i. The word atom comes from Greek language which means

A. beautiful
B. indivisible
C. smooth
D. sharp

ii. Leucippus is known to be the mentor of Democritus and the father of atomic philosophy. Who was the first to use the word atom?

A. Leucippus
B. James Clerk Maxwell
C. Democritus
D. Erwin Schrodinger

iii. Who put forward the atomic theory?

A. Dalton
B. J C Maxwell
C. Al Ghazali
D. E Schrodinger

iv. Who observed the movement of molecules from one container to the other in Maxwell's thought experiment?

A. Maxwell
B. the demon
C. Maxwell's students
D. Maxwell's mentor

v. The Maxwell's demon experiment violates which of the following law?

A. law of conservation of mass
B. the Boyle's law
C. first law of thermodynamics
D. second law of thermodynamics

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vi. The Schrodinger's thought experiment is believed to have contributed to evolving the well-known field of physics called

A. plasma physics
B. particle physics
C. statistical mechanics
D. quantum mechanics

vii. What were the findings for an outside observer in Schrodinger's cat thought experiment?

A. the cat was dead
B. the cat was alive
C. the cat was both alive and dead simultaneously

D. the cat was neither alive nor dead

viii. The famous book of Al-Ghazali, "Tahafut-al-Falsafa" challenged the philosophical thought of Neoplatonic thinkers which believed that

A. perfection and happiness are achievable in this world

B. no happiness and perfection exist in this world

C. there is life hereafter

D. man is mortal

ix. Al-Ghazali thought experiment was based on burning

A. paper B. cotton C. wood D. coal

x. What is correct statement about Al-Ghazali's approach?

I. he thought that every event must have a cause

II. he thought that there is succession of events, not causation

III. he thought that God can suspend the habitual continuation of events

A. I & II only B. II & III only C. III only D. I,II &III

2. Give short answer.

i. What was an atom to Democritus?

History of Chemistry

Thought experiment :- The experiment performed in human mind
Real experiment :- The experiment performed physically in lab.

Leucippus :- first person to think about atom.
→ father of atomic philosophy.

Democritus Contribution :- (Ref Q2 i, ii)
→ Thought that matter is made up of uniform and undivid-able substance called "atomos" means uncutable.
→ Atoms also exists for emotions and feelings of a person. On precise view, he tried to explain that our soul, body, brain perceptions consists of atoms too.
→ Shape of atom to feeling :-
a) Anger → Sharp, pointed atoms.
b) Joy → Large, slow atoms.
c) Sour taste → Needle shape atom.
d) White color of matter → Smooth atom.
→ He argued that "change in matter is due to combination or seperation of indivisible particle in matter."

"All the contribution of democritus was just a THOUGHT."

Problem
↓
Observation
↓
Hypothesis
↓
Deduction
↓
Experiment
↓
Result
↓
Theory
↓
Law.

JOHN DALTON contribution:- (Ref Qs.4)

→ He was the first one who converted Democritus thoughts into scientific theory, which is Dalton's atomic theory.

→ With approval & contribution of few other scientists the base of Atomic philosophy & atomic chemistry was laid.

Thought experiments → Real experiment

(Detailed) MAXWELL'S EXP. (Ref Qs.3)

Introduction:- James Maxwell devised a thought experiment on gas molecules in 1867.

- Demon → Character
- Entropy → Measure of disorder.

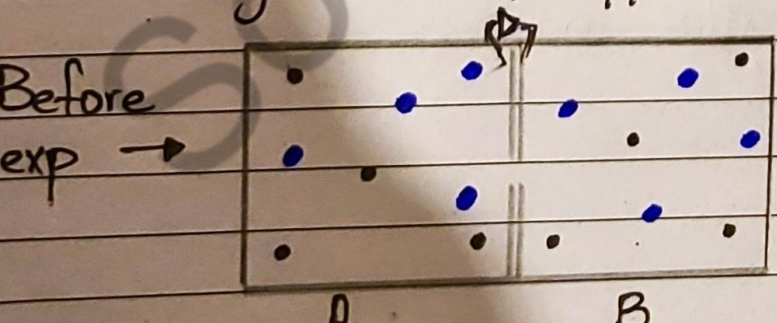
Experiment:-

Maxwell performed an experiment using:-

→ 2 containers seperated by a wall but a very little hole in the wall.

→ Gas molecules. → The character demon.

Arrangement of apparatus:-

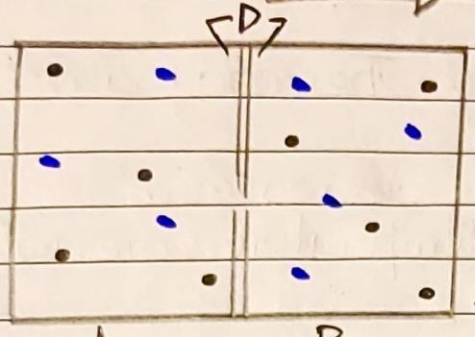


1) The containers have same gas of same temperature; Thus, Kinetic energy of all molecules is same.

2) Molecules are spread uniformly.

Dated: _____ Demon :

b)



1) As particles are moving continusly, So some particles will develop kinetic energy difference among them. K.E

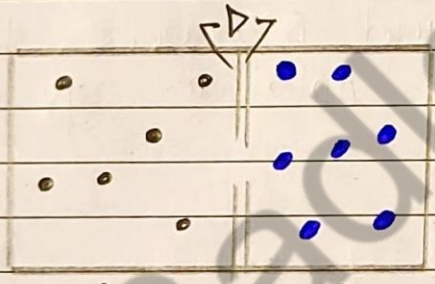
2) The particles/molecules with high ~~temp~~. will be moving to container B from container A.

3) The molecules of low kinetic energy will be moving from container B to container A.

High K.E → A → B
Low K.E → B → A.

- Low K.E
- High K.W.E.

Now;



1) This movement of particles is done by Demon, who is guarding the setup and allowed high K.E molecules to gather in B and Low K.E to gather in container A.

2) However, this phenomenon can not occur naturally.

3) This setup will create a temperature difference in containers such as A with Low temperature and B with high temperature.

2nd Law of thermodynamics :- (entropy increases)

→ Spontaneous events don not requires energy.
→ Nonspontaneous events requeirs energy.
→ Heat flow from hot → cold.
→ Similarly, water flows from high → low (slope).

Maxwells contradiction to Thermodynamics :-

1) The entropy of Maxwell's d exp. decreases.
2) The molecules of different temperature are not moving from e.g. hot → cold "
3) The experiment must be non-spontaneous means it requires energy, that shall be provided by demon. But, the character demon have no energy.

Thus, non-spontaneous events can not be done without energy supply, and Maxwell's thought experiment is clearly a violation of 2nd law of thermodynamics.

Dated: _____

SCHRODINGER'S CAT EXP.

(detail)

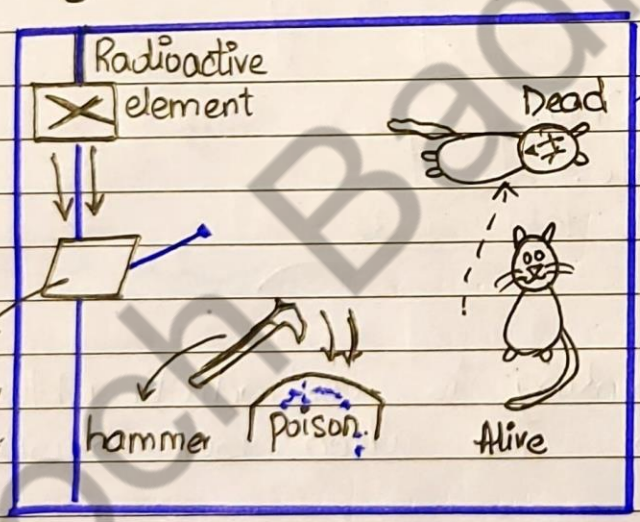
Background :- The scientist Erwin schrodinger performed experiment to overcome problems of Quantum mechanics and to clearify Dual nature of matter.

Experiment :-

He performed experiment with general cat to deduce his concepts of dual nature of matter.

Apparatus :- Opque box → Cat → Poison
→ Hammer → Radioactive element → Geiger Counter.

Arrangement :



1) This is the basic setup inside the box.
2) Radioactive element is there.
3) Geiger counter is sensitive to radioactive decay.
4) Hammer is connected to lever of Geiger counter.
5) Poison will spread if hammer break poison box.

Concept ⇒ Case 01 :- Radioactive decay → Dead.
No radioactive decay → Alive.

Dated:

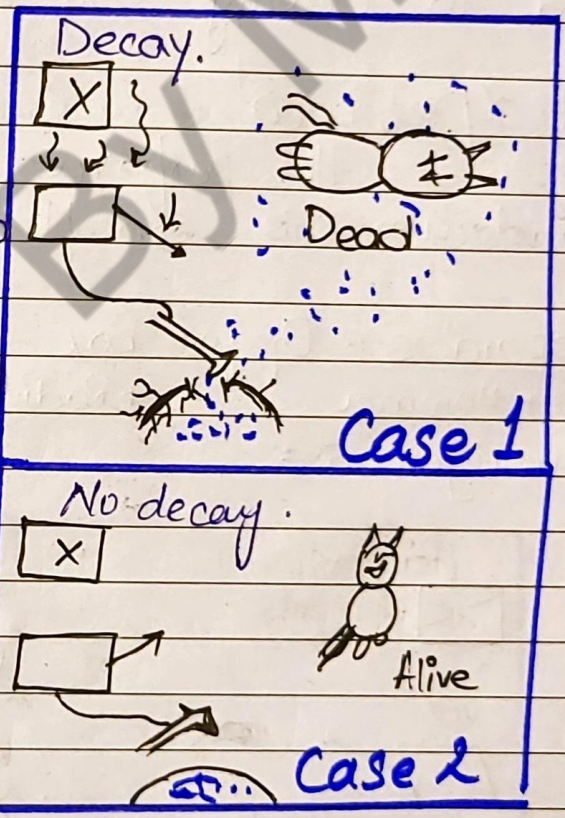
(Case 1/2 → Ref Qs 2 iii)

Case 01 :-

If the radioactive element is decaying, then the geiger counter will lower the lever and poison will spread causing death of cat.

Case 02 :-

If the radioactive element is not decaying the geiger counter and hammer remain lifter and poison boxed. So cat will be alive.



Suspect :-

A person suspecting the opaque box will be thinking of probablity of cat's life.

either → Alive
→ Dead.

- So the person's view of thinking is contradicting b/w 2.
- He will be sure for one when box will open.

Dual Nature :- (Ref Qs. 5) (Ref. Qs 2 iv)

Just like suspect, an electron could be of more than one nature like particle and wave.

Dated:

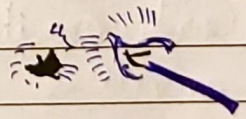
The equation $\left(\lambda = \frac{h}{mv}\right)$ provides the relation of matter and nature of matter as particle / wave.
→ The clarification of nature of matter occurs when perimeters of equation are measured.

⇒ GHAZALI'S CONTRIBUTIONS

Introduction :- Imam Ghazali was teacher, debatist, and Imam of Iraq who contributed in philosophy and religion by written books "Revival of Religious Science" and "Tahafat ul falsafa". (MCQ)

Challenged :- He challenged thought of Neoplatonic that says "perfection can be attained by logic & cause

Necessary Causation :- [Burning of cotton] (Ref Qs 2 V) Qs 6
Cause → Effect.
Every event takes place due to it's cause.
example :-
Effect → Burning Cotton.
Cause → Burning flame.
→ The cotton burned due to burning flame.
→ The burning flame burned the cotton.
So, there is a link blw cotton & flame.
This link is called as Necessary Causation.



[Rainfall] → Effect : Rain → Cause : Clouds

→ The rainfall happens due to clouds.
→ The clouds let cause the rain.

Departure :- (Ref Os 6)

→ Ghazali presented that blind man can't see as he is unable to open his eyelids.
→ But what if one day a miracle happen and he stated to see world.
→ The blind man will think that opening of eye lid is the cause of his sight.

The theory of causation will then rejects God's will.

→ Sometimes or many, events happen in continuation like a linked chain and necessary cause has nothing to do with their occurance.
→ They occurs as a miracle [by God's will] in a natual and habitudl manner.
→ God created universe, and suspended succesion of events.

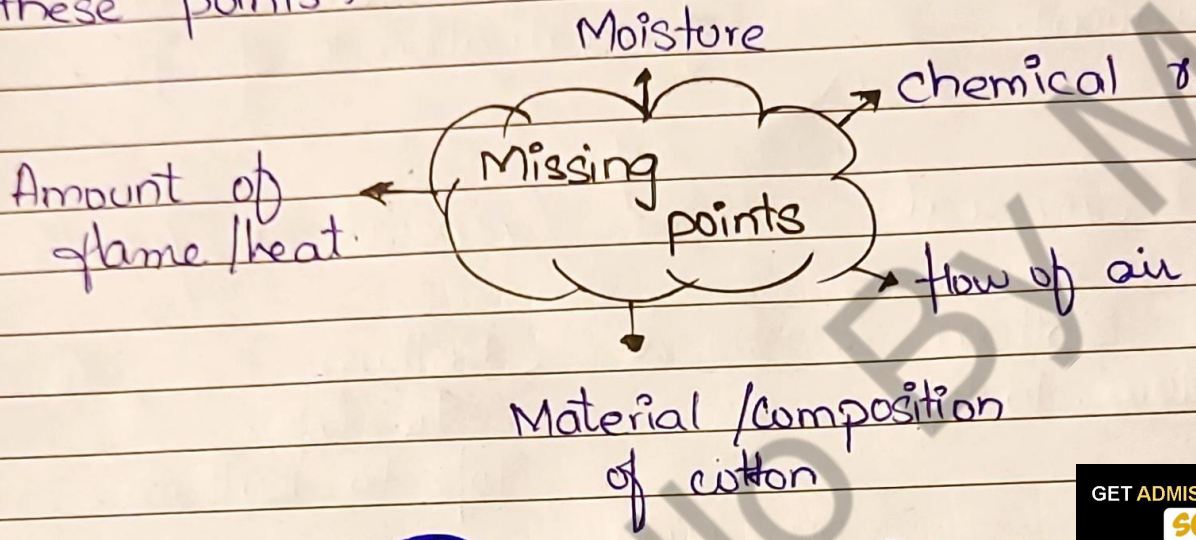
Challenge to Inductive Reasoning :- (Ref Os 7)

Ghazali gave few points of inductive reasoning :-
(a) The flame burns a peice of cotton.
(b) The ~~burning of~~ cotton burns when kept near flame.
(c) The flame is the cause of burning cotton.

→ When cotton is placed near flame it always burn.

Repeated same observations are not always true.

The outcome could be different when highlighting these points;



Reasoning

Definition :-

It is a process to think about something in a logical way for the formation of conclusion. It envolves evidance, principle, analysis, critical thinking to solve problem.

OR

It is a stepwise thinking with purpose & goal in mi

Types :-

- Inductive
- Deductive

Dated: _____ (Qs 2 vi)

INDUCTIVE REASONING		DEDUCTIVE REASONING
	Definition	
It is the process of reasoning that moves from specific to broad generalizations.		It is the process of reasoning that moves from broad generalization to specific.
Specific → General	Hiarchy	General → Specific
Top to Bottom bottom. to top.	Approach	(Bottom to top. Top to Bottom.
	Conclusion	
Conclusion are not necessarily true but are based on premisis provided.		Conclusions are reached through deductive reasoning are necessarily correct if premisis are true.
Degree of uncertainity is involve	Certainity	~~Un~~certainity is involve.
Scientific research etc..	Uses	Mathematics etc..
All swans are white. Thats why my swan is white.	Example	All men are mortal Socarate is man Socarate is mortal.