Class 10 Science · Chapter 1: Chemical Reactions and Equations

Answer key and marking scheme · 20 marks · about 40 minutes · based on NCERT

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1. Which of these changes forms a new substance? [1]

(a) A copper wire is bent into a ring.
(b) Water boils in a kettle.
(c) Slaked lime brushed on a wall turns into a hard, shiny layer over three days.
(d) A glass bottle shatters on the floor.

Answer: (c) Bending, boiling and shattering change only shape or state. On the wall, calcium hydroxide reacts with carbon dioxide of the air to form calcium carbonate, a new substance.

2. Asked to balance $Al + O_2 \rightarrow Al_2O_3$, a student writes $2Al + O_2 \rightarrow Al_2O_2$. The mistake is that the student has [1]

(a) changed the formula of the product instead of changing coefficients
(b) left out the state symbols
(c) used coefficients larger than needed
(d) written oxygen as a molecule

Answer: (a) A formula is fixed; only the coefficients in front may be changed. Al_2O_2 is not aluminium oxide. The correct equation is $4Al + 3O_2 \rightarrow 2Al_2O_3$.

3. A week after a room is whitewashed, a flake of the shiny wall surface is dropped into dilute hydrochloric acid. It fizzes, and the gas turns lime water milky. The flake is mainly [1]

(a) calcium carbonate
(b) calcium hydroxide
(c) calcium oxide
(d) calcium chloride

Answer: (a) Calcium hydroxide on the wall slowly takes up carbon dioxide from the air to form calcium carbonate, the shiny layer. A carbonate with dilute acid gives carbon dioxide, which turns lime water milky.

4. At a building site in Jaipur, a mason pours water on lumps of quicklime in an iron drum. The water hisses and the drum becomes too hot to touch. The product and the nature of the reaction are [1]

(a) calcium hydroxide; exothermic
(b) calcium carbonate; exothermic
(c) calcium hydroxide; endothermic
(d) calcium oxide; endothermic

Answer: (a) Quicklime (CaO) and water form slaked lime, calcium hydroxide, $Ca(OH)_2$, with a large release of heat, so the reaction is exothermic.

5. Which of the following is a word-equation? [1]

(a) $Zn + CuCl_2 \rightarrow ZnCl_2 + Cu$
(b) Zinc + Copper chloride → Zinc chloride + Copper
(c) $Zn(s) + CuCl_2(aq) \rightarrow ZnCl_2(aq) + Cu(s)$
(d) $Zn + Cu \rightarrow ZnCu$

Answer: (b) A word-equation names the reactants and products; the others use chemical formulae, and (d) is not a real reaction at all.

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6. Vegetable peels dumped in a school compost pit make the heap feel warm after a few days. (a) Name the type of reaction, in terms of energy, going on in the heap. (b) Name one reaction of the same type that takes place in your own body. [2]

(a) Heat is released, so the decomposition of vegetable matter into compost is an exothermic reaction. (b) Respiration: glucose combines with oxygen in the cells to give carbon dioxide, water and energy.

- exothermic, because heat is released (1)
- respiration as the exothermic reaction in the body (1)

7. Potassium hydroxide solution is added to dilute nitric acid until the acid is just used up. Write the balanced equation and name the type of reaction. [2]

$KOH + HNO_3 \rightarrow KNO_3 + H_2O$. An acid and a base give a salt and water: a neutralisation reaction, which is a double displacement reaction.

- balanced equation giving KNO_3 and H_2O (1)
- neutralisation (a double displacement reaction) (1)

8. A potted plant kept in a dark cupboard for a week makes no glucose, though it has water and carbon dioxide. (a) Use this to explain why photosynthesis is an endothermic reaction. (b) Write the equation for photosynthesis, with its conditions over the arrow. [2]

(a) The plant needs energy from sunlight to turn carbon dioxide and water into glucose; without light the reaction cannot go, so it absorbs energy: endothermic. (b) $6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$, with 'sunlight, chlorophyll' over the arrow ($6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ also accepted).

- energy from sunlight is absorbed, so endothermic (1)
- correct equation with sunlight and chlorophyll over the arrow (1)

9. Meera pours blue copper sulphate solution into a zinc tray by mistake. Next day the solution is colourless and a brown powder lines the tray. (a) Name the brown powder and the substance now dissolved in the solution, and say why they formed. (b) Write the balanced equation. (c) Would the solution have changed if it had been kept in a copper vessel? Give a reason. [3]

(a) The brown powder is copper and the solution now holds zinc sulphate. Zinc is more reactive than copper, so it displaces copper from copper sulphate. (b) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$ (Zn 1, Cu 1, S 1, O 4 on each side). (c) No. A displacement needs a metal more reactive than the one in the salt; copper cannot displace copper.

- copper and zinc sulphate, zinc being more reactive than copper (1)
- $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$ (1)
- no change in copper, with the reason (1)

10. Three new iron nails are kept on a wet cloth in a kitchen for a week: nail X bare, nail Y coated with oil, nail Z painted. (a) Which nail is attacked, and what does its surface look like? (b) Name the process. (c) Nail X was in contact with two substances that the coatings kept away from nails Y and Z. Name the two. [3]

(a) Nail X, which gets coated with a reddish brown powder. (b) Corrosion of iron, called rusting. (c) Air (its oxygen) and moisture; the oil and paint cut both off from the iron surface.

- X, with a reddish brown coating (1)
- corrosion (rusting) (1)
- air and moisture, both named (1)

11. Test tube P holds zinc granules and test tube Q holds marble chips. Dilute hydrochloric acid is added to both, and gas bubbles out of each. (a) Name the gas from each tube. (b) Give one test that tells the two gases apart. (c) Write the balanced equation for the reaction in tube Q. [3]

(a) P gives hydrogen; Q gives carbon dioxide. (b) A lit splint brought near the gas from P goes out with a pop (hydrogen); the gas from Q turns lime water milky (carbon dioxide). (c) $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$.

- hydrogen from P and carbon dioxide from Q (1)
- pop with a lit splint, or lime water turning milky (1)
- $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$ (1)

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