

27. Nov. 2018

Tuesday

Chapter: 15

"Environmental Chemistry: II" Water

• Review Exercise:

Q2: Give short answers:

(i) List the impurities present in rain water.

Rain water is soft water. As rain water falls through atmosphere, it dissolves a little oxygen, nitrogen, carbon dioxide and dust particles. During thunderstorms, it also dissolves nitric acid.

(ii) List toxic substances present in household wastes.

Household wastes include, human wastes, livestock wastes, soaps and detergents, paints and oils and vegetable wastes, garbage etc.

(iii) In what ways, industrial wastes pollute water?

• Industrial Wastes:

Manufacturing of industrial products is accompanied by some by-products and waste effluents.

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These waste products may be in the form of waste heat, smoke, solid or waste water effluents. These wastes may contain highly toxic compounds and heavy metals that run into water bodies and pollute them.

(iv): What is water pollution?

• WATER POLLUTION:

Water pollution is the contamination of water bodies such as lakes, rivers, seas, oceans as well as ground water. It occurs when pollutants reach these bodies of water without treatment it affects plants and organisms living in it.

(v): List some waterborne diseases.

Some waterborne diseases are:

- (i) Cholera
- (ii) Dysentery
- (iii) Jaundice
- (iv) Hepatitis
- (v) Typhoid.

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(vi) What are pathogenic microorganisms?

• Pathogenic Microorganisms:

Any microorganism that is capable of injuring or harming its hosts is called pathogenic microorganisms.

• Example:

Bacteria, viruses etc.

Q3: What is hard water? Why is it sometimes undesirable?

• Hard Water:

Water that gives a little or forms scum with soap is called hard water.

• Disadvantages of Hard Water:

- (i) Hard water wastes a lot of soap, when used for washing.
- (ii) The soap forms scum with hard water, which adhere to the clothes being washed. Scum can spoil the finish of some fabrics.
- (iii) Causes kettles to fur.
- (iv) Can cause hot water pipes, boilers and car radiators to block due to the formation

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of insoluble calcium and magnesium salts, causing great damage.

Q4: List two ways in which lakes and streams become polluted.

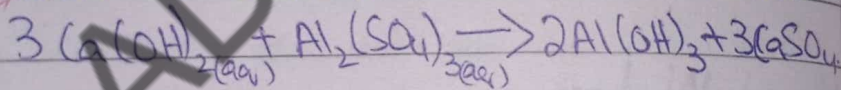
The two ways in which lakes and streams become polluted are:

(i) Industrial wastes

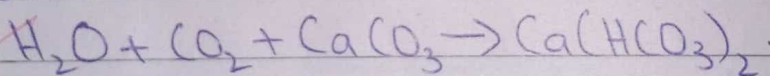
(ii) Household wastes.

Give brief description

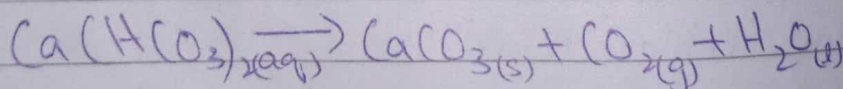
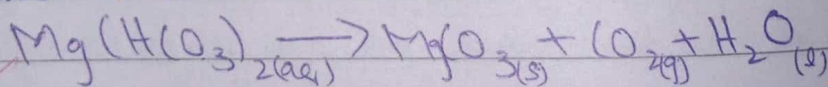
Q5: Give chemical equations for the
(a) reaction of slaked lime with alum.



(b) Carbonated rain water with lime stone.



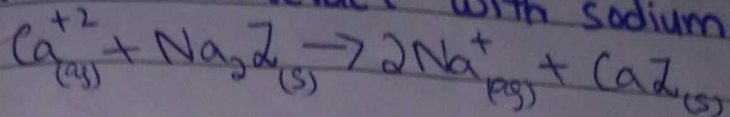
(c) reaction that occurs with temporary hard water is boiled.



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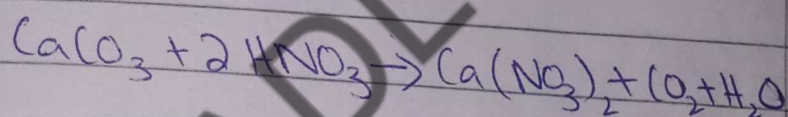
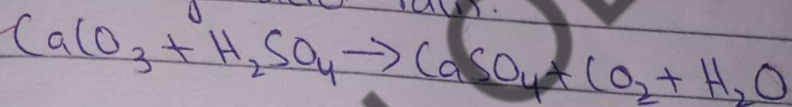
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(b) Ca^{+2} ions interact with sodium zeolite.



Q6: How can buildings made of limestone be affected by acid rain?

Acid rain contains carbonic acid, sulphuric acid and nitric acid which can dissolve limestone that's why building made of limestone can be affected by acid rain.



Q9: What are the Earth's four main water sources?

The Earth's four main water sources are:

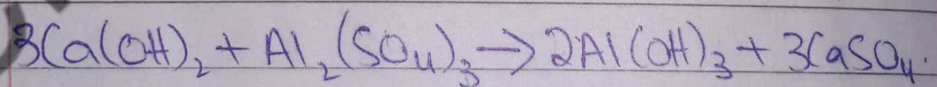
- (i) Fresh water 0.2%.
- (ii) Oceans 97%.
- (iii) Glaciers and Icecaps 2.1%.
- (iv) Underground water 1%.

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Q11: What is the purpose of coagulation in water treatment?

Impurities in the raw water, in the form of suspension of ~~colloids~~ can be coagulated (become thick or solid) with the help of coagulation agents such as alum ($\text{Al}_2(\text{SO}_4)_3$) and slaked lime ($\text{Ca}(\text{OH})_2$), this process is called coagulation. When alum is added in raw water in the presence of slaked lime, a gelatinous white precipitate of Aluminium hydroxide ($\text{Al}(\text{OH})_3$) is formed and suspended particles are absorbed on the surface of Aluminium hydroxide. This process can remove more than 80% of suspended solids in raw water.



Q14: What are some health effects of biological contamination of water?

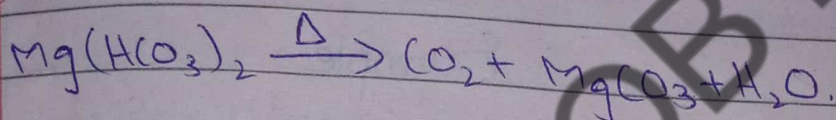
Bacterial contents may cause infectious diseases such as diarrhoea, dysentery, cholera, hepatitis, jaundice, and typhoid.

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Q15: Write a word and balanced chemical equation to show the effect of heat on magnesium hydrogen carbonate in an aqueous solution.

Magnesium hydrogen carbonate $\xrightarrow{\text{heat}}$ carbon dioxide + Magnesium carbonate + water



Q16: How does hard water differ from soft water?

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Hard Water

Contains

It contains minerals such as calcium and magnesium.

Soft Water

It contains only sodium salts.

Reaction With Soap

Hard water forms scum with soap. Soft water forms lather with soap.

Lather Formation

It forms little lather with soap.

Soft water forms large amount of lather.

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Problems

✓ It leaves deposits called scale.

It does not cause any problem.

Removal

✓ Hardness can be removed by both chemical and physical methods.

It does not contain any hardness.

Example

✓ Ground water, oceans

Rain water, distilled water.

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Environmental Chemistry: II Water

Think - Tank:

Q16: Why is it cooler near a lake than inland during summer?

As rate of evaporation is directly proportional to temperature.

In summers the temperature is high so rate of evaporation is also high as evaporation is the cooling process, it is cooler near a lake than inland during summer.

Q17: Public health depends on water quality. Give arguments.

Water quality is defined by its physical, chemical, biological and aesthetic characteristics. A healthy environment

is one in which the water quality supports community of organisms and protect public health. If water quality

is not maintained, not only environment will suffer but the commercial and recreational value of our water resources will also diminish.

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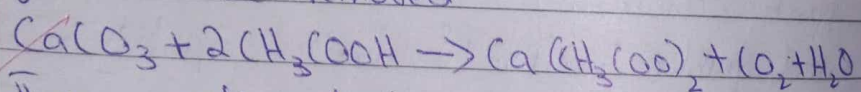
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Q12: Explain how hard water hampers the cleansing action of soap.

It is difficult to make the soap lather in hard water. Instead, the water becomes cloudy. The cloudiness is due to the formation of white precipitate by the reaction of Ca^{+2} or Mg^{+2} ions present in hard water and soap. This white precipitate is known as scum. Hard water leaves scum on the fabrics, which gives grey or yellow appearance to white fabrics. So hard water hampers cleansing action of soap.

Q19: Hard water causes kettles to fur. This fur can be removed by using an acid. Justify.

Hardness in water can cause limestone (calcium carbonate) which is known as fur to be deposited on the sides of kettle. With help of acetic acid the fur can be removed.



The reaction between calcium carbonate and acetic acid gives calcium acetate, carbon dioxide and water thus the fur is removed.

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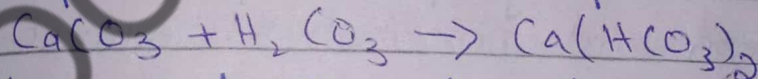
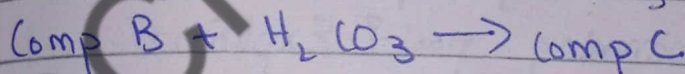
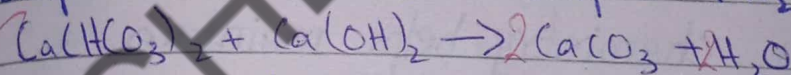
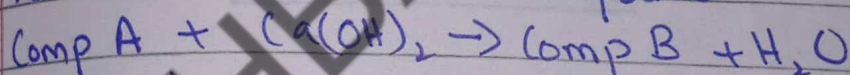
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Question 19

Reason:

Calcium and magnesium carbonate make up the fur on kettles. Carbonates are soluble in acids, however, so adding some acid will decompose the carbonate salts. If we use an acid which provides soluble calcium or magnesium salts, the scaling ^{will} dissolve. Acetic acid (vinegar) is a good example as both calcium acetate and magnesium acetate are soluble.

Q20: The following chemical equation is about a calcium compound.



White
balanced
equation

(a) Name and give formula of

(i) Compound A

Calcium hydrogen carbonate $\text{Ca(HCO}_3)_2$

(ii) Compound B

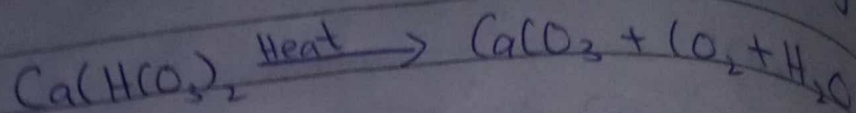
Calcium carbonate CaCO_3 .

Compound C: $\text{Ca(HCO}_3)_2$

(b) Describe with aid of a balanced chemical equation. What happens when compound C is heated?

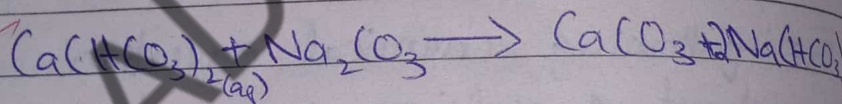
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When calcium hydrogen carbonate is heated it decomposes to insoluble calcium carbonate, carbon dioxide and water.

(c) Compound C is soluble in water. Write a balanced chemical equation to show what happens when its aqueous solution is treated with washing soda?



Q21: How chemistry helps maintain a clean swimming pool? Explain.

Aeration and chlorination treatment of swimming pool water has lessened the threat of biological contamination.

Q22: It is advisable to wash hands well with soap after using bathrooms, evaluate it.

After using bath rooms, it is advisable to wash hands well with soap to

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prevent the infections caused by bacteria like cold, flu, diarrhoea. Therefore, washing hands regularly can control the spread of germs.

Q24 Evaluate the advantages of waste water treatments.

• Advantages of Waste Water Treatment:

Water treatment is essential for many reasons:

(i) Through water purification, we can avoid drinking impure and contaminated water, which causes many epidemic diseases and unsafe for healthy life.

(ii) It removes bacteria, viruses and parasites which may cause diarrhoea, dysentery, botulism, typhoid, cholera, polio and hepatitis.

(iii) It also removes heavy metals like As, Bs, Cr and Pb which can cause long term neurological problems, kidney diseases, nausea, dizziness and cancer.

(iv) It also improves flavour and appearance.

3rd Dec. 2018

Monday

Chapter: 15

"Environmental Chemistry II: Water"

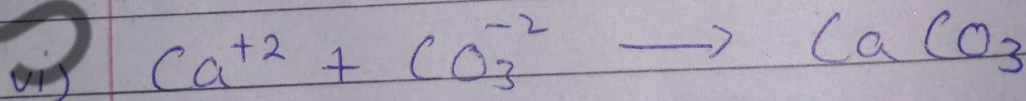
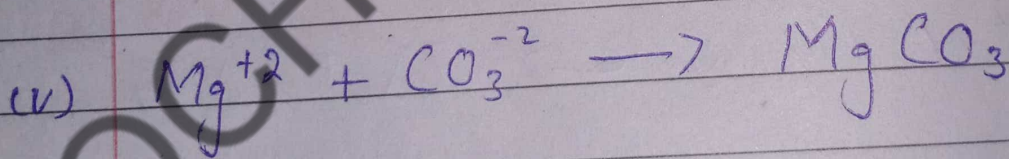
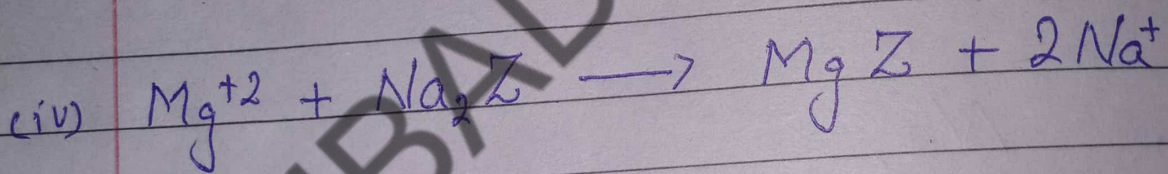
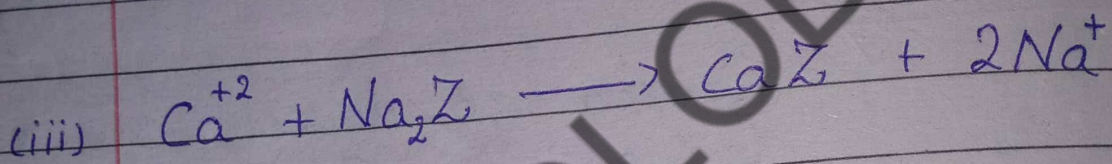
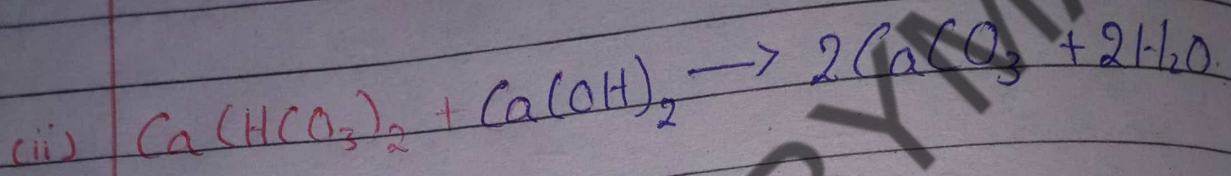
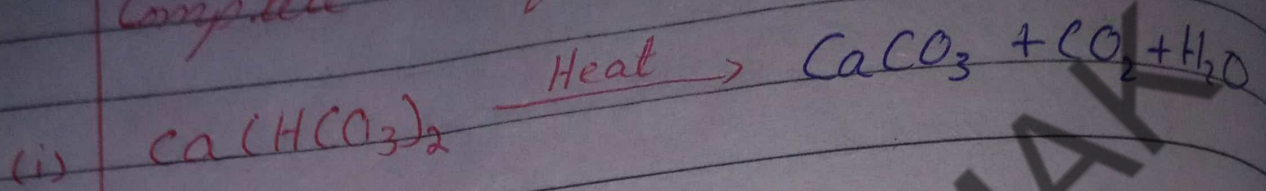
• Think-Tank:

Q25: Water born diseases are no longer common in developed countries. Defend this statement.

Water born diseases are no longer common in developed countries because with the advancement in technology, it has become easier to treat the polluted water and make it ultimately safe for human use that decreases the risk of water born diseases.

SELF ASSESSMENT EXERCISE 15.4

Complete the following reactions.



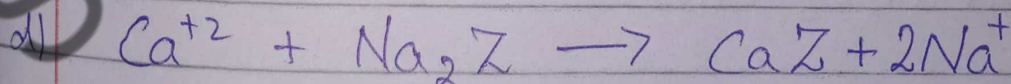
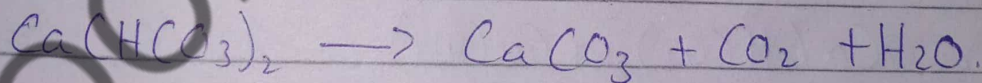
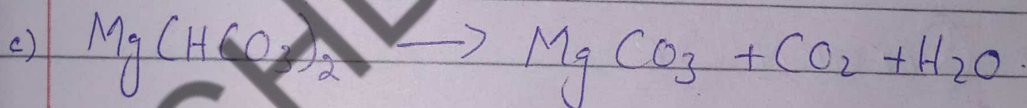
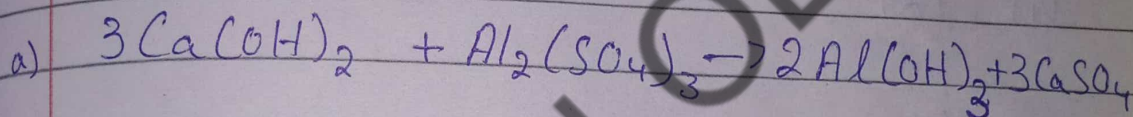
15.8 WATERBORNE DISEASES

Due to polluted water

PATHOGENIC MICROORGANISMS :-

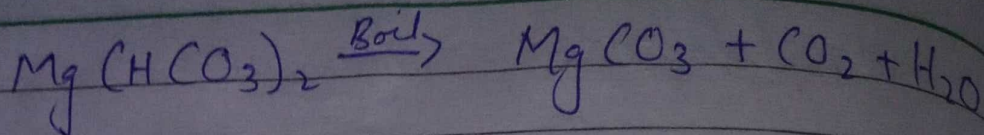
Any microorganism capable of injuring its host e.g; bacteria or virus

QUESTION 5.



QUESTION 15

Magnesium hydrogen carbonate $\xrightarrow{\text{Boil}}$ Magnesium carbonate + carbon dioxide water



QUESTION 1

(iii) (d)

(iv) (d)

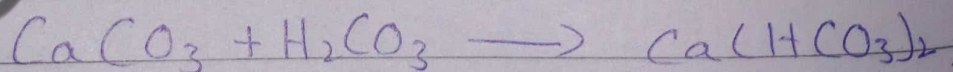
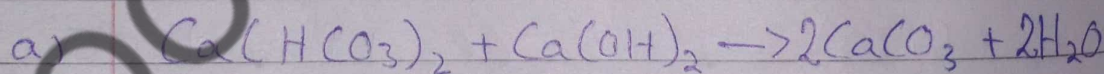
v) (d)

vi) (d)

vii) (d)

viii) (b).

QUESTION 20



COMPOUND A is ~~CaCO₃~~ $\text{Ca}(\text{HCO}_3)_2$

COMPOUND B is CaCO_3

COMPOUND C is $\text{Ca}(\text{HCO}_3)_2$

