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Metals and Non-metals — CBSE Class 10 Science Chapter Test

FREE CHAPTER TEST · CLASS X · SCIENCE (086) · PATTERN OF THE CBSE SAMPLE QUESTION PAPER 2026-27

TIME ALLOWED	MAXIMUM MARKS	QUESTIONS	NAME / ROLL NO.
1½ hours	40	20 (A 10 · B 4 · C 3 · D 1 · E 2)	

GENERAL INSTRUCTIONS

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 20 questions. All questions are compulsory.
2. This question paper is divided into five sections: A, B, C, D and E.
3. In Section A, Questions 1 to 8 are multiple choice questions (MCQs) and Questions 9 and 10 are assertion-reason based questions of 1 mark each.
4. In Section B, Q11–14 are very short answer (VSA) type questions, carrying 2 marks each.
5. In Section C, Q15–17 are short answer (SA) type questions, carrying 3 marks each.
6. In Section D, Q18 is a long answer (LA) type question, carrying 5 marks.
7. In Section E, Q19–20 are case study based questions, carrying 4 marks each, with sub-parts of the values of 1, 1 and 2 marks.
8. There is no overall choice. However, an internal choice has been provided in 1 question of Section B, 1 question of Section C, 1 question of Section D and in the 2-mark sub-part of each question of Section E.
9. Use of calculators is not allowed.
10. This chapter test follows the section structure, question types and marks per question of the CBSE Class X Science (086) Sample Question Paper 2026-27, at about half the length of the 80-mark board paper: 40 marks in 1½ hours.
11. The answer key and the marking scheme are at the end of this booklet. Attempt the paper in 1½ hours before you look at them.

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Chapter: Metals and Non-metals · **Topics:** Physical properties · Reactions with oxygen, water and acids · Reactivity series · Ionic compounds · Basic metallurgy · Electrolytic refining · Corrosion and its prevention · Alloys

SECTION A

This section comprises 10 questions of 1 mark each: 8 multiple choice questions (MCQs) and 2 assertion-reason based questions.

1. Which of the following metals is a liquid at room temperature? 1

(A) Gallium (B) Mercury

(C) Caesium (D) Sodium

2. Which of the following oxides reacts with both hydrochloric acid and sodium hydroxide solution to form a salt and water? 1

(A) MgO (B) CaO

(C) Na_2O (D) ZnO

3. Which of the following metals does not give hydrogen gas with dilute hydrochloric acid? 1

(A) Copper (B) Zinc

(C) Magnesium (D) Iron

4. The electronic configuration of the sodium ion, Na^+, is 1

(A) 2, 8, 1 (B) 2, 8, 2

(C) 2, 8 (D) 2, 8, 8

5. Which metal is stored under kerosene to protect it? 1

(A) Magnesium (B) Aluminium

(C) Zinc (D) Sodium

6. In the thermite reaction used to join railway tracks, iron(III) oxide is reduced by 1

(A) carbon (B) aluminium

(C) copper (D) hydrogen

7. Which of the following metals reacts with steam but not with cold or hot water? 1

(A) Potassium (B) Calcium

(C) Iron (D) Copper

8. Solder, used for welding electrical wires together, is an alloy of 1

(A) lead and tin (B) copper and zinc

(C) copper and tin (D) iron and nickel

9. **Assertion (A):** Copper does not react with dilute hydrochloric acid. 1
Reason (R): Copper is a poor conductor of electricity.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

10. **Assertion (A):** Hydrogen gas is not given off when most metals react with nitric acid. 1
Reason (R): Nitric acid is a strong oxidising agent and oxidises the hydrogen produced to water.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

SECTION B

This section comprises 4 very short answer (VSA) type questions of 2 marks each.

11. (a) Show the formation of magnesium chloride from magnesium (atomic number 12) and chlorine (atomic number 17) by the transfer of electrons. 2

OR

(b) Show the formation of sodium oxide from sodium (atomic number 11) and oxygen (atomic number 8) by the transfer of electrons.

12. Why is sodium kept immersed in kerosene oil? Write the balanced equation for the reaction of sodium with water, and say why the hydrogen formed catches fire. 2

13. Write balanced equations for the reactions of (i) calcium with cold water and (ii) magnesium with hot water. Why do calcium and magnesium start floating in these reactions? 2

14. What is aqua regia, and what is special about it? Pure gold is 24 carat; what percentage of gold is present in 22 carat gold? 2

SECTION C

This section comprises 3 short answer (SA) type questions of 3 marks each.

15. (a) Zinc is extracted from zinc blende (ZnS). (i) Why is the sulphide ore first converted to the oxide? Name the process and write its equation. (ii) Write the equation for the reduction of zinc oxide with carbon. (iii) Name the process used if the ore is calamine ($ZnCO_3$), and write its equation. 3

OR

(b) Mercury is obtained from its ore cinnabar (HgS). (i) Name the first step and write its equation. (ii) Write the equation for the next step, in which mercury is formed. (iii) Why does mercury not need a reducing agent such as carbon?

16. Impure copper is purified by electrolysis. Name (i) the anode, (ii) the cathode and (iii) the electrolyte used, and say what happens to the soluble and the insoluble impurities. 3

17. Strips of four metals P, Q, R and S were put into solutions of salts of the other metals. Q was deposited when P was put into a solution of a salt of Q. Nothing happened when Q was put into a solution of a salt of R, when R was put into a solution of a salt of P, or when S was put into a solution of a salt of Q. (i) Arrange P, Q, R and S in decreasing order of reactivity. (ii) Would R displace S from a solution of a salt of S? (iii) Which of the metals P, R and S could be used to make a container for a solution of a salt of Q? 3

SECTION D

This section comprises 1 long answer (LA) type questions of 5 marks each.

18. (a) Element X has atomic number 11 and element Y has atomic number 17. 5

(i) Write the electronic configurations of X and Y.

(ii) Which of them is a metal and which a non-metal? Give a reason.

(iii) Show how X and Y form a compound, and write its formula.

(iv) Name the type of bond in the compound and give two of its physical properties.

(v) Does the compound conduct electricity in the solid state? Explain.

OR

(b) Iron nails were placed in three test tubes: A with ordinary tap water, B with boiled distilled water and a layer of oil on top, and C with dry air over some anhydrous calcium chloride. All three were corked and left for a few days.

(i) In which test tube do the nails rust?

(ii) Why is the water in B boiled, and why is the oil added?

(iii) What is the role of anhydrous calcium chloride in C?

(iv) What do you conclude about the conditions for rusting?

(v) Explain how galvanising and alloying prevent rusting.

SECTION E

This section comprises 2 case study based questions of 4 marks each, with sub-parts of 1, 1 and 2 marks.

19. Metals at the top of the reactivity series, such as sodium, magnesium and calcium, are so reactive that they cannot be obtained from their compounds by heating with carbon. Sodium is obtained by passing electricity through molten sodium chloride.

(i) Why can sodium not be obtained by heating its oxide with carbon? [1]

(ii) At which electrode is sodium deposited? [1]

(iii) Write the reactions at the cathode and at the anode during the electrolysis of molten sodium chloride. [2]

OR

(iii) Why is the chloride electrolysed in the molten state and not as a solid? Name one other metal obtained by electrolytic reduction. [2]

20. A jeweller explains that ornaments are not made from 24 carat gold but from 22 carat gold, an alloy of gold with copper or silver. He also uses an alloy of lead and tin to join wires.

(i) What is an alloy? [1]

(ii) Why are ornaments not made of 24 carat gold? [1]

(iii) What percentage of an 18 carat gold ornament is gold? How much gold is there in an 18 carat ornament of mass 12 g? [2]

OR

(iii) Name the metals present in brass and in bronze, and give the reason solder is used for welding electrical wires. [2]

END OF THE QUESTION PAPER

ANSWER KEY — SECTION A

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
(B)	(D)	(A)	(C)	(D)	(B)	(C)	(A)	(C)	(A)

MARKING SCHEME AND WORKED SOLUTIONS

Marks for each step are shown in brackets, as in the CBSE marking scheme. Any correct alternative method earns full marks.

Q1. Answer (B). Mercury is the only metal that is a liquid at room temperature; gallium and caesium melt only a little above it (they melt on the palm).

Q2. Answer (D). Zinc oxide (like aluminium oxide) is amphoteric: it shows both acidic and basic behaviour. The others are basic oxides.

Q3. Answer (A). Copper is below hydrogen in the reactivity series, so it cannot displace hydrogen from the acid.

Q4. Answer (C). Sodium (atomic number 11) is 2, 8, 1; it loses its one outer electron to form Na^+, which is 2, 8.

Q5. Answer (D). Sodium (like potassium) reacts so vigorously with air that it catches fire if kept in the open, so it is kept in kerosene.

Q6. Answer (B). $Fe_2O_3 + 2Al \rightarrow 2Fe + Al_2O_3$: aluminium, being more reactive, takes the oxygen; so much heat is given out that the iron formed is molten.

Q7. Answer (C). Iron (like aluminium and zinc) reacts only with steam, giving its oxide and hydrogen. Potassium and calcium react with cold water; copper does not react with water at all.

Q8. Answer (A). Solder (lead and tin) has a low melting point. Copper and zinc make brass; copper and tin make bronze.

Q9. Answer (C). A is true (copper is less reactive than hydrogen). R is false: copper is one of the best conductors of electricity. Answer (C).

Q10. Answer (A). Both true, and R explains A (nitric acid itself is reduced to oxides of nitrogen). Answer (A).

Q11. (2 marks) Answer: (a) $Mg \rightarrow Mg^{2+} + 2e^-$, $2Cl + 2e^- \rightarrow 2Cl^-$, $MgCl_2$; (b) $2Na \rightarrow 2Na^+ + 2e^-$, $O + 2e^- \rightarrow O^{2-}$, Na_2O.
(a) Mg (2, 8, 2) loses its two outer electrons to form Mg^{2+} (2, 8); each of two Cl atoms (2, 8, 7) gains one electron to form Cl^- (2, 8, 8). [1]
$Mg \rightarrow Mg^{2+} + 2e^-$; $2Cl + 2e^- \rightarrow 2Cl^-$; Mg^{2+} and $2Cl^-$ are held by electrostatic attraction in $MgCl_2$ (an ionic compound). [1]
OR (b) Each of two Na atoms (2, 8, 1) loses one electron to form Na^+ (2, 8); O (2, 6) gains two electrons to form O^{2-} (2, 8). [1]
$2Na \rightarrow 2Na^+ + 2e^-$; $O + 2e^- \rightarrow O^{2-}$; the ions combine as Na_2O. [1]

Q12. (2 marks) Answer: To keep air away; $2Na + 2H_2O \rightarrow 2NaOH + H_2$ + heat (so much heat that H_2 ignites).
Sodium reacts so vigorously with oxygen (and moisture) of the air that it catches fire if kept in the open; kerosene keeps air away. [1]
$2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$ + heat; the reaction is so exothermic that the hydrogen evolved catches fire. [1]

Q13. (2 marks) Answer: $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$; $Mg + 2H_2O \rightarrow Mg(OH)_2 + H_2$; hydrogen bubbles stick to the metal.
(i) $Ca(s) + 2H_2O(l) \rightarrow Ca(OH)_2(aq) + H_2(g)$; (ii) $Mg(s) + 2H_2O(l) \rightarrow Mg(OH)_2(s) + H_2(g)$ [1]
Bubbles of hydrogen gas stick to the surface of the metal, which makes it float. [1]

Q14. (2 marks) Answer: Conc. HCl and conc. HNO_3 3 : 1, dissolves gold and platinum; about 91.7%.
Aqua regia is a freshly prepared mixture of concentrated hydrochloric acid and concentrated nitric acid in the ratio 3 : 1; it can dissolve gold and platinum, which neither acid can dissolve alone. [1]
22 carat gold has 22 parts of gold in 24: $22/24 \times 100 \approx 91.7\%$. [1]

Q15. (3 marks) Answer: (a) roasting $2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$; $ZnO + C \rightarrow Zn + CO$; calcination $ZnCO_3 \rightarrow ZnO + CO_2$; (b) $2HgS + 3O_2 \rightarrow 2HgO + 2SO_2$; $2HgO \rightarrow 2Hg + O_2$; low in the series.
(a) (i) It is easier to obtain a metal from its oxide than from its sulphide. Roasting (heating strongly in excess air): $2ZnS(s) + 3O_2(g) \xrightarrow{\text{heat}} 2ZnO(s) + 2SO_2(g)$ [1]
(ii) $ZnO(s) + C(s) \rightarrow Zn(s) + CO(g)$ [1]
(iii) Calcination (heating strongly in limited air): $ZnCO_3(s) \xrightarrow{\text{heat}} ZnO(s) + CO_2(g)$ [1]
OR (b) (i) Roasting: $2HgS(s) + 3O_2(g) \xrightarrow{\text{heat}} 2HgO(s) + 2SO_2(g)$ [1]
(ii) $2HgO(s) \xrightarrow{\text{heat}} 2Hg(l) + O_2(g)$ [1]
(iii) Mercury is low in the reactivity series, so its oxide breaks down on heating alone; no reducing agent is needed. [1]

Q16. (3 marks) Answer: Impure copper anode, pure copper cathode, acidified copper sulphate; soluble impurities into solution, insoluble ones as anode mud.
(i) A thick block of impure copper is the anode. (ii) A thin strip of pure copper is the cathode. [1]
(iii) The electrolyte is a solution of a copper salt, acidified copper sulphate. Pure copper dissolves from the anode and is deposited on the cathode. [1]
Soluble impurities go into the solution; insoluble impurities settle at the bottom of the anode as anode mud. [1]

Q17. (3 marks) Answer: (i) P > R > Q > S; (ii) yes; (iii) S.
(i) P displaces Q, so P > Q; Q cannot displace R, so R > Q; R cannot displace P, so P > R; S cannot displace Q, so Q > S. Order: P > R > Q > S. [1]
(ii) Yes: R is more reactive than S. [1]
(iii) S: it is less reactive than Q and will not displace it; P and R would. [1]

Q18. (5 marks) Answer: (a) 2, 8, 1 and 2, 8, 7; X metal, Y non-metal; X^+Y^-, NaCl; ionic, any two properties; no, ions not free; (b) only A; boiling removes air, oil keeps it out; $CaCl_2$ dries air; air and water both needed; galvanising, stainless steel.
(a) (i) X: 2, 8, 1; Y: 2, 8, 7. [1]
(ii) X is a metal: it has 1 valence electron, which it loses easily. Y is a non-metal: it has 7 valence electrons and gains one to complete its octet. [1]
(iii) $X \rightarrow X^+ + e^-$ (2, 8); $Y + e^- \rightarrow Y^-$ (2, 8, 8); the ions attract each other: XY (sodium chloride, NaCl). [1]
(iv) Ionic (electrovalent) bond. Two properties: hard crystalline solid; high melting and boiling points; soluble in water but not in kerosene or petrol. [1]
(v) No: the ions are held in fixed positions in the solid and cannot move; it conducts when molten or dissolved in water, when the ions are free to move. [1]
OR (b) (i) Rust forms only in A. [1]
(ii) Boiling removes dissolved air from the water; the oil stops air from dissolving in it again. [1]
(iii) Anhydrous calcium chloride absorbs moisture, so the air in C is dry. [1]
(iv) Rusting of iron needs both air and water. [1]
(v) Galvanising coats iron with zinc, which protects it even if the coating is broken; alloying with nickel and chromium gives stainless steel, which does not rust. [1]

Q19. (4 marks) Answer: (i) Na has more affinity for oxygen than carbon; (ii) cathode; (iii)(a) $Na^+ + e^- \rightarrow Na$, $2Cl^- \rightarrow Cl_2 + 2e^-$; (b) ions move only when molten; aluminium.
(i) Sodium has more affinity for oxygen than carbon has, so carbon cannot reduce its oxide. [1]
(ii) At the cathode (negative electrode). [1]
(iii)(a) At the cathode: $Na^+ + e^- \rightarrow Na$. [1]
At the anode: $2Cl^- \rightarrow Cl_2 + 2e^-$ (chlorine gas is given off). [1]
OR (iii)(b) In the solid the ions are held in fixed positions; in the molten state they are free to move to the electrodes. [1]
Aluminium (obtained by electrolytic reduction of its oxide), or magnesium or calcium. [1]

Q20. (4 marks) Answer: (i) homogeneous mixture of metals (or metal and non-metal); (ii) pure gold is too soft; (iii)(a) 75%, 9 g; (b) Cu + Zn, Cu + Sn; low melting point.

(i) A homogeneous mixture of two or more metals, or of a metal and a non-metal. [1]

(ii) 24 carat gold is pure gold, which is very soft and gets bent or worn easily; alloying makes it harder. [1]

(iii)(a) 18/24 × 100 = 75%. [1]

75% of 12 g = 9 g of gold. [1]

OR (iii)(b) Brass: copper and zinc; bronze: copper and tin. [1]

Solder has a low melting point. [1]

All questions are original and © Master Testing Agency. Free to download and use for personal practice; not for resale. Every answer in this paper was checked independently by computer: every equation balanced by counting atoms, electronic configurations computed shell by shell, the reactivity order found by testing every possible order against the observations, and carat purities computed.