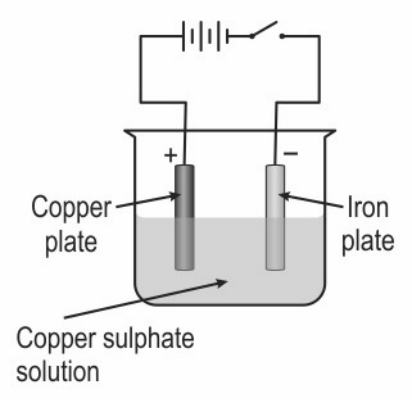
Chapter - 3
Metals and Non-metals

Answer any four of the following five questions based on the information given below.

Krunal connected a copper plate and an iron plate to the positive and negative terminals of a battery respectively along with a switch. He immersed the plates into a beaker containing acidified copper sulphate solution.



Q: 1 **After a few minutes, even before he turned the switch on, he noticed that copper was deposited on the iron plate.**

This could have been due to _____.

1. electrolysis
2. electroplating
3. a combination reaction
4. a displacement reaction

Q: 2 **Which of the following is likely to happen when the current is started?**

1. Iron will be deposited on the copper plate.
2. Copper will continue to be deposited on the iron plate.
3. No reaction will occur at the iron plate or at the copper plate.
4. The copper already deposited on the iron plate will go back into the solution.

Q: 3 **Krunal now replaces the iron plate with a silver plate. He sees that there is no deposition of copper on the silver plate before starting the current.**

Which of the following could be the reason?

1. Silver is more reactive than iron.
2. Silver is less reactive than copper.
3. Silver is a poorer conductor of electricity than iron.
4. Silver is a better conductor of electricity than copper.

Q: 4 **What is likely to happen to the concentration of copper sulphate in the solution on passing electric current through the solution in the set-up with the silver plate?**

1. It will increase.
2. It will decrease.
3. It will remain the same.
4. (Cannot say without knowing the amount of current passed.)

Q: 5 **Which of the following will happen to the weights of the silver and copper plates after passing the current for some time?**

1. The weight of the silver plate will increase and that of the copper plate will decrease.
2. The weight of the copper plate will increase and that of the silver plate will decrease.
3. Both the plates will decrease in weight.
4. Both the plates will increase in weight.

Q: 6 **Three pieces of a rust free iron rod are completely coated with the following:** **[5]**

(i) plastic
(ii) oil paint
(iii) zinc

An identical scratch is made on each piece, thus exposing the iron. The pieces of iron are kept exposed to moist air for 10 days and then checked for rust formation.

(a) State if rusting will be observed at the point of the scratch on the three iron pieces.

(b) Give reasons for your answer in each case.

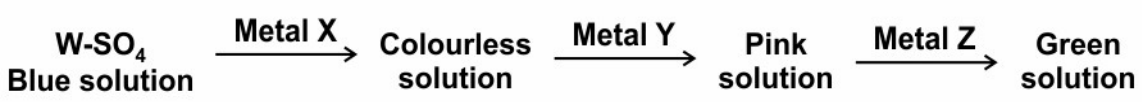
(c) Name the process of applying a protective zinc coating to steel or iron.

Q: 7 **Listed here is the reactivity of certain metals.** **[1]**

Metal	Reaction with air	Reaction with water	Reaction with dilute acids
Gold	Does not oxidise or burn	No reaction	No reaction
Sodium	Burns vigorously to form an oxide	Violent reaction	Violent reaction
Zinc	Burns to form an oxide	Reacts on heating	Reacts to produce hydrogen
Platinum	No reaction	Does not dissolve or react	No reaction

From the list above, identify the metal(s) that are likely to be found in a pure state in the Earth's crust.

Q: 8 **The blue-coloured solution of the sulphate salt of metal W is taken in a beaker. Metal powders X, Y and Z are added one after the other to the beaker. The colour changes occurring in the solution are shown below.** **[2]**



State what colour change, if any, will occur if metal X is again added to the green solution in the beaker. Explain why.

Q: 9 **A piece of iron rusts when it comes in contact with air and moisture. Prakash had two identical shiny iron pieces P and Q. To prevent the pieces from rusting, he coated piece P with oil paint and he galvanized piece Q with a coat of zinc metal. He noticed that the coatings were not complete and that a small part of the iron was exposed in both the pieces.** **[4]**

What is Prakash likely to observe about the exposed parts of the two iron pieces after some days? Explain why.

Q: 10 **Read the following statements.** **[2]**

(P) Stainless steel does not rust.
(Q) Iron, nickel and chromium form an alloy.

Does statement (Q) present a valid explanation for statement (P)? Justify your answer.

Q: 11 **A teacher asks her students to identify a metal, M. She gives them the following clues to help them.** **[3]**

(P) Its oxide reacts with both HCl and NaOH.
(Q) It does not react with hot or cold water but reacts with steam.
(R) It can be extracted by electrolysis of its ore.

(a) Identify the metal.
(b) Write the chemical equations for the reaction of the metal with HCl and NaOH respectively.
(c) What would happen if the metal is reacted with iron oxide?

Q: 12 **A metal oxide on being heated with carbon does NOT produce carbon dioxide.** **[1]**

Give a possible explanation for this behaviour of the metal oxide.

Q: 13 **A metallic element, M, has the following properties:** **[2]**

- floats on water
- can be cut with a knife
- occurs naturally as its chloride, of formula MCl
- its oxide dissolves in water to form the hydroxide

(a) State the method of manufacture of the metal M.
(b) Name the major byproduct obtained in the process.

The table below gives the correct answer for each multiple-choice question in this test.

Q.No	Correct Answers
1	4
2	2
3	2
4	3
5	1

Q.No	Teacher should award marks if students have done the following:	Marks
6	(a) (i) Rust will be seen on the plastic coated iron piece. [0.5 marks] (ii) Rust will be seen on the painted iron piece. [0.5 marks] (iii) No rust will be seen on the zinc coated iron piece. [1 mark]	2
	(b) (i) The iron rod is in contact with air and moisture. [0.5 marks] (ii) The iron rod is in contact with air and moisture. [0.5 marks] (iii) Zinc is more reactive than iron and gets oxidised in preference to the iron object. [1 mark]	2
	(c) galvanisation	1
7	0.5 marks each for identifying the following: - gold - platinum	1
8	No colour change will occur.	1
	Metal X is less reactive than metal Z. OR Metal X is lower than metal Z in the activity series.	1
9	1 mark each for the following: - The exposed part of piece P is rusted. - The exposed part of piece Q not rusted.	2
	1 mark each for the following: - Oil painting prevents rusting only by preventing contact of iron with moist air. [1 mark] - Galvanising also protects by zinc getting oxidised in preference to iron as it is more reactive than iron. [1 mark]	2

Q.No	Teacher should award marks if students have done the following:	Marks
10	Yes, it does. [1 mark] Since alloying can change the properties of a metal. [1 mark]	2
11	(a) Aluminium	0.5
	(b) 1 mark each for correct equations: $Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$ $Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$	2
	(c) It would displace iron to form aluminium oxide.	0.5
12	The metal is more reactive than carbon.	1
13	(a) electrolysis of the molten chloride	1
	(b) chlorine	1