Physical and Chemical Changes

In text Questions

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1. Cut a piece of paper in four squares and each square into further square pieces. Lay the pieces so that the pieces acquire the shape of original paper. Is there a change in the property of the paper?

Ans. No, the property of the paper does not change. Although, we cannot join the piece back to make the original piece of paper.

2. Can we recover chalk by drying a paste of chalk dust and water?

Ans. Yes, if we make a paste of chalk dust and water, and allow it to dry, chalk will be recover. Chalk and chalk dust have same properties as chalk is broken into pieces, form chalk dust.

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3. What is photosynthesis? Is it a chemical reaction?

Ans. The process by which plants make their own food using carbon dioxide and water in the presence of chlorophyll and sunlight, is known as photosynthesis.

Chlorophyll is a green pigment present in the leaves of plants. The pigment capture the sun's energy which is used to prepare food from' carbon dioxide and water.

$$6CO_2 + 6H_2O \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} \underset{\text{Glucose}}{C_6H_{12}O_6} + 6O_2$$

It is a chemical process.

NCERT Exercises (Questions-Solutions)

Exercises

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1. Classify the changes involved in the following processes as physical or chemical changes.
(a) Photosynthesis
(b) Dissolving sugar in water
(c) Burning of coal
(d) Melting of wax
(e) Beating aluminium to make aluminium foil
(f) Digestion of food

Ans. (a) Photosynthesis — Chemical change
(b) Dissolving sugar in water — Physical change
(c) Burning of coal - Chemical change
(d) Melting of wax - Physical change
(e) Beating aluminium to make aluminium foil - Physical change
(f) Digestion of food - Chemical change

2. State whether the following statements are true or false. In case a statement is false, write the correct statement in your notebook.
(a) Cutting a log of wood into pieces is a chemical change. (True/False)
(b) Formation of manure from leaves is a physical change. (True/False)
(c) Iron pipes coated with zinc do not get rusted easily. (True/False)
(d) Iron and rust are the same substances. (True/False)
(e) Condensation of steam is not a chemical change. (True/False)

Ans. (a) False, cutting a log of wood into pieces is a physical change.
(b) False, formation of manure from leaves is a chemical change.
(c) True
(d) False, iron and rust are two different chemical substances.
(e) True

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3. Fill in the blanks in the following statements.
(a) When carbon dioxide is passed through lime water, it turns milky due to the formation of .....
(b) The chemical name of baking soda is ..... .
(c) Two methods by which rusting of iron can be prevented are ..... and ..... .
(d) Changes in which only ..... properties of a substance change are called physical changes.
(e) Changes in which new substances are formed are called.

Ans. (a) calcium carbonate $\underset{\text{Lime water}}{Ca(OH)_2} + \underset{\text{Carbon dioxide}}{CO_2} \longrightarrow \underset{\text{Calcium carbonate}}{CaCO_3} + \underset{\text{Water}}{H_2O}$

(b) sodium hydrogen carbonate
(c) galvanization, painting
(d) physical
(e) chemical changes

4. When baking soda is mixed with lemon juice, bubbles are formed with the evolution of a gas. What type of change is it? Explain.

Ans. When baking soda (sodium bicarbonate) is mixed with lemon juice (citric acid), a chemical change occurs. In this reaction, new substances like carbon dioxide is formed and heat is evolved. This change is irreversible. It is a chemical change.

$$\text{Sodium bicarbonate}\left(NaHCO_3\right) + \text{citric acid}$$
$$\downarrow$$
$$\text{Sodium citrate} + \text{carbon dioxide} + \text{water} + \text{heat} \uparrow$$

5. When a candle burns, both physical and chemical changes take place. Identify these changes. Give another example of familiar process in which both the chemical and physical changes take place.

Ans. **Physical changes in burning candle** On heating, candle's wax melts, it is a physical change. Since, it again turns into solid wax on cooling. The change is reversible.

Chemical changes in burning candle The wax near to flame burns and gives new substances like carbon dioxide, carbon soot, water vapours, heat and light.

Cooking of food, boiling of eggs are examples of both physical and chemical changes. In both cases, the physical appearance of the substances change and new substances are formed.

6. How would you show that setting of curd is a chemical change?

Ans. Setting of curd is a chemical change because we cannot get the original substance (milk) back. The new substance, i.e. curd is different from the milk in taste, smell and chemical properties.

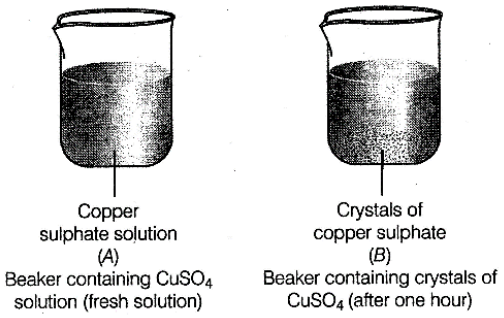
7. Explain why burning of wood and cutting it into small pieces are considered as two different types of changes.

Ans. Burning of wood is a chemical change while cutting of wood is a physical change because during burning, new substances are formed.

After burning, we cannot get original substance, (i.e. wood) back. Cutting of wood into small pieces is a physical change because no new substance is formed.

8. Describe how crystals of copper sulphate are prepared.

Ans. Crystals of copper sulphate are prepared in the following manner:
(i) Take a cup full of water in a beaker.
(ii) Add a few drops of dilute sulphuric acid.
[Caution never add water to the acid as the acid may splash on you].
(iii) Heat the water.
(iv) When it starts boiling, add copper sulphate powder slowly with constant stirring.
(v) Continue adding copper sulphate powder till no more powder can be dissolved.
(vi) Filter the solution.
(vii) Allow it to cool.
(viii) Do not disturb the solution, when it is cooling.
(ix) Look at the solution after sometime and wait till it changes into crystals.



9. Explain how painting of an iron gate prevents it from rusting.

Ans. Rusting of iron is due to the exposure of iron to the atmosphere for sometime. To prevent rusting of iron gate, we paint it. Painting prevents the iron gate to come in direct contact of atmosphere, water or both. Thus, a coat of paint cuts the contact between iron and atmosphere and it prevents rusting of iron.

Also we know that

$$\text{Iron}(Fe) + \text{Oxygen}(O_2) + \text{Water}(H_2O) \longrightarrow \text{Rust}(\text{ironoxide}, Fe_2O_3)$$

Thus, it is necessary to cut the oxygen contact with iron to prevent rusting.

10. Explain why rusting of iron objects is faster in coastal areas than in deserts.

Ans. We know that for rusting, the presence of both oxygen and water (water vapour) is essential.

Thus, in coastal areas, the air contains high moisture which means more humid environment and rusting becomes faster.

Whereas in deserts, moisture in air is less, hence rusting of iron is very slow there.

11. The gas we use in the kitchen is called Liquefied Petroleum Gas (LPG). In the cylinder, it exists as liquid. When it comes out of the cylinder, it becomes a gas (change A). Then, it burns (change B).
The following statements pertain to these changes. Choose the correct one.
(a) Process A is a chemical change
(b) Process B is a chemical change
(c) Both processes A and B are chemical changes
(d) None of the above processes is a chemical change

Ans. (b) Process B is a chemical change. Process A is a physical change. The LPG in cylinder is in liquid form because of high pressure. When it comes from cylinder, it turns into gas. It is a physical change. Process B is a chemical change because burning of gas is a chemical change.

12. Anaerobic bacteria digest animal waste and produce biogas (change A). The biogas is then burnt as fuel (change B). The following statements pertain to these changes. Choose the correct one.
(a) Process A is a chemical change
(b) Process B is a chemical change
(c) Both processes A and B are chemical changes
(d) None of the above processes is a chemical change

Ans. (c) Both processes A and B are chemical changes.

Bacteria acts on waste and converts it to biogas (change A). Hence, it is a chemical change during biogas production (change B), it works as fuel and produces CO_2 and heat. Hence, A and B both are chemical changes.

NCERT Exemplar (Problems-Solutions)

Multiple Choice Questions

1. Which one of the following is a physical change?
(a) Rusting of iron
(b) Combustion of magnesium ribbon
(c) Burning of candle
(d) Melting of wax

Ans. (d) Melting of wax is a physical change.

2. Which one of the following is a chemical change?
(a) Twinkling of stars
(b) Cooking of vegetables
(c) Cutting of fruits
(d) Boiling of water

Ans. (b) Cooking of vegetables is a chemical change.

3. A chemical change may involve
(a) change in colour only
(b) change in temperature only
(c) evolution of gas only
(d) All of the above

Ans. (d) Change in colour, change in temperature and evolution of gas all are chemical changes.

4. A man painted his main gate made up of iron, to
(i) prevent it from rusting
(ii) protect it from the sun
(iii) make it look beautiful
(iv) make it dust free
Which of the above statements is/are correct?
(a) (i) and (ii)
(b) (ii) and (iii)
(c) only (ii)
(d) (i) and (iii)

Ans. (d) To prevent rusting of iron gate, we do paint on it. Painting makes it beautiful.

5. Iron pillar near the Qutub Minar in Delhi is famous for the following facts. Which of these facts is responsible for its long stability?
(a) It is more than 7 m high
(b) It weighs about 6000 kg
(c) It was built more than 1600 years ago
(d) It has not rusted after such a long period

Ans. (d) The iron pillar located in Delhi in Qutub complex is famous for the rust-resistant composition of the metals used in its construction. It has not rusted after such a long period.

6. Galvanization is a process used to prevent the rusting of which of the following?
(a) Iron
(b) Zinc
(c) Aluminium
(d) Copper

Ans. (a) Galvanization is the process of depositing a layer of zinc on iron.

7. Paheli's mother made a concentrated sugar syrup by dissolving sugar in hot water. On cooling, crystals of sugar got separated.
This indicates a
(a) physical change that can be reversed
(b) chemical change that can be reversed
(c) physical change that cannot be reversed
(d) chemical change that cannot be reversed

Ans. (a) Dissolution of sugar in hot water is a physical change that can be reversed.

8. Which of the following statements is incorrect for a chemical reaction?
(a) Heat may be given out but never absorbed
(b) Sound may be produced
(c) A colour change may take place
(d) A gas may be evolved

Ans. (a) Actually during the chemical reaction, heat may be given out or can be absorbed.

Very Short Answer Type Questions

9. State whether the following statements are true or false.
(i) When a candle burns, both physical and chemical changes take place.
(ii) Anaerobic bacteria digest animal wastes and produce biogas.
(iii) Ships suffer a lot of damage though they are painted.
(iv) Stretching of rubber band is not a physical change.

Ans. (i)True (ii) True (iii) True (iv) False

10. Melting of wax is a change where a solid changes to liquid state. Give one more such change which you observe in your surroundings.

Ans. Melting of ice is also a change where solid changes into liquid state.

11. What kind of change is shown by tearing of paper?

Ans. Tearing of paper is a physical change although it cannot be reversed.

Short Answer Type Questions

12. Match the items of Column I with the items of Column II

	Column I		Column II
(a)	Large crystals	(i)	Turn lime water milky

(b)	Depositing a layer of zinc on iron	(ii)	Physical change
(c)	Souring dioxide	(iii)	Rust
(d)	Carbon dioxide	(iv)	Sugar candy (mishri)
(e)	Iron oxide	(v)	Chemical change
(f)	Dissolving common salt in water	(vi)	Galvanization

Ans. (a) - (iv), (b) - (vi), (c) - (v), (d) - (i), (e) - (iii), (f) - (ii)

13. Fill in the blanks in the following statements using the words given in the box.
rusted, colourful, substance, chemical, physical, reversible, iron oxide, object
(a) Making sugar solution is a ..... change.
(b) A physical change is generally ..... .
(c) Grinding of wheat grain changes its size. It is a ..... change.
(d) Iron benches kept in lawns and gardens get..... . It is a..... . change because a new ..... is formed.

Ans. (a) physical (b) reversible (c) physical (d) rusted, chemical, substance

14. Classify the following processes into physical or chemical changes.
(a) Beating of aluminium metal to make aluminium foil
(b) Digestion of food
(c) Cutting of a log of wood into pieces
(d) Burning of crackers

Ans. Physical changes are
(a) Beating of aluminium metal to make aluminium foil.
(c) Cutting of a log of wood into pieces.
Chemical changes are
(b) Digestion of food.
(d) Burning of crackers.

15. Write word equations for two chemical reactions with the help of materials given in the box.
Air, copper sulphate, iron, vinegar, iron oxide, carbon, dioxide, iron sulphate, copper, lime water, water

Ans. (i) $Iron + air + water \longrightarrow iron\ oxide$

(ii) $Copper\ sulphate + iron \longrightarrow iron\ sulphate + copper$

16. Explain the following.
(a) Lime water turns milky on passing carbon dioxide gas into it.
(b) Bubbles are produced when acetic acid is added to a solution of sodium hydrogen carbonate.

Ans. (a) White coloured insoluble calcium carbonate is formed.
(b) Carbon dioxide is evolved due to the chemical reaction between acetic acid and sodium hydrogen carbonate.

Long Answer Type Questions

17. Give two examples for each of the following cases:
(a) Physical changes which are reversible.
(b) Physical changes which are not reversible.

Chemical changes

Ans. (a) (1) Folding of paper (2) Melting of ice
(b) (1) Tearing of paper (2) Breaking of glass
(c) (1) Reaction between vinegar and baking soda.
(2) Burning of a matchstick.
There are many other examples in each case which can be given.

18. Give an example of a chemical reaction for each of the following situations:
(a) A change in colour is observed.
(b) A gas is evolved.
(c) Sound is produced.

Ans. (a) Reaction between copper sulphate solution and iron metal.
(b) Reaction between baking soda and vinegar (carbon dioxide is evolved).
(c) Burning of crackers.

19. If you leave a piece of iron in the open for a few days it acquires a film of brownish substance, called rust.
(a) Do you think rust is different from iron?
(b) Can you change rust back into iron by some simple method?
(c) Do you think formation of rust from iron is a chemical change?
(d) Give two other examples of a similar type of change.

Ans. (a) Yes, rust is quite different from iron.
(b) No
(c) Yes, it is a chemical change.
(d) (i) Setting of curd from milk.
(ii) Burning of magnesium ribbon to form magnesium oxide.

20. A student took a solution of copper sulphate in a beaker and put a clean iron nail into it and left it for about an hour.
(a) What changes do you expect?
(b) Are these changes chemical in nature?
(c) Write a word equation for the chemical change, if any.

Ans. (a) (i) Colour of the solution in the beaker changes from blue to green.
(ii) A brown coloured deposit is found on the surface of the iron nail.
(b) The changes are chemical in nature as new substances, iron sulphate (green) and copper (brown) are formed.
(c) $\underset{(\text{Blue})}{Copper\ sulphate} + iron \longrightarrow \underset{(Green)}{iron\ sulphate} + \underset{(Brown)}{copper}$