

PHYSICAL SCIENCES

GR 10 RESOURCE



EXERCISE 3.1

MODULE 3 TOPIC 1 Unit 1, p. 116
Gr 10 Physical Sciences 3-in-1

QUESTION 1

1.1 Complete the following table.

Characteristics	Physical change	Chemical change
chemical nature of substance before and after the change	1.1.1	1.1.2
energy involved	1.1.3	1.1.4
conservation of mass, number of atoms and molecules	1.1.5	1.1.6
reversibility	1.1.7	1.1.8

1.2 For each of the changes below, indicate whether it represents a **physical** or **chemical** change.

1.2.1 Distillate sugar water to recover the sugar that was dissolved in the water.

1.2.2 Melt sugar in a pan on the stove.

1.2.3 Dilute sulphuric acid (H_2SO_4) by adding 2 ml H_2SO_4 to 100 ml of water.

1.2.4 Dissolve a teaspoon sodium chloride (NaCl) in a beaker of water.

1.2.5 Liquidise grapes.

1.2.6 Add yeast to grape juice for fermentation.

1.2.7 Mow the lawn.

1.2.8 Allow lawn clippings and other plant material to decompose.

QUESTION 2

2.1 An iron gate is exposed to oxygen in the air and rust (Fe_2O_3) forms.

2.1.1 Write the word equation for this reaction.

2.1.2 Is this a synthesis or a decomposition reaction?

2.2 Iron sulphide (FeS) forms when a mixture of iron filings and sulphur powder is heated over a Bunsen burner.

2.2.1 Write the word equation for this reaction.

2.2.2 Is this a synthesis or a decomposition reaction?

2.3 Aluminium carbonate is heated and aluminium oxide and carbon dioxide gas forms.

2.3.1 Write the chemical equation for this reaction.

2.3.2 Is this a synthesis or a decomposition reaction?

2.4 An electric current is passed through a copper chloride solution in an electrolytic cell. After a while chlorine gas and copper metal form at the two electrodes respectively.

2.4.1 Write the chemical equation for this reaction.

2.4.2 Is this a synthesis or a decomposition reaction?

2.5 Hydrogen peroxide (H_2O_2) is a useful household substance. It breaks down easily into oxygen and water when exposed to the atmosphere.

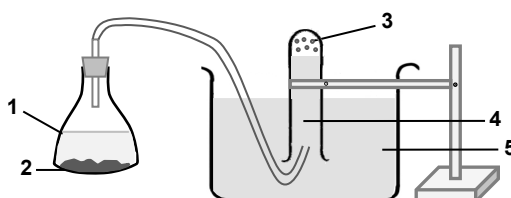
A 3% solution of H_2O_2 sold in pharmacies can be used as an antiseptic. In a more concentrated form, it can be used to bleach human hair.

2.5.1 Is the decomposition of hydrogen peroxide a physical or a chemical change? Give a reason for your answer.

2.5.2 Write down the balanced chemical reaction for the decomposition of hydrogen peroxide.

2.5.3 Will a 3% solution of hydrogen peroxide, left in an open container for a prolonged period of time, be effective as an antiseptic? Give a reason for your answer.

2.5.4 The apparatus used in a laboratory to perform a much faster decomposition of hydrogen peroxide is shown below. Identify numbers 1 to 5.

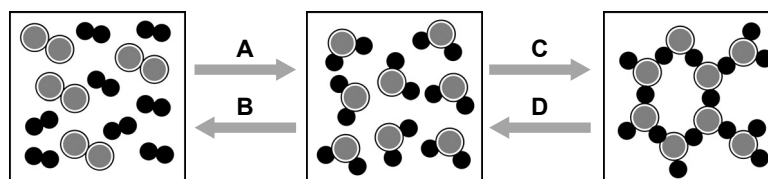


2.5.5 What is the function of substance 2 and what is this type of substance called?

2.5.6 After the reaction in QUESTION 2.5.4 is completed, the test tube is carefully sealed off and turned upright. A glowing splint is held at the mouth of the test tube. What may be observed?

QUESTION 3

The diagram below shows four processes/changes (A, B, C and D) that can take place under certain reaction conditions with regards to the substance involved.



KEY: O atom H atom

3.1 Determine whether each process, A to D, represents a chemical or physical change.

3.2 Is energy absorbed or released during process D?

3.3 Write a chemical equation for process C.

3.4 Compare the amount of energy involved in process B with that of process D. Explain this difference.

3.5 Write a word equation for process B.

3.6 How do the number of atoms and the number of molecules of the reactants compare to that of the products during the process/change A?

EXERCISE ANSWERS

QUESTION 1

1.1

Characteristics	Physical change	Chemical change
chemical nature of substance before and after the change	1.1.1 chemical nature of the substance remains the same	1.1.2 chemical nature of the substance changes
energy involved	1.1.3 little energy involved	1.1.4 much more energy involved
conservation of mass, number of atoms and molecules	1.1.5 mass, number of atoms and number of molecules are conserved	1.1.6 mass and number of atoms are conserved, but not necessarily the number of molecules
reversibility	1.1.7 changes are mostly temporary and can be reversed by physical methods	1.1.8 changes are more permanent and cannot be reversed (not by physical methods)

1.2.1 physical

distillation, a separation process to reverse a physical change

1.2.2 chemical

the sugar obtains a golden brown colour and a new chemical nature



1.2.3 chemical

H₂SO₄ ionises in water; chemical reaction takes place

1.2.4 physical

the salt dissociates and breaks up into its constituent ions

1.2.5 physical

1.2.6 chemical

fermentation will change the grape juice into alcohol, i.e. change its nature.

1.2.7 physical

1.2.8 chemical

QUESTION 2

2.1.1 iron metal + oxygen gas → iron(III) oxide

2.1.2 synthesis

2.2.1 iron(s) + sulphur(s) → iron(II) sulphide(s)

2.2.2 synthesis

2.3.1 $\text{Al}_2(\text{CO}_3)_3(\text{s}) \rightarrow \text{Al}_2\text{O}_3(\text{s}) + 3\text{CO}_2(\text{g})$

2.3.2 decomposition

REMEMBER

Al³⁺ : CO₃²⁻ bond in a 2:3 ratio (take the number of the charges and swap around to give the number of ions, i.e. criss-cross method)



2.4.1 $\text{CuCl}_2(\text{aq}) \rightarrow \text{Cu}(\text{s}) + \text{Cl}_2(\text{g})$

2.4.2 decomposition

2.5.1 chemical change; oxygen gas is formed, the nature of the substance therefore changes

2.5.2 $2\text{H}_2\text{O}_2(\text{l}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g})$

2.5.3 No, it decomposed into water and oxygen, which is not antiseptic.

2.5.4 It activates the reaction and increases the rate of the chemical reaction. A catalyst.

2.5.5 The glowing wooden splint catches alight; thus the gas collected in the test tube is oxygen.

QUESTION 3

3.1.1 A: chemical change

3.1.2 B: chemical change

3.1.3 C: physical change

3.1.4 D: physical change

3.2 absorbed

3.3 $\text{H}_2\text{O}(\ell) \rightarrow \text{H}_2\text{O}(\text{s}) + \text{energy}$

3.4 Much more energy is absorbed during process B (a chemical decomposition reaction) than during process D (a physical phase change). Process B involves breaking and forming of chemical bonds, whereas process D only involves the overcoming of intermolecular forces.

3.5 water $\rightarrow$ hydrogen gas + oxygen gas

3.6 The number of atoms is conserved, but not the number of molecules. There are 24 reactant atoms and 24 product atoms, and there are 12 reactant molecules but only 8 product molecules for process A.