

CHEMICAL CHANGES & REACTIONS

SOLVED QUESTION

1. (a) Define physical change.
(b) State four characteristics of a physical change.
(c) Give four examples of physical changes.

Ans. (a) A change which alters some specific property of matter (its state, texture, magnetic or electrical conditions or colour), without any change in the composition of its molecules, is called physical change, provided it gets reversed, if the cause producing the change is removed.

(b) Characteristics of a physical change:

- (i) No new or different products are formed.
- (ii) The change is temporary and reversible.
- (iii) There is no gain or loss of energy.
- (iv) There is no change in the weight of the substance.

(c) Examples of physical changes:

- (i) Formation of dew.
- (ii) Evaporation of water.
- (iii) Crystallization of sugar from its saturated solution.
- (iv) Ringing of an electric bell.

2. (a) Define chemical change.
(b) State four characteristics of a chemical change.
(c) Give four examples of chemical changes.

Ans. (a) A change which alters the specific properties of a material by bringing about a change in its molecular composition, followed by a change in state, is called a chemical change.

(b) Characteristics of a chemical change:

- (1) A chemical change results in the formation of one or more new products.
- (2) The weight of the substance undergoing a chemical change, usually changes.
- (3) The chemical change is permanent and irreversible.
- (4) The chemical change is always accompanied with the liberation or absorption of energy.

(c) Examples of chemical changes:

- (i) Burning of wood or charcoal.
- (ii) Burning of candle.
- (iii) Decomposition of water into hydrogen and oxygen.
- (iv) Digestion of food

3. By giving two examples, state what do you understand by an endothermic change?

Ans. Endothermic change: When a chemical change takes place with the absorption of heat energy, the change is said to be endothermic.

Examples of endothermic changes:

(i) Decomposition of mercuric oxide to mercury and oxygen.

(ii) Decomposition of calcium carbonate to calcium oxide and carbon dioxide.

4. By giving two examples, state what do you understand by an exothermic change?

Ans. Exothermic change: When a chemical change takes place with the release of heat energy, the change is said to be exothermic.

Examples of exothermic changes:

(i) Sodium reacts with water to form sodium hydroxide and hydrogen with the release of heat energy.

(ii) Carbon (coke or coal), hydrocarbons (methane, butane), burn in air with the liberation of heat energy.

5. A person eats chocolate and digests it. In doing so there takes place a physical change and a chemical change. Identify the changes and give reasons for your answer.

Ans. Eating of chocolate, which involves chewing, such that it melts in the mouth is a physical change. During digestion of chocolate, the material in it ultimately breaks down in the cells to form carbon dioxide and water with the release of energy. Thus, digestion is a chemical change.

6. Give two examples in which a physical and a chemical change take place simultaneously.

Ans. Example 1. When zinc hydroxide is heated, it decomposes to form zinc oxide and steam. As new products are formed the change is a chemical change. However, zinc oxide formed is yellow when hot and white when cold, but no change in its chemical composition takes place, hence the change is a physical change.

Example 2. When crystals of potassium nitrate are heated, they melt and hence a physical change takes place. The molten potassium nitrate decomposes to form potassium nitrite and oxygen, and hence it is a chemical change.

7. How does dissolving of common salt in water differ from dissolving of sodium metal in water?

Ans. When common salt dissolves in water, no new products are formed, no energy is released or absorbed and the change can be reversed. Thus, dissolving of common salt in water involves a physical change. When sodium metal dissolves in water, it forms new products sodium hydroxide and hydrogen, with the release of heat energy and the change cannot be reversed. Thus, dissolving of sodium in water involves a chemical change.

8. Heat is produced when,

(i) Water is added to concentrated sulphuric acid.

(ii) Water is added to quicklime.

However, (i) is a physical change and (ii) is a chemical change. Explain.

Ans. In case of concentrated sulphuric acid, on addition of water heat is produced, but no new products are formed. Furthermore, the change can be reversed; therefore it is a physical change. In case of water and calcium oxide (quicklime), heat is produced but at the same time new product calcium hydroxide (slaked lime) is formed. As new chemical product is formed, therefore change is a chemical change.

9. When ammonium chloride is heated strongly, it decomposes to form ammonia gas and hydrochloric acid gas, but the change is regarded as physical. However, when ammonium nitrate is heated, it decomposes to form nitrous oxide gas and steam, but the change is regarded as a chemical change. Explain the above statements.

Ans. No doubt ammonium chloride decomposes to form ammonia gas and hydrochloric acid gas, but these gases very quickly recombine to form white fumes. As no new chemical products are formed, therefore, the change is regarded as a physical change.
However, when ammonium nitrate decomposes to form nitrous oxide and steam, they cannot be recombined to form ammonium nitrate. As new chemical products are formed and the change cannot be reversed, therefore it is a chemical change.

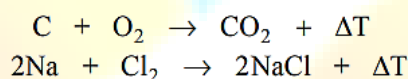
10. (a) What do you understand by the term “chemical reaction”?
(b) Name four main types of chemical reaction.

Ans. (a) Chemical reactions: When one or more substances (elements or compounds) undergo a chemical change, with the absorption or liberation of energy so as to form one or more new products, then the change so taking place is collectively called a chemical reaction.
(b) (i) Chemical combination (ii) Chemical decomposition (iii) Chemical displacement
(iv) Chemical double displacement

11. By giving two examples define exothermic reactions.

Ans. Exothermic reactions: The chemical reactions which proceed with the evolution of heat energy are called exothermic reactions.

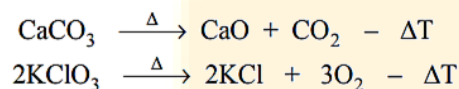
Examples:



12. By giving two examples define endothermic reactions.

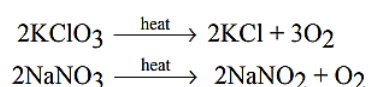
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Examples:

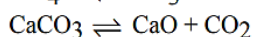
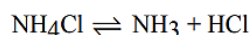


13. By giving two examples each bring out clearly the difference between thermal decomposition and thermal dissociation.

Ans. During thermal decomposition a chemical compound breaks into simpler compounds. The simpler compounds do not reunite to form the original compound on cooling.



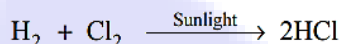
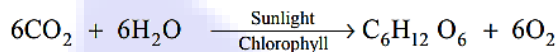
During thermal dissociation a chemical compound breaks into simpler compounds. The simpler compounds on cooling reunite to form the original compound.



14. By giving two examples define photochemical reaction.

Ans. Photo-chemical reactions: The chemical reactions which proceed with the absorption of light energy are called photo-chemical reactions.

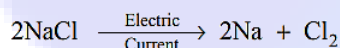
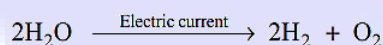
Examples:



15. By giving two examples define electrochemical reaction.

Ans. Electro-chemical reactions: The chemical reactions which proceed with the absorption of electric energy are called electrochemical reactions.

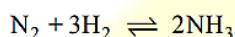
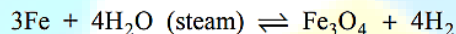
Examples:



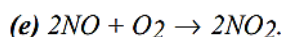
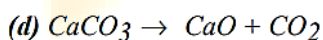
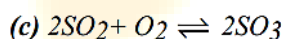
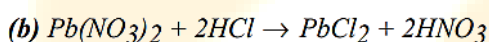
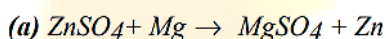
16. What do you understand by the term "Reversible reaction"? Give two examples.

Ans. Reversible reaction: A chemical reaction in which both the forward as well as backward reactions proceed at the same time and a stage is reached when the overall composition of reactants and products remains unaltered is called a reversible reaction.

Example:



17. Classify the following reactions as (1) chemical composition (2) chemical decomposition (3) chemical displacement (4) chemical double decomposition (5) reversible reaction.



Ans. (a) It is chemical displacement.

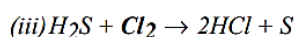
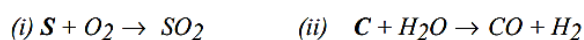
(b) It is chemical double decomposition.

(c) It is a reversible reaction.

(d) It is chemical decomposition.

(e) It is chemical combination.

18. In the equations given below state whether the substances printed in bold are oxidized or reduced. Support your answer with a reason.



Ans. (i) Sulphur is oxidized as it gains oxygen.

- (ii) Carbon is oxidized as it gains oxygen.
- (iii) Chlorine is reduced as it gains hydrogen.

19. Complete the following word equations by writing down the products in each case.

- (a) Red hot iron + water (steam).
- (b) Copper oxide + carbon monoxide.
- (c) Sodium hydroxide solution + aluminium + water.
- (d) Sodium hydroxide solution + iron (III) chloride solution.

Ans. (a) Red hot iron + water (steam) → Magnetic oxide of iron + hydrogen.
(b) Copper oxide + carbon monoxide → Copper + carbon dioxide.
(c) Sodium hydroxide solution + aluminium + water → Sodium aluminate + hydrogen.
(d) Sodium hydroxide solution + ferric chloride → Sodium chloride + ferric solution hydroxide.

20. State what will be observed and write a chemical equation when lead nitrate is heated in a test tube?

Ans. (1) The white colored crystals decrepitate with crackling noise to form a powdery mass.
(2) It gives off reddish brown nitrogen dioxide gas.
(3) It gives off oxygen gas, which relights a glowing wooden splinter.
(4) The residue is reddish brown when hot.
(5) The residue changes to yellow colour on cooling.
(6) The residue partly fuses with the glass test tube and stains it yellow.

