proton acceptor

Correct answer: d) A proton acceptor

12) The pH of 10^{-3} moles/dm³ of an aqueous solution of H_2SO_4 is:

- a) 3.0
- b) 2.7
- c) 2.0
- d) 1.5

Correct answer: c) 2.0

13) Hydrolysis of which ion-pair gives an alkaline solution?

- a) Cl^-
- b) HS^-
- c) HCO_3^-
- d) None of these

Correct answer: c) HCO_3^-

14) pH of 0.062 M NaOH solution will be:

- a) 1.21
- b) 12.79
- c) 2.32
- d) 10.32

Correct answer: b) 12.79

15) Organic acid is present in fruits and other substances. Which substance has tartaric acid?

- a) Insect bite
- b) Sour milk
- c) Apple
- d) Grapes juice

Correct answer: d) Grapes juice

16) Which ion can be easily hydrolyzed?

- a) Cl^-
- b) SO_4^{2-}
- c) A^{3+}
- d) Na^+

Correct answer: c) A^{3+}

17) If an acid has $\text{pK}_a = 3.4$, what will be pK_b for its conjugate base?

- a) 8.4
- b) 10.6
- c) 12.3
- d) 3.4

Correct answer: b) 10.6

18) Which of the following is an amphoteric oxide?

- a) MgO
- b) CrO_3

- c) NO_2
- d) Na_2O

Correct answer: b) CrO_3

19) pH of 0.001 M NaOH solution is:

- a) 10^{-3}
- b) 11
- c) 10^{-11}
- d) 3

Correct answer: b) 11

20) Which of the following compounds will produce an acidic solution on hydrolysis?

- a) KNO_3
- b) NaCl
- c) NH_4NO_3
- d) NaCN

Correct answer: c) NH_4NO_3

Chemical Kinetics

1) The unit of rate constant for a 2nd order reaction is:

- a) $\text{mole} \cdot \text{dm}^3 \cdot \text{sec}$
- b) $\text{mole} \cdot \text{dm} \cdot \text{sec}$
- c) $\text{mole} \cdot \text{dm}^3 \cdot \text{sec}$
- d) $\text{mole} \cdot \text{dm}^3 \cdot \text{sec}^{-1}$

Correct answer: d) $\text{mole} \cdot \text{dm}^3 \cdot \text{sec}^{-1}$

2) Consider the following reaction: $\text{NO} + \text{O}_3 \rightarrow \text{NO}_2 + \text{O}_2$. Rate = $K[\text{NO}][\text{O}_3]$. Which statement is NOT correct about the given reaction?

- a) The reaction is of first order with respect to NO
- b) The reaction is of first order with respect to O_3
- c) If $[O_3]$ is constant and $[NO]$ is increased twice, the rate of reaction will be increased thrice
- d) If $[NO]$ is constant and $[O_3]$ is increased twice, the rate of reaction will increase twice

Correct answer: c) If $[O_3]$ is constant and $[NO]$ is increased twice, the rate of reaction will be increased thrice

3) The rate of a chemical reaction is measured in:

- a) mol.dm
- b) mol.dm/s
- c) mol.dm.s
- d) $dm^3, mol.s$

Correct answer: b) mol.dm/s

4) The order of enzyme-catalyzed reactions is:

- a) 3
- b) 0
- c) 1
- d) 2

Correct answer: b) 0

5) The rate constant is equal to the rate of reaction if the order of reaction is:

- a) 0
- b) 1
- c) 2
- d) 3

Correct answer: b) 1

6) The rates of reaction as the reaction proceeds:

- a) Increase
- b) Remain the same
- c) Decrease
- d) May decrease or increase

Correct answer: c) Decrease

7) If the energy of activated complex lies close to the energy of reactants, it means that the reaction is:

- a) Slow
- b) Reaction does not take place
- c) Fast
- d) Endothermic

Correct answer: a) Slow

8) For which reaction the unit of rate constant is the same as that of rate of reaction?

- a) First order reaction
- b) Second order reaction
- c) Third order reaction
- d) Zero order reaction

Correct answer: d) Zero order reaction

9) In a reversible exothermic reaction, the activation energy for the forward reaction is:

- a) Less than for the backward reaction
- b) Higher than for the backward reaction
- c) Equal to the backward reaction
- d) Same or not

Correct answer: a) Less than for the backward reaction

10) The unit of the rate constant is the same as that of the rate of reaction in:

- a) First order reaction
- b) Second order reaction
- c) Zero order reaction
- d) Third order reaction

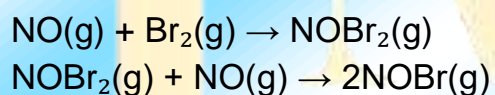
Correct answer: c) Zero order reaction

11) The unit of rate constant and the rate of reaction will be the same when the order of reaction is:

- a) 2
- b) 3
- c) Zero
- d) 1

Correct answer: d) 1

12) The following mechanism has been proposed for the reaction of NO and Br₂ to form NOBr:



If the second step is the rate-determining step, the order of the reaction with respect to NO(g) is:

- a) 0
- b) 3
- c) 2
- d) 1

Correct answer: a) 0

S and P Block Elements

1) Br reduces H_2SO_4 to form: (FBISE 2018)

- a) S
- b) H_2S
- c) SO_2
- d) SO_3

Correct Option: c) SO_2

2) Which one of the following will NOT produce nitrite on heating? (FBISE 2018)

- a) LiNO_2
- b) NaNO_3
- c) KNO_2
- d) RbNO_2

Correct Option: b) NaNO_3

3) Which one is NOT correct order of stability of oxidation states of group IV elements? (FBISE 2018)

- a) $\text{Ge} > \text{Sn}$
- b) $\text{Sn} > \text{Pb}$
- c) $\text{Ge} > \text{Ge}$
- d) $\text{Pb} > \text{Pb}$

Correct Option: c) $\text{Ge} > \text{Ge}$

4) The ONLY alkaline earth metal which reacts with alkalis is: (FBISE 2018)

- a) Be
- b) Mg
- c) Ca
- d) Ba

Correct Option: a) Be

5) Which of the following compounds gives an acidic solution with water? (FBISE 2017)

- a) BaCl_2
- b) SiCl_4
- c) NaCl
- d) KCl

Correct Option: b) SiCl_4

6) Green is the characteristic flame colour of: (FBISE 2017)

- a) Strontium
- b) Sodium
- c) Calcium
- d) Barium

Correct Option: d) Barium

7) $3\text{Ca} + \text{N}_2 \rightarrow ?$ (FBISE 2016)

- a) CaN
- b) CaN_2
- c) Ca_3N_2
- d) Ca_2N

Correct Option: c) Ca_3N_2

8) Which one of the following oxides is basic in nature? (FBISE 2016)

- a) Na_2O
- b) Al_2O_3
- c) P_4O_{10}
- d) SO_3

Correct Option: a) Na_2O

9) Due to inert pair effect, the elements of group IV having electronic configuration ns^2np^2 will form: (FBISE 2016)

- a) M^{4+} cation
- b) M^{4-} cation
- c) M^{2+} cation
- d) M^{2-} cation

Correct Option: c) M^{2+} cation

10) The oxidation states -1, +1, +3, +5 and +7 are shown by all the halogens except: (FBISE 2016)

- a) Fluorine
- b) Bromine
- c) Iodine
- d) Chlorine

Correct Option: a) Fluorine

11) Pale green is a characteristic flame color of: (FBISE 2016)

- a) Strontium
- b) Sodium
- c) Calcium
- d) Barium

Correct Option: d) Barium

12) Which of the following is MOST stable cation? (FBISE 2017S)

- a) Sn^+
- b) Si^+
- c) Ge^+
- d) Pb^{2+}

Correct Option: d) Pb^{2+}

13) Which of the following is correct decreasing order of bond length of Halogens? (FBISE 2018S)

- a) $\text{I}_2 > \text{Cl}_2 > \text{Br}_2 > \text{F}_2$
- b) $\text{I}_2, \text{Br}_2 > \text{Cl}_2 > \text{F}_2$
- c) $\text{Br}_2 > \text{I}_2 > \text{Cl}_2 > \text{F}_2$
- d) $\text{I}_2 > \text{Cl}_2 > \text{F}_2 > \text{Br}_2$

Correct Option: a) $\text{I}_2 > \text{Cl}_2 > \text{Br}_2 > \text{F}_2$

14) Group VIII elements are generally called: (FBISE 2016)

- a) Coinage elements
- b) Halogens

- c) Alkali metals
- d) Noble gases

Correct Option: d) Noble gases

15) Which property increases going down the Group IIA of Periodic Table?
(FBISE 2017S)

- a) Electronegativity
- b) Ionic radius
- c) Maximum oxidation number
- d) Second ionization energy

Correct Option: b) Ionic radius

16) The element Cesium resembles with: (FBISE 2017S)

- a) Lithium
- b) Potassium
- c) Sodium
- d) Rubidium

Correct Option: d) Rubidium

17) Keeping in view the sizes of atoms, which order is correct one? (FBISE 2017S)

- a) $Mg > Sr$
- b) $Ba > Mg$
- c) $Li > Cs$
- d) $Cl > I$

Correct Option: b) $Ba > Mg$

18) Aluminium Oxide is: (FBISE 2017S)

- a) Basic oxide
- b) Acidic oxide
- c) Amphoteric oxide
- d) Either acidic or basic

Correct Option: c) Amphoteric oxide

19) The anhydride of $HClO_4$ is: (FBISE 2017S)

- a) Cl_2O_3
- b) ClO_2
- c) Cl_2O_5
- d) Cl_2O_7

Correct Option: d) Cl_2O_7

20) Which of the following oxides is amphoteric in nature? (FBISE 2016S)

- a) Na_2O
- b) Al_2O_3
- c) P_4O_{10}
- d) SO_3

Correct Option: b) Al_2O_3

21) Which one of the following shows high boiling point? (FBISE 2016S)

- a) HCl
- b) HF
- c) HBr
- d) HI

Correct Option: b) HF

22) The carbonates of alkali metals are not affected by heat except: (FBISE 2016S)

- a) K_2CO_3
- b) Na_2CO_3
- c) Li_2CO_3
- d) Rb_2CO_3

Correct Option: c) Li_2CO_3

23) Electron affinity is a measure of: (FBISE 2016S)

- a) Energy required to excite electron
- b) Energy released during de-excitation of electron
- c) Energy released during addition of electron
- d) Energy required to remove electron

Correct Option: c) Energy released during addition of electron

24) Which one of the Sulphate is water soluble? (FBISE 2016S)

- a) Lead sulphate
- b) Strontium sulphate
- c) Magnesium sulphate
- d) Barium sulphate

Correct Option: c) Magnesium sulphate

25) The element belongs to Group IV-A is: (FBISE 2016S)

- a) Nitrogen
- b) Lead
- c) Oxygen
- d) Barium

Correct Option: b) Lead

26) Which is the strongest oxy-Acid of chlorine? (FBISE 2016S)

- a) HClO_2
- b) HClO
- c) HClO_4
- d) HClO_3

Correct Option: c) HClO_4

Organic Compounds

1) $-\text{SH}$ is the functional group present in the organic compounds known as: (FBISE 2018)

- a) Sulphides
- b) Sulphones
- c) Thiols
- d) Hydrogen sulphides

Correct Option: c) Thiols

2) Full name of Bucky Balls: (FBISE 2017)

- a) Buckminster carbenes
- b) Buckminsterenes
- c) Buckminster Abbey
- d) Buckminster Fullerenes

Correct Option: d) Buckminster Fullerenes

3) When AgNO_3 is added to Lassaigne's Solution, which color is formed for Chlorine? (FBISE 2017)

- a) White
- b) Black
- c) Yellow
- d) Blue

Correct Option: a) White

4) In the organic compounds, the carbon atom generally forms: (FBISE 2016)

- a) Covalent bond
- b) Ionic bond
- c) Hydrogen bond
- d) Metallic bond

Correct Option: a) Covalent bond

5) The functional group having structure ($-\text{COOH}$) represents the family called: (FBISE 2016)

- a) Carboxylic acid
- b) Ketones
- c) Ethers
- d) Esters

Correct Option: a) Carboxylic acid

6) Which of the following is not an Organic compound? (FBISE 2017S)

- a) HCO_2H
- b) H_2CO_3
- c) $\text{C}_2\text{H}_5\text{CO}_2$
- d) $\text{CH}_3\text{CO}_2\text{CH}_3$

Correct Option: b) H_2CO_3

7) When AgNO_3 is added to Lassaigne's solution, which color is formed for iodine? (FBISE 2016S)

- a) Deep yellow
- b) Green
- c) Blue
- d) Violet

Correct Option: a) Deep yellow

Chapter 16: Hydrocarbons

1) The electrophile in the aromatic sulphonation reaction of Benzene is: (FBISE 2018)

- a) H_2SO_4
- b) HSO_4^-
- c) SO_3
- d) SO_2

Correct Option: c) SO_3

2) The Meta directing group among the following: (FBISE 2018)

- a) $-\text{NH}_2$
- b) $-\text{OCH}_3$
- c) $-\text{COOH}$
- d) $-\text{OH}$

Correct Option: c) $-\text{COOH}$

3) Geometrical isomerism is shown by: (FBISE 2018)

- a) Lactic acid
- b) Tartaric acid
- c) 1-Butene
- d) 2-Butene

Correct Option: d) 2-Butene

4) 2,3-Dimethyl-2-butene on reaction with O_3/H_2O gives: (FBISE 2018)

- a) Acetaldehyde
- b) Acetone
- c) Acetic acid
- d) Ethyl alcohol

Correct Option: b) Acetone

5) In which of the following compounds benzene rings are isolated? (FBISE 2017)

- a) Phenanthrene
- b) Naphthalene
- c) Diphenyl ethane
- d) Anthracene

Correct Option: c) Diphenyl ethane

6) It is possible to distinguish between optical isomers by using: (FBISE 2017)

- a) IR spectroscopy
- b) Chemical tests
- c) Polarimetry
- d) Mass spectrometry

Correct Option: c) Polarimetry

7) Which of the following alcohols will be most easily dehydrated to give an alkane? (FBISE 2017)

- a) 3-Propanol
- b) 1-Propanol
- c) 2-Methyl-2-propanol
- d) 2-Propanol

Correct Option: c) 2-Methyl-2-propanol

8) Benzoic acid is obtained by the oxidation of: (FBISE 2017)

- a) p-Xylene
- b) m-Xylene

- c) Benzene
- d) Toluene

Correct Option: d) Toluene

9) The IUPAC name of the compound $\text{HCC}-\text{CH}=\text{CH}-\text{CH}_3$ is: (FBISE 2016)

- a) Penta-2-ene-4-yne
- b) Penta-3-ene-1-yne
- c) Penta-4-ene-2-yne
- d) Penta-3-ene-5-yne

Correct Option: b) Penta-3-ene-1-yne

10) The compounds n-Butane and Isobutane are best considered as: (FBISE 2016)

- a) Functional group isomers
- b) Positional isomers
- c) Chain isomers
- d) Metamers

Correct Option: c) Chain isomers

11) The Nitration of phenol at 25°C produces: (FBISE 2016)

- a) Phenol nitrate
- b) Toluene
- c) Benzene
- d) o-Nitrophenol

Correct Option: d) o-Nitrophenol

12. Double bond is formed as a result of: (FBISE 2016)

- a) Addition reaction
- b) Substitution reaction
- c) Polymerization reaction
- d) Elimination reaction

Correct answer: a) Addition reaction

13. Stability order of simple alkyl carbocation is: (FBISE 2018S)

a) methyl > 3° > 2° > 1°

b) 3° > 2° > 1° > methyl

c) 3° > methyl > 2° > 1°

d) 3° < 2° < 1° < methyl

Correct answer: b) 3° > 2° > 1° > methyl

14. Which of the following is NOT a dehydrating agent? (FBISE 2018S)

a) HNO₃

b) H₂SO₄

c) H₃PO₄

d) P₄O₁₀

Correct answer: a) HNO₃

15. Catalytic oxidation of benzene takes place in presence of _____ as catalyst. (FBISE 2018S)

a) Fe

b) Pt

c) Ni

d) Pd

Correct answer: b) Pt

16. Acidic Hydrogen is present in: (FBISE 2017S)

a) Propyne

b) Propene

c) Propane

d) 2-Butyne

Correct answer: a) Propyne

17. A Chiral Carbon is a Carbon which has different group(s) attached with it. (FBISE 2017S)

a) 3

b) 2

c) 1

d) 0

Correct answer: c) 1

18. Which of the following compounds have no attraction at all with water?
(FBISE 2017S)

a) C_6H_6

b) C_2H_5OH

c) CH_2CH_2OH

d) CH_3COOH

Correct answer: a) C_6H_6

19. Alcohol and ethers show the phenomenon of: (FBISE 2017S)

a) Position isomerism

b) Metamerism

c) Functional group isomerism

d) Cis-trans isomerism

Correct answer: b) Metamerism

20. Benzene cannot undergo: (FBISE 2017S)

a) Addition reaction

b) Substitution reaction

c) Oxidation reaction

d) Elimination reaction

Correct answer: a) Addition reaction

21. $-CHO$ group in benzene is: (FBISE 2017S)

a) Ortho directing

b) Meta directing

c) Para directing

d) Meta & Para directing

Correct answer: b) Meta directing

22. The electrophile in aromatic sulphonation is: (FBISE 2016S)

a) HSO_3

b) H_2SO_4

c) SO_3

d) H_2O

Correct answer: c) SO_3

23. Soda lime is: (FBISE 2016S)

a) NaOH and CaO

b) KOH and NaOH

c) Na and Ca $(\text{OH})_2$

d) NaOH and K_2CO_3

Correct answer: a) NaOH and CaO

24. Geometrical isomerism is shown by: (FBISE 2016S)

a) Lactic acid

b) Maleic acid

c) 1,1-Dichloroethylene

d) 1-Butene

Correct answer: c) 1,1-Dichloroethylene

25. Central carbon atom in tertiary butyl alcohol is: (FBISE 2016S)

a) sp^2 Hybridized

b) sp Hybridized

c) dsp^2 Hybridized

d) sp^1 Hybridized

Correct answer: a) sp^2 Hybridized

26. During Nitration of benzene, the active nitrating agent is: (FBISE 2016S)

- a) NO_2^+
- b) NO_2^-
- c) SO_4^{2-}
- d) NO_3^-

Correct answer: a) NO_2^+

Alkyl Halide

1. Which one of the following reducing agents reduces the aromatic nitro compounds to amine? (FBISE 2018)

- a) Sn/HCl
- b) Br_2 / KOH
- c) $\text{Na} / \text{NH}_3(\text{liq})$
- d) NaBH_4

Correct Option: d) NaBH_4

2. Which one of the following is a poor leaving group in S_N -reactions? (FBISE 2018)

- a) F^-
- b) Cl^-
- c) Br^-
- d) I^-

Correct Option: a) F^-

3. Which of the following alkyl halides cannot be formed by direct reaction of alkanes with halogen? (FBISE 2017)

- a) RI
- b) RF
- c) RBr
- d) RCl

Correct Option: b) RF

4. For which mechanisms the first step involved is the same? (FBISE 2017)

- a) E_1 and SN_2
- b) E_1 and SN
- c) E_1 and E_2
- d) E_2 and SN_2

Correct Option: c) E_1 and E_2

5. Reaction of alkyl halides with Na metal yields: (FBISE 2017)

- a) Alkenes
- b) Phenols
- c) Alkanes
- d) Alcohols

Correct Option: c) Alkanes

6. Reduction of Alkyl Nitriles gives: (FBISE 2016)

- a) Sec: amines
- b) Alcohols
- c) Alkanes
- d) Primary amines

Correct Option: d) Primary amines

7. Identify the most stable carbocation among the following: (FBISE 2017S)

- a) $CH_3-C^+H_2$
- b) $CH_3-C^+H_3$

- c) $\text{C}_6\text{H}_5\text{-C}^+$
- d) $\text{CH}_3\text{-CH}_2\text{-C}^+$

Correct Option: c) $\text{C}_6\text{H}_5\text{-C}^+$

8. For which mechanism, the first step involved is the same? (FBISE 2017S)

- a) E_1 and E_2
- b) SN_1 and SN_2
- c) E_1 and SN
- d) E_2 and SN_2

Correct Option: a) E_1 and E_2

9. SN_2 reactions can be best carried out with: (FBISE 2016S)

- a) Secondary alkyl halide
- b) Primary alkyl halide
- c) Normal alkyl halide
- d) Tertiary alkyl halide

Correct Option: b) Primary alkyl halide

10. $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-Br}$ on treatment with alcoholic KOH gives: (FBISE 2016S)

- a) Propane
- b) Propene
- c) Propyne
- d) Propanol

Correct Option: b) Propene

11. Which one of the following is NOT a nucleophile? (FBISE 2016S)

- a) H_2S
- b) BF_3

c) NH_3

d) H_2O

Correct Option: b) BF_3

Alcohol, Phenols, and Ethers

1. The alcohol with greater reactivity with respect to the cleavage of its O-H bond is? (FBISE 2010)

a) CH_3OH

b) Pri-alcohol

c) Sec-alcohol

d) Ter-alcohol

Correct Option: d) Ter-alcohol

2. Ethers can be prepared by the reaction of alkyl halides with: (FBISE 2018)

a) Cu_2O

b) Na_2O

c) PbO

d) KOH

Correct Option: a) Cu_2O

3. The MORE acidic compound among the followings is: (FBISE 2018)

a) CH_3COOH

b) H_2CO_3

c) CHOH

d) $\text{C}_2\text{H}_5\text{OH}$

Correct Option: a) CH_3COOH

4. The alcohol with greater reactivity with respect to the cleavage of its C-O bond is? (FBISE 2018)

- a) CHOH
- b) Pri-alcohol
- c) Sec-alcohol
- d) Ter-alcohol

Correct Option: d) Ter-alcohol

5. When phenol reacts with CH_3COCl the product formed is: (FBISE 2017)

- a) Ethanol
- b) Ethanal
- c) Ether
- d) Ester

Correct Option: d) Ester

6. Molecular formula of catechol is: (FBISE 2018S)

- a) $\text{C}_6\text{H}_5(\text{OH})(\text{NO}_2)$
- b) $\text{C}_6\text{H}_5(\text{OH})_2$
- c) $\text{C}_6\text{H}_5(\text{NO}_2)_2$
- d) $\text{C}_6\text{H}_5(\text{NH}_2)_2$

Correct Option: b) $\text{C}_6\text{H}_5(\text{OH})_2$

7. _____ are Sulfur analogues of Alcohols. (FBISE 2016S)

- a) Alkenes
- b) Thiols
- c) Imines
- d) Amines

Correct Option: b) Thiols

8. Phenol is more acidic than alcohol. Which statement is correct? (FBISE 2017S)

- a) Phenoxide ion is stabilized due to resonance
- b) Phenol turns blue litmus paper red

- c) Alkoxide ion is stabilized due to resonance
- d) Alcoholic liberates CO_2 with carbonate solution

Correct Option: a) Phenoxide ion is stabilized due to resonance

9. According to Lewis concept ethers behave as: (FBISE 2016S)

- a) Base
- b) Amphoteric compound
- c) Oxidizing agent
- d) Acid

Correct Option: a) Base

Aldehydes and Ketones

1. The reagent which is used to distinguish between aldehydes and alcohols is: (FBISE 2018)

- a) Hydroxyl amine
- b) Phenyl hydrazine
- c) Hydrazine
- d) 2,4-dinitro phenyl hydrazine

Correct Option: b) Phenyl hydrazine

2. Which one of the following does NOT give iodoform test on reaction with NaOH ? (FBISE 2018)

- a) Acetaldehyde
- b) Acetone
- c) 1-Propanol
- d) 2-Propanol

Correct Option: c) 1-Propanol

3. Aldehydes are prepared by: (FBISE 2016S)

- a) Oxidation of alcohol
- b) Reduction of ketone
- c) Reduction of ester
- d) Reduction of alcohol

Correct Option: a) Oxidation of alcohol

4. Tollen's test is given by: (FBISE 2016S)

- a) Acetaldehyde
- b) Acetic acid
- c) Methyl acetate
- d) Acetone

Correct Option: a) Acetaldehyde

5. An Acetal is produced when acetaldehyde reacts with: (FBISE 2018)

- a) A ketone
- b) An alcohol
- c) An ether
- d) An ester

Correct Option: b) An alcohol

6. Which of the following can undergo Aldol condensation reaction? (FBISE 2017)

- a) Benzaldehyde
- b) Formaldehyde
- c) Trimethylacetaldehyde
- d) Acetaldehyde

Correct Option: d) Acetaldehyde

7. Which of the following alkyne would not produce a Ketone on hydration? (FBISE 2017)

- a) 2-Butyne

- b) Ethyne
- c) Propyne
- d) 1-Butyne

Correct Option: b) Ethyne

8. Which one of the following reagents will react with both aldehydes and Ketones? (FBISE 2017)

- a) Fehling's reagent
- b) Grignard's reagent
- c) Benedict's reagent
- d) Tollens's reagent

Correct Option: b) Grignard's reagent

9. Acetone can be obtained by the oxidation of: (FBISE 2016)

- a) 2-propanol
- b) Propanol
- c) Ethanol
- d) 1-propanol

Correct Option: a) 2-propanol

10. Which of the following is an acid catalyzed reaction? (FBISE 2018)

- a) Polymerization of aldehydes
- b) Haloform reaction
- c) Condensation
- d) Addition of hydrogen cyanide

Correct Option: c) Condensation

11. Which of the following will NOT give iodoform test? (FBISE 2018S)

- a) Acetone
- b) Acetaldehyde
- c) Ethanal
- d) 3-pentanone

Correct Option: d) 3-pentanone

12. Ketones are prepared by the oxidation of: (FBISE 2017S)

- a) Primary alcohol
- b) Secondary alcohol
- c) Carboxylic acids
- d) Aldehydes

Correct Option: b) Secondary alcohol

13. Cannizzaro's reaction is not given by: (FBISE 2016S)

- a) Benzaldehyde
- b) Acetaldehyde
- c) Trimethyl acetaldehyde
- d) Formaldehyde

Correct Option: c) Trimethyl acetaldehyde

Carbonyl Compounds

1. Reduction of carboxylic acids with LiAlH_4 results in the formation of: (FBISE 2018)

- a) Pri-alcohols
- b) Sec. alcohols
- c) Ter. alcohols
- d) Aldehydes

Correct Option: a) Pri-alcohols

2. Acetamide can be prepared by heating: (FBISE 2018)

- a) Ethyl amine

- b) Ethyl nitrile
- c) Nitro ethane
- d) Ammonium acetate

Correct Option: d) Ammonium acetate

3. IUPAC name of Valeric acid is: (FBISE 2017)

- a) Propanoic acid
- b) Pentanoic acid
- c) Ethanoic acid
- d) Butanoic acid

Correct Option: b) Pentanoic acid

4. Hydrolysis of nitriles produces: (FBISE 2017)

- a) Carboxylic acids
- b) TNT
- c) Nitrates
- d) Nitroalkanes

Correct Option: a) Carboxylic acids

5. Which one of the following compounds does not contain a carboxylic group? (FBISE 2017)

- a) Benzoic acid
- b) Picric acid
- c) Acetic acid
- d) Formic acid

Correct Option: b) Picric acid

6. The reaction of Carboxylic acid with an alcohol is called: (FBISE 2017)

- a) Ammonolysis
- b) Esterification
- c) Saponification

d) Hydrolysis

Correct Option: b) Esterification

7. Tartaric acid is obtained from: (FBISE 2018S)

a) Vinegar

b) Wine

c) Grapes

d) Sugar

Correct Option: c) Grapes

8. Malonic acid is a common name for: (FBISE 2018S)

a) Ethane dioic acid

b) Benzene dioic acid

c) Propane dioic acid

d) Butanoic acid

Correct Option: a) Ethane dioic acid

9. Which of the following order is correct regarding the acidity of carboxylic acids? (FBISE 2017S)

a) $\text{CCl}_3\text{COOH} > \text{CHCl}_2\text{COOH} > \text{CH}_2\text{ClCOOH}$

b) $\text{CH}_2\text{ClCOOH} > \text{CHCl}_2\text{COOH} > \text{CCl}_3\text{COOH}$

c) $\text{CHCl}_2\text{COOH} > \text{CCl}_3\text{COOH} > \text{CH}_2\text{ClCOOH}$

d) $\text{CH}_2\text{ClCOOH} > \text{CCl}_3\text{COOH} > \text{CHCl}_2\text{COOH}$

Correct Option: a) $\text{CCl}_3\text{COOH} > \text{CHCl}_2\text{COOH} > \text{CH}_2\text{ClCOOH}$

10. Esterification is the reaction of _____ with an alcohol.

a) Amide

b) Carboxylic acid

c) Ester

d) Amine

Correct Option: b) Carboxylic acid

11. Which of the following can be prepared in the laboratory by dry distillation of $(\text{HCOO})_2\text{Ca}$?

Correct Option: a) Acetic acid

12. Which of the following cannot be prepared directly from acetic acid?

- a) CH_3CHO
- b) CH_3OH
- c) $\text{CH}_2=\text{CH}_2$
- d) HCHO

Correct Option: c) $\text{CH}_2=\text{CH}_2$

13. Which of the following derivatives cannot be prepared directly from acetic acid?

- a) Acetyl chloride
- b) Acetamide
- c) Acetic anhydride
- d) Ethyl acetate

Correct Option: d) Ethyl acetate

14. The reagent used to reduce carboxylic acid to an alcohol is: (FBISE 2016S)

- a) H_2/Pt
- b) LiAlH_4
- c) $\text{K}_2\text{Cr}_2\text{O}_7/\text{H}_2\text{SO}_4$
- d) H_2/Ni

Correct Option: b) LiAlH_4

Environmental Chemistry

1. The industrial smog contains smoke mixed with: (FBISE 2018)

- a) O_3
- b) SO_2
- c) SO_3
- d) CO_2

Correct Option: b) SO_2

2. Peroxyl Acetyl Nitrate (PAN) is a secondary pollutant which affects: (FBISE 2018)

- a) Lungs
- b) Eyes
- c) Nose
- d) Skin

Correct Option: b) Eyes

3. Which of the following is not present in acid rain? (FBISE 2017)

- a) CH_3COOH
- b) HNO_3
- c) H_2CO_3
- d) H_2SO_4

Correct Option: a) CH_3COOH

4. Ozone layer is present at a height of about: (FBISE 2017)

- a) 80 km above the earth
- b) 5 km above the earth
- c) 100 km above the earth
- d) 28 km above the earth

Correct Option: d) 28 km above the earth

5. Which of the following is NOT an alternative to ozone-depleting Chlorofluorocarbons (CFCs)? (FBISE 2016)

- a) Hydrocarbons
- b) Hydrofluorocarbons (HFCs)
- c) CO₂
- d) Perfluorocarbons (PFCs)

Correct Option: c) CO₂

6. Miticides are used to control: (FBISE 2018S)

- a) Mice and bats
- b) Fungi
- c) Unwanted plants
- d) Ticks and mites

Correct Option: d) Ticks and mites

7. What is the value of BOD for clean water? (FBISE 2018S)

- a) 5
- b) 3
- c) 2
- d) 1

Correct Option: d) 1

8. Which of the following is NOT an air pollutant? (FBISE 2017S)

- a) SO₂
- b) NO₂
- c) CO
- d) CO₂

Correct Option: d) CO₂

9. Which of the following gases is not a pollutant? (FBISE 2016S)

- a) CO

b) NO₂

c) SO₂

d) CO₂

Correct Option: d) CO₂

