CHAPTER 5

# Changes Around Us: Physical and Chemical

CLASS 7TH

NCERT SOLUTIONS - SCIENCE

P1 P2



**1. Which statements are characteristics of a physical change?**

**Statements**

- (i) The state of the substance may or may not change.
- (ii) A substance with different properties is formed.
- (iii) No new substance is formed.
- (iv) The substance undergoes a chemical reaction.

(a) (i) and (ii)
(b) (ii) and (iii)
(c) (i) and (iii)
(d) (iii) and (iv)

**ANSWER**

(c) (i) and (iii)

**Explanation:**

- (i) True → In physical changes, sometimes the state changes (ice → water), and sometimes it doesn't (cutting paper).
- (ii) False → Formation of a substance with different properties indicates a chemical change.
- (iii) True → Physical changes do not create new substances (only form/size/state may change).
- (iv) False → Chemical reaction happens in chemical changes, not physical ones.

**2. Predict which of the following changes can be reversed and which cannot be reversed. If you are not sure, you may write that down. Why are you not sure about these?**

**(i) Stitching cloth to a shirt**
**(ii) Twisting of straight string**
**(iii) Making idli from a batter**
**(iv) Dissolving sugar in water**
**(v) Drawing water from a well**
**(vi) Ripening of fruits**
**(vii) Boiling water in an open pan**
**(viii) Rolling up a mat**
**(ix) Grinding wheat grains to flour**
**(x) Forming of soil from rocks.**

**ANSWER**

| No. | Change | Reversible? | Reason / Notes |
|---|---|---|---|
| (i) | Stitching cloth to a shirt | Irreversible | Once stitched and cut to shape, you can't get back the original cloth pieces exactly. |
| (ii) | Twisting a straight string | Usually reversible (Not sure if over-twisted) | You can untwist it if fibres aren't damaged/ knotted. If over-twisted (plastic deformation/ broken fibres), it becomes irreversible. |
| (iii) | Making idli from batter | Irreversible | Heating causes protein denaturation, starch gelatinization, gas bubbles set the structure-new properties form (chemical/thermo-set changes). |
| (iv) | Dissolving sugar in water | Reversible | Evaporate water to recrystallize sugar (physical change). |
| (v) | Drawing water from a well | Reversible | You can pour the same water back; no new substance formed (physical relocation). |
| (vi) | Ripening of fruits | Irreversible | Complex biochemical reactions (enzymes, pigments, aroma compounds) can't be undone. |
| (vii) | Boiling water in an open pan | Reversible in principle; not reversed in an open pan | Change of state (liquid → gas) is reversible if you condense the steam. In an open pan the vapour escapes, so you won't recover it there. |
| (viii) | Rolling up a mat | Reversible | You can unroll it back to original form (physical change). |
| (ix) | Grinding wheat grains to flour | Irreversible | Size is permanently reduced; you can't reconstruct whole grains. |
| (x) | Forming soil from rocks | Irreversible (practically) | Weathering is a very slow, one-way process on human timescales; rock can reform only via long geological cycles (not practically reversible). |



**3. State True or False. If False, give the correct statement.**

**(i) Melting of wax is necessary for burning a candle.**

**ANSWER:**

True.

**Explanation:** When a candle burns, heat from the flame melts the solid wax near the wick. Liquid wax is drawn up the wick by capillary action, vaporises in the flame and the vapour burns. Without melting (and subsequent vapourisation) the wax cannot sustain the flame.

(ii) Collecting water vapour by condensing involves a chemical change.

**ANSWER:**

False.

**Correct statement:** Collecting water vapour by condensing is a physical change.

**Explanation:** Condensation is a change of state (gas → liquid). No new substance is formed and the process is reversible, so it is physical, not chemical.

**(iii) The process of converting leaves into compost is a chemical change.**

**ANSWER**

True.

**Explanation:** Decomposition of leaves by microorganisms leads to formation of new substances (humus, simpler organic compounds, minerals). Chemical bonds are broken and new ones formed → a chemical change.

**(iv) Mixing baking soda with lemon juice is a chemical change.**

**ANSWER**

True.

**Explanation:** Baking soda (sodium hydrogen carbonate) reacts with lemon juice (citric/acid) to produce carbon dioxide gas (bubbling), water and new salts. New substances are formed, so it is a chemical change.



**4. Fill in the blanks**

(i) Nalini observed that the handle of her cycle has got brown deposits. The brown deposits are due to _____ and this is a _____ change.

(ii) Folding a handkerchief is a _____ change and can be _____

(iii) A chemical process in which a substance reacts with oxygen with evolution of heat is called _____, and this is a _____ change.

(iv) Magnesium, when burnt in air, produces a substance called _____. The substance formed is _____ in nature. Burning of magnesium is a _____ change.

(i) rusting and chemical .

**Reason:** Rust (iron oxide) forms when iron reacts with oxygen and water — a new substance is produced.

(ii) physical and reversed.

**Reason:** Only shape changes; no new substance is formed.

(iii) combustion, and chemical.

**Example:** Burning wood produces ash (new substances) and releases heat and light.

(iv) magnesium oxide, basic andchemical.

**Reaction:** $2Mg + O_2 \rightarrow 2MgO$ (white powder; MgO forms alkaline solution with water).

**5. Are the changes of water → ice and water → steam physical or chemical? Explain.**

**ANSWER**

Both are physical changes.

**Explanation:**

- In freezing (water → ice) and boiling/evaporation (water → steam) only the state of water changes (liquid ↔ solid ↔ gas).
- No new substance is formed ($H_2O$ remains $H_2O$).
- These changes are reversible by heating or cooling. Therefore they are physical, not chemical.

**6. Is curdling of milk a physical or chemical change? Justify your answer.**

**ANSWER**

Chemical change.

**Explanation:**

- Curdling (conversion of milk into curd) involves enzymatic/acid action on milk proteins (casein). The protein molecules coagulate and form a different substance (curd) with altered properties (texture, taste, pH).
- New chemical bonds/formations occur and the process is not easily reversible to obtain original milk.
- Therefore curdling is a chemical change.

**7. Natural factors (wind, rain, etc.) help form soil from rocks. Is this change physical or chemical and why?**

**ANSWER**

It involves both physical and chemical changes.

**Explanation:**

- Physical weathering (mechanical): wind, water flow, temperature changes, frost action, root growth break large rocks into smaller pieces (sediments). This is physical because the rock's composition may remain the same though its size/shape changes.
- Chemical weathering: water and dissolved chemicals (carbonic acid from $CO_2$ + water, oxygen) react with minerals in rocks → forming new chemical substances (e.g., iron oxides, clay minerals). This is chemical weathering.
- Over long time, both processes together convert rock into soil (a mix of broken rock, organic matter and altered minerals).

**8. Story: "Eco-friendly Prithvi" - tick options & give a title**

**Read the following story titled 'Eco-friendly Prithvi', and tick the most appropriate option(s) given in the brackets. Provide a suitable title of your choice for the story.**

**Prithvi is preparing a meal in the kitchen. He chops vegetables, peels potatoes, and cuts fruits (physical changes/chemical changes). He collects the seeds, fruits, and vegetable peels into a clay pot (physical change/chemical change). The fruits, vegetable peels, and other materials begin to decompose due to the action of bacteria and fungi, forming compost (physical change/chemical change). He decides to plant seeds in the compost and water them regularly. After a few days, he notices that the seeds begin to germinate and small plants start to grow, eventually blooming into colourful flowers (physical change/chemical change). His efforts are appreciated by all his family members.**

## ANSWER

**Story recap (choices in brackets):**

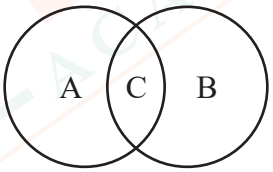
- Prithvi chops vegetables, peels potatoes, cuts fruits → (physical changes/chemical changes).
  - **Reason:** only the size/shape changes; no new substance is formed.
- He collects seeds, fruits, peels into a clay pot → (physical change/chemical change).
  - **Reason:** gathering/placing material does not change their chemical nature.
- The collected material decomposes due to bacteria/fungi → (physical change/chemical change) (forms compost).
  - **Reason:** microorganisms break down complex organic matter into new substances (humus, simpler compounds); chemical composition changes.
- He plants seeds in compost; seeds germinate and plants grow → (physical change/chemical change).
  - **Reason:** Germination is a biological process involving many chemical reactions (energy conversion, synthesis of new biomolecules, cell division). If forced to choose between only "physical" or "chemical", mark chemical (because new tissues and substances are produced).

**Suggested suitable title for the story:**

"Home Composting: From Kitchen Waste to Healthy Plants"

(or) "Eco-friendly Prithvi: Composting for a Greener Home"

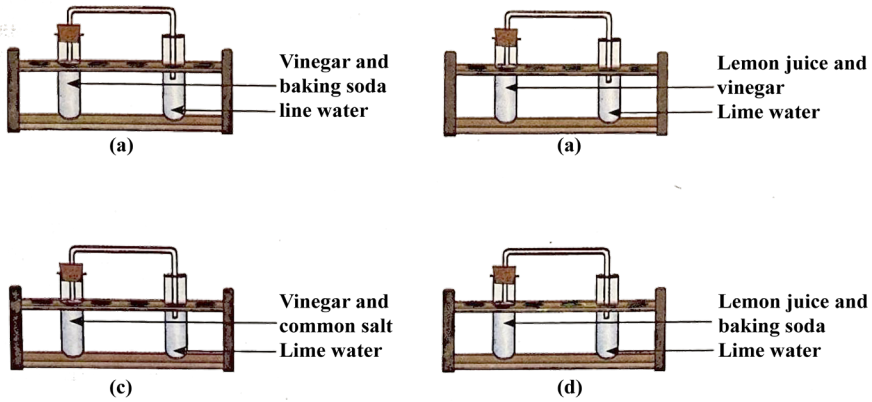
**9. Some changes are given here. Write physical changes in the area marked ' A ' and chemical changes in the area marked ' B '. Enter the changes which are both physical and chemical in the area marked 'C'. Process of burning a candle; Tearing of paper; Rusting; Curdling of milk; Ripening of fruits; Melting of ice; Folding of clothes; Burning of magnesium and Mixing baking soda with vinegar.**




## ANSWER

- **A (Physical):** Tearing of paper, Melting of ice, Folding of clothes
- **B (Chemical):** Rusting, Curdling of milk, Ripening of fruits, Burning of magnesium, Mixing baking soda with vinegar
- **C (Both):** Burning of candle

**10. The experiments shown in Fig. 5.11a, b, c, and d were performed. Find out in which case(s) did lime water turn milky and why?**




## ANSWER

(a) Vinegar + Baking soda → $CO_2$ released

- Vinegar (acetic acid) reacts with baking soda (sodium bicarbonate).
- **Reaction:** $CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + H_2O + CO_2\uparrow$
- $CO_2$ passes into lime water → turns milky.

(b) Lemon juice + Vinegar → No $CO_2$

- Both are acids. Mixing two acids does not release $CO_2$.
- Lime water → no change.

(c) Vinegar + Common salt → No $CO_2$

- Mixing vinegar (acid) with common salt (NaCl) does not produce $CO_2$ under normal conditions.
- Lime water → no change.

(d) Lemon juice + Baking soda → $CO_2$ released

- Lemon juice (citric acid) reacts with baking soda (sodium bicarbonate).
- **Reaction:** $H^+ + NaHCO_3 \rightarrow Na^+ + H_2O + CO_2\uparrow$
- $CO_2$ passes into lime water → turns milky.

**Final Answer:**

- Lime water turns milky in (a) Vinegar + Baking soda and (d) Lemon juice + Baking soda.
- **Reason:** These reactions release carbon dioxide gas, which reacts with lime water to form calcium carbonate (white precipitate).