CBSE CLASS X

Science (086)

ANSWER KEY

AI-generated question paper

Code: 6BPP8E	Questions: 16	Maximum Marks: 30	Generated: 2026-06-25 12:04

SELECTIONS USED

Subject	Science
Lessons	1 Chemical Reactions and Equations
Level of understanding	Initial understanding
Question selection	Curated chapter coverage (~3 questions per section)
Model	claude-sonnet-4-6

Composition — Difficulty: 7 straightforward · 9 medium | Types: 10 Short · 5 Very short · 1 MCQ

Q1. straightforward · initial-understanding · § Chapter Introduction **[1]**

Which of the following observations does NOT indicate that a chemical reaction has taken place?
(A) Change in colour
(B) Change in temperature
(C) Change in shape
(D) Evolution of a gas

A Change in colour
B Change in temperature
C Change in shape
D Evolution of a gas

◆ **Chemical Reactions and Equations**

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Model Answer

(C) Change in shape

According to the textbook, the indicators of a chemical reaction are change in state, change in colour, evolution of a gas, and change in temperature — not change in shape.

Source: Chapter 1, Chemical Reactions and Equations (Activity 1.1–1.3 observations)

Explanation

The textbook explicitly lists four observations that indicate a chemical reaction: change in **state**, change in **colour**, **evolution of a gas**, and change in **temperature**. "Change in shape" is a physical change (e.g., cutting, bending) and does NOT indicate a new substance has formed. Examiners expect students to recall this list precisely — note it is "change in state," not "change in shape."

Q2. straightforward | initial-understanding | § Chapter Introduction **[1]**

When a magnesium ribbon is burned in air, it produces a white powder. What is this powder, and what two substances reacted to form it?

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Model Answer

The white powder is **magnesium oxide (MgO)**. It is formed by the reaction of **magnesium** and **oxygen**.

Source: Chemical Reactions and Equations, Section 1.1; Metals and Non-metals, Section 3.2.1

Explanation

The examiner expects the name/formula of the product and both reactants named clearly. The word equation is: Magnesium + Oxygen → Magnesium oxide. Mentioning "air" in the question is acceptable since oxygen is the reactive component in air; the product remains magnesium oxide.

Q3. straightforward | initial-understanding | § 1.1 CHEMICAL EQUATIONS **[2]**

Why is it necessary to balance a chemical equation?

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Model Answer

A chemical equation must be balanced to satisfy the **Law of Conservation of Mass**, which states that mass can neither be created nor destroyed in a chemical reaction. This means the number of atoms of each element must be equal on both the reactant side (LHS) and the product side (RHS) of the equation.

Source: Chapter 1, Section 1.1.2 Balanced Chemical Equations

Explanation

- The examiner expects direct reference to the **Law of Conservation of Mass** — always name it.
- The second point (equal atoms on both sides) is the practical consequence and earns the second mark.
- Do not confuse *why* we balance (the law) with *how* we balance (hit-and-trial method) — the question asks only for the reason.

Q4. straightforward | initial-understanding | § 1.1.1 Writing a Chemical Equation **[1]**

What is the difference between a skeletal chemical equation and a balanced chemical equation?

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Model Answer

A **skeletal chemical equation** has unequal numbers of atoms on both sides, while a **balanced chemical equation** has equal numbers of atoms of each element on both sides, satisfying the law of conservation of mass.

Explanation

The examiner looks for the key distinction: skeletal = unbalanced (formulae written but atoms not equalised); balanced = atoms of each element are equal on LHS and RHS. Mentioning the law of conservation of mass adds accuracy and is rewarded.

Q5. straightforward | initial-understanding | § 1.1.2 Balanced Chemical Equations **[1]**

What law of nature makes it necessary to balance a chemical equation?

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Model Answer

The **Law of Conservation of Mass** makes it necessary to balance a chemical equation, as mass can neither be created nor destroyed in a chemical reaction.

Source: Chapter 1, Section 1.1.2 Balanced Chemical Equations

Explanation

Examiners expect the exact law name and a brief reason. "Mass is neither created nor destroyed" is the key phrase from the textbook. Do not just write the law name without the reason — that risks losing the mark.

Q6. medium | initial-understanding | § 1.1.2 Balanced Chemical Equations **[2]**

A student writes the equation: Mg + O_2 → MgO. Is this a complete and balanced chemical equation? State two ways in which it is incomplete or incorrect.

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Model Answer

No, it is **not** a complete and balanced chemical equation. It is only a **skeletal chemical equation**.

Two ways it is incomplete/incorrect:

1. **Unbalanced:** LHS has 2 oxygen atoms (O_2) but RHS has only 1 (MgO), violating the law of conservation of mass.
2. **Physical states missing:** The symbols (s), (g), etc., for reactants and products are not mentioned, making the equation incomplete.

Source: Chapter 1, Sections 1.1.1 and 1.1.2

Explanation

Examiners look for two distinct points: (1) the balancing issue — atoms of Mg and O are unequal on both sides, and (2) the missing physical state symbols (s/g/l/aq). The textbook explicitly calls Mg + O_2 → MgO a "skeletal chemical equation." A balanced form would be **2Mg + O_2 → 2MgO**. Always name both errors clearly for full marks.

Q7. medium | initial-understanding | § 1.1.2 Balanced Chemical Equations **[2]**

While balancing a chemical equation, a student writes H_2O_4 instead of 4H_2O to increase the number of oxygen atoms. Why is this approach incorrect?

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Model Answer

Writing H_2O_4 is incorrect because it changes the **chemical formula** of water, implying a compound that does not exist. While balancing an equation, we can only change the **coefficients** (numbers in front of the formula), not the subscripts. The correct way is to write **4H_2O**, which means four molecules of water, keeping the formula of each molecule unchanged.

Source: Chapter 1, Section 1.1.2 Balanced Chemical Equations

Explanation

- Examiners expect two clear points: (1) H_2O_4 is a non-existent/wrong compound — changing subscripts alters the identity of the substance; (2) only coefficients may be changed during balancing.
- The textbook explicitly states: *"we cannot alter the formulae of the compounds... we can put coefficient '4' as 4H_2O and not H_2O_4."* Quote or paraphrase this for full marks.
- Avoid lengthy explanations — two crisp points are enough for 2 marks.

Q8. medium | initial-understanding | § 1.2 TYPES OF CHEMICAL REACTIONS **[3]**

Iron nails are dipped in copper sulphate solution. After some time, the blue colour of the solution fades. (i) Name the type of chemical reaction taking place. (ii) What substance is deposited on the iron nails, and why?

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Model Answer

(i) This is a **displacement reaction**. Iron, being more reactive than copper, displaces copper from copper sulphate solution.

(ii) Copper is deposited on the iron nails (they turn brownish). Iron displaces copper from $CuSO_4$ solution because iron is more reactive than copper. The reaction is:

$$Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$$

As Cu^{2+} ions are used up, the blue colour of the solution fades.

Source: Chapter 1, Section 1.2.3 — Displacement Reaction

Explanation

- **(i)** must name the reaction type clearly — "displacement reaction" is the exact term used in the textbook.
- **(ii)** Two points are needed for full marks: **what** is deposited (copper/brownish layer) and **why** (iron is more reactive, so it displaces copper). Writing the balanced equation strengthens the answer and is expected in board exams.
- The fading of blue colour is due to conversion of $CuSO_4 \rightarrow FeSO_4$ (which is pale green/colourless) — mention this to show complete understanding.

Q9. straightforward | initial-understanding | § 1.2.1 Combination Reaction **[2]**

What is a combination reaction? Give one example from everyday life where two substances combine to form a single product.

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Model Answer

A reaction in which two or more substances combine to form a single new substance is called a **combination reaction**.

Example: Calcium oxide (quick lime) reacts with water to form calcium hydroxide (slaked lime):

$$\mathrm{CaO}(s) + \mathrm{H_2O}(l) \rightarrow \mathrm{Ca(OH)_2}(aq) + \mathrm{Heat}$$

This is used in everyday whitewashing of walls.

Source: Chapter 1 – Chemical Reactions and Equations, Section 1.2.1

Explanation

- **1 mark** for the correct definition — must include "two or more substances" combining into "one/single product."
- **1 mark** for the example — the equation (even in word form) with reactants and product named earns full credit. The CaO + H2O → Ca(OH)2 reaction is the textbook illustration, so use it confidently.
- Avoid writing a long explanation; the examiner checks for the definition keyword and a valid equation/example.

Q10. medium | initial-understanding | § 1.2.1 Combination Reaction **[1]**

Calcium oxide reacts with water to form calcium hydroxide. What type of energy change occurs in this reaction, and how would you detect it?

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Model Answer

An **exothermic** energy change occurs — heat is released. It can be detected by **touching the beaker**, which feels hot.

Source: Chapter 1, Section 1.2.1 – Combination Reaction

Explanation

The examiner looks for two things in one line: (1) the correct term *exothermic* and (2) the method of detection (touching the beaker/rise in temperature). Both must appear for full credit on a 1-mark question. Avoid writing "endothermic" — the textbook explicitly states "releasing a large amount of heat."

Q11. medium | initial-understanding | § 1.2.2 Decomposition Reaction **[2]**

When lead nitrate is heated strongly, brown fumes are produced along with a solid residue and oxygen gas. (i) Name the brown gas evolved. (ii) What type of decomposition reaction is this?

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Model Answer

(i) The brown gas evolved is **nitrogen dioxide (NO_2)**.

(ii) This is a **thermal decomposition** reaction, as the decomposition is caused by heat.

The reaction is:

$$2Pb(NO_3)_2(s) \xrightarrow{\text{Heat}} 2PbO(s) + 4NO_2(g) + O_2(g)$$

Source: Chapter 1, Section 1.2.2 Decomposition Reaction (Activity 1.6)

Explanation

- **(i)** is straightforward — the textbook explicitly states "These fumes are of nitrogen dioxide (NO_2)." Write the name **and** formula for full credit.
- **(ii)** The key term examiners look for is **thermal decomposition** (not just "decomposition"), because the energy source is **heat**. Writing the balanced equation earns the second mark and demonstrates understanding of the reaction type.

Q12. medium | initial-understanding | § 1.2.2 Decomposition Reaction **[3]**

Decomposition reactions can be brought about by different forms of energy. Name the three forms of energy that can cause decomposition, and give one example of a reaction for each.

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Model Answer

The three forms of energy that cause decomposition reactions are **heat**, **light**, and **electricity**.

1. **Heat (Thermal decomposition):**

$$2Pb(NO_3)_2(s) \xrightarrow{\Delta} 2PbO(s) + 4NO_2(g) + O_2(g)$$

1. **Light (Photolytic decomposition):**

$$2AgCl(s) \xrightarrow{\text{sunlight}} 2Ag(s) + Cl_2(g)$$

1. **Electricity (Electrolytic decomposition):**

$$2H_2O(l) \xrightarrow{\text{electricity}} 2H_2(g) + O_2(g)$$

Source: Chapter 1 – Chemical Reactions and Equations, Section 1.2 (Types of Chemical Reactions)

Explanation

- The examiner expects all **three forms named + one correct equation each** — that's 1 mark per pair.
- Use the standard NCERT examples: lead nitrate (heat), silver chloride (light), water (electricity). These are the safest choices.
- Write state symbols and the energy type above the arrow — examiners notice and reward this detail.
- Do **not** confuse electrolytic decomposition of water with any combustion reaction.

Q13. medium | initial-understanding | § 1.2.3 Displacement Reaction **[3]**

Iron nails are dipped in copper sulphate solution and left for some time. Name the type of chemical reaction that takes place and explain why the blue colour of the solution fades.

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Model Answer

Type of Reaction: Displacement reaction.

Iron (Fe) is more reactive than copper (Cu), so it displaces copper from copper sulphate solution. The reaction is:

$$\mathrm{Fe}(s) + \mathrm{CuSO_4}(aq) \rightarrow \mathrm{FeSO_4}(aq) + \mathrm{Cu}(s)$$

Why the blue colour fades: Copper sulphate ($CuSO_4$) gives the solution its blue colour. As iron displaces copper, $CuSO_4$ is consumed and replaced by iron sulphate ($FeSO_4$), which is pale green. Since the concentration of $CuSO_4$ decreases, the blue colour of the solution gradually fades. Copper metal is deposited on the iron nail, turning it brownish.

Source: Chapter 1, Section 1.2.3 – Displacement Reaction

Explanation

- **1 mark** for naming the reaction (displacement reaction).
- **1 mark** for the balanced chemical equation.
- **1 mark** for explaining the fading of blue colour — examiners want you to link it to the *consumption of $CuSO_4$* and *formation of $FeSO_4$*. Just saying "copper is displaced" is insufficient; you must explain what happens to the blue-coloured ion.
- Always write the equation with state symbols — it signals precision to the examiner.

Q14. medium | initial-understanding | § 1.2.4 Double Displacement Reaction **[2]**

When sodium sulphate solution is mixed with barium chloride solution, a white precipitate of barium sulphate is formed. Name the type of chemical reaction involved and give one reason for your answer.

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Model Answer

The reaction involved is a **double displacement reaction** (also called a precipitation reaction).

Reason: The sulphate ions (SO_4^{2-}) from sodium sulphate and barium ions (Ba^{2+}) from barium chloride exchange (displace) each other to form an insoluble white precipitate of barium sulphate.

$$Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$$

Source: Chapter 1, Section 1.2.4 Double Displacement Reaction

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Explanation

- **Name of reaction (1 mark):** Double displacement reaction. You may also call it a precipitation reaction — both are acceptable.
- **Reason (1 mark):** Examiners want you to mention *exchange of ions* between the reactants and/or the formation of an *insoluble precipitate* ($BaSO_4$). Either point earns the mark; stating both makes your answer complete.
- Writing the balanced equation supports your answer but is not always compulsory for 2 marks — include it to be safe.
- Remember: in double displacement, two compounds swap their ionic partners; neither element changes its oxidation state (unlike displacement or redox reactions).

Q15. medium | initial-understanding | § 1.2.5 Oxidation and Reduction **[3]**

In the reaction between copper(II) oxide and hydrogen gas, copper(II) oxide is converted to copper. Is copper(II) oxide oxidised or reduced in this reaction? Give one reason for your answer.

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Model Answer

Copper(II) oxide is **reduced** in this reaction.

The reaction is:

$$CuO + H_2 \xrightarrow{\text{Heat}} Cu + H_2O$$

Reason: A substance is said to be reduced when it **loses oxygen** during a reaction. In this reaction, copper(II) oxide (CuO) loses its oxygen to hydrogen and is converted to copper (Cu). Therefore, copper(II) oxide is reduced. (Simultaneously, hydrogen gains oxygen and is oxidised, making this a redox reaction.)

Source: Chapter 1, Section 1.2.5 Oxidation and Reduction

Explanation

- The examiner expects the term **"reduced"** clearly stated — this is worth 1 mark.
- The **definition** (loses oxygen = reduction) must be written — 1 mark.
- Applying the definition to this specific reaction (CuO losing oxygen to become Cu) — 1 mark.
- Mentioning the redox nature or hydrogen's oxidation is a bonus but keep it brief.
- Always write the chemical equation when explaining a reaction; it shows understanding and saves words.

Q16. straightforward | initial-understanding | § 1.3 HAVE YOU OBSERVED THE EFFECTS OF OXIDATION REACTIONS IN EVERYDAY LIFE? **[1]**

Why do chips manufacturers flush bags of chips with nitrogen gas before sealing them?

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Model Answer

Chips manufacturers flush bags with nitrogen gas to prevent oxidation (rancidity) of the chips. Nitrogen is inert and does not react with the food, keeping the chips fresh and crispy for longer.

Source: Chapter 4, Carbon and its Compounds

Explanation

The passage mentions that saturated fats/oils can turn rancid due to oxidation. Nitrogen is used as an inert packaging gas to displace oxygen, preventing the chips (which contain fats/oils) from getting oxidised. Examiners expect the key words: **inert**, **prevent oxidation/rancidity**. One sentence with these two ideas earns full marks.

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