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METALS AND NON-METALS

TEXTBOOK QUESTIONS AND THEIR ANSWERS

Q.1. Give an example of metal which :

- (i) is a liquid at room temperature.
- (ii) can be easily cut with a knife
- (iii) is the best conductor of heat
- (iv) is poor conductor of heat

Ans. (i) Mercury is a metal which is liquid at room temperature.
(ii) Sodium metal can be easily cut with knife.
(iii) Silver metal is the best conductor of heat.
(iv) Tungsten metal is poor conductor of heat.

Q.2. Explain the meanings of malleable and ductile.

Ans. Malleable : A metal which can be easily beaten into sheets is called malleable.

Ductile : A metal which can be easily drawn into wires is called ductile.

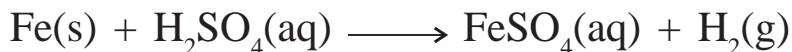
Q.3. Write equations for the reactions of :

- (i) Iron with steam.
- (ii) Calcium and potassium with water.

Ans. (i) $3\text{Fe(s)} + 4\text{H}_2\text{O(steam)} \xrightleftharpoons{\text{Heat}} \text{Fe}_3\text{O}_4\text{(s)} + 4\text{H}_2\text{(g)}$
(ii) $\text{Ca(s)} + 2\text{H}_2\text{O(l)} \longrightarrow \text{Ca(OH)}_2\text{(aq)} + \text{H}_2\text{(g)}$
 $2\text{K(s)} + 2\text{H}_2\text{O(l)} \longrightarrow 2\text{KOH(aq)} + \text{H}_2\text{(g)}$

Q.4. Which gas is produced when dilute hydrochloric acid is added to a reactive metal ? Write the chemical reaction when iron reacts with dilute sulphuric acid.

Ans. Hydrogen gas is produced



Q.5. What do you observe when zinc is added to a solution of iron (II) sulphate ? Write the chemical reaction taken place.

Ans. (i) The light green colour of ferrous sulphate gradually fades and a colourless solution is formed.

(ii) A grey deposit of iron settles on the surface of zinc.



Q.6. What are amphoteric oxides ? Give two examples of amphoteric oxides.

Ans. The oxides of certain metals which reacts, both with acids as well as alkalis to form a salt and water as only products, are called amphoteric oxides.

Zinc oxide [ZnO] and aluminium oxide [Al₂O₃] are amphoteric oxides.

Q.7. Name two metals which will displace hydrogen from dilute acids and two metals which will not displace hydrogen from the dilute acids.

Ans. Magnesium and zinc displace hydrogen from the dilute acids.

Copper and silver does not displace hydrogen from dilute acids.

Q.8. You are given a hammer, a bulb, a battery, wires and a switch.

(a) How could you use them to distinguish between samples of metals and non-metals ?

(b) Assess the usefulness of these tests in distinguishing between metals and non-metals.

Ans. (a) (i) Hammer the given samples for sometime. In case of metal sample it will flatten, because metals are

malleable. In case of non-metal sample, it will break, because non-metals are not malleable.

(ii) Connect the given samples one by one to a circuit of battery, wires and a switch in series. In case of metals, the bulb lights up, because metals are good conductors of electricity. In case of non-metals the bulb does not light up, because non-metals are bad conductor of electricity.

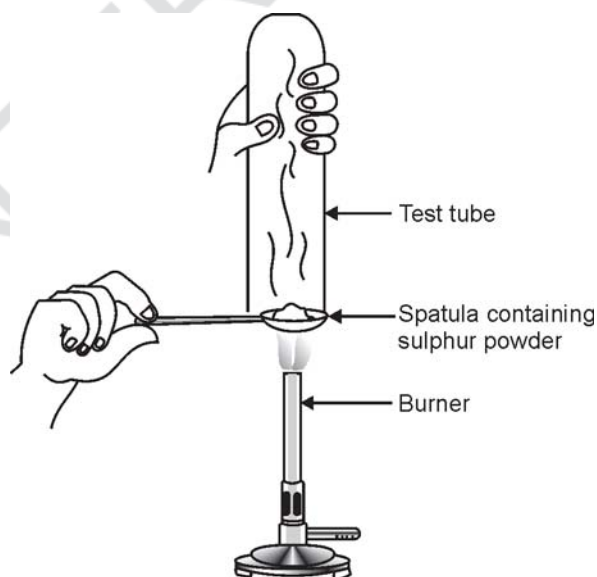
(b) Amongst the above tests, testing for electrical conductivity is more useful than hammering while distinguishing metals from non-metals.

Q.9. Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting test tube over it as shown in the diagram.

(a) What will be the action of gas on

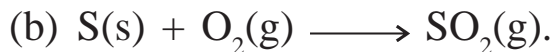
(i) dry litmus paper ? (ii) moist litmus paper ?

(b) Write balanced chemical equation for the reaction taking place.



Ans. (a) (i) No change in colour takes place in case of dry litmus.

(ii) The moist litmus paper will change to red colour.



Q.10. Which of the following methods is suitable for preventing an iron frying pan from rusting ?

(a) Applying grease

(b) Applying paint

(c) Applying a coating of zinc

(d) All of the above

Ans. (c) is the correct answer, because grease and paint will burn when frying pan is put on fire.

Q.11. An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be : (a) calcium, (b) carbon, (c) silicon, (d) iron.

Ans. (a) is the correct answer, because carbon and silicon form acidic oxides and oxide of iron is insoluble in water.

Q.12. Food cans are coated with tin and not with zinc because :

(a) zinc is costlier than tin

(b) zinc has a higher melting point than tin

(c) zinc is more reactive than tin.

(d) zinc is less reactive than tin.

Ans. (c) is the correct answer.

Q.13. Name two metals which are found in nature in free state.

Ans. Silver and gold are found in free state.

Q.14. Which metals do not corrode easily ?

Ans. Gold and Platinum do not corrode easily.

Q.15. What are alloys ?

Ans. A homogeneous mixture of two or more metals, obtained by mixing molten metals is called an alloy.

Q.16. What chemical process is used for obtaining a metal from its oxide ?

Ans. Reduction process is used in obtaining a metal from its oxide. The reduction of metal oxide may be carried with coke, carbon monoxide, hydrogen, active metals or with the help of electricity depending upon the position of metal in the metal activity series.

Q.17. In the electrolytic refining of a metal M, what would you take as the anode, the cathode and the electrolyte.

Ans. Anode : Impure metal.

Cathode : A thin plate of pure metal.

Electrolyte : An aqueous solution of the salt of metal.

Q.18. State two ways to prevent the rusting of iron.

Ans. (i) By coating iron with zinc (Galvanising)

(ii) By oiling, greasing or painting surface of Iron.

Q.19. What type of oxides are formed when non-metals combine with oxygen?

Ans. Normally acidic oxides are formed. However, some non-metals also form neutral oxides.

Q.20. Why do ionic compounds have high melting points ?

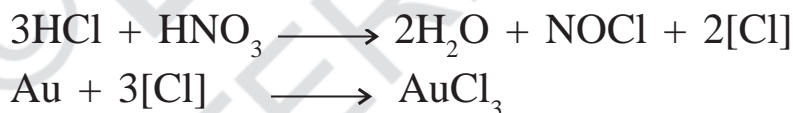
Ans. All ionic compounds have very strong inter-ionic forces which hold the ions very tightly. A lot of heat energy is required to break these inter-ionic forces and hence they have high melting points.

Q.21. You must have seen tarnished copper vessels being cleaned with lemon or tamarind juice. Explain why these sour substances are effective in cleaning the vessels.

Ans. Lemon juice and tamarind juice contain citric acid and tartaric acid respectively. These acids react with the thin layer of copper oxide on the surface of copper metal to form soluble copper salts. As these soluble salts are wiped off clean and shining surface of copper is exposed.

Q.22. A man went door to door posing as a goldsmith. He promised to bring back the glitter of old and dull gold ornaments. An unsuspecting lady gave a set of gold bangles to him which he dipped in a particular solution. The bangles sparkled the new, but their weight was reduced drastically. The lady was upset but after a futile argument the man beat a hasty retreat. Can you play the detective to find out the nature of solution he had used.

Ans. The solution is aqua regia, i.e., a mixture of three parts of conc. hydrochloric acid and one part of conc. nitric acid. This solution not only dissolves unwanted oxides on the surface of gold, but dissolves the gold itself. This leads to decrease in the weight of gold ornaments as explained by the following equations.



Q.23. Write the electron dot structures for sodium, oxygen and magnesium.

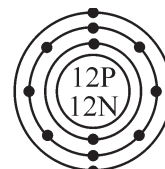
Ans.



Sodium



Oxygen



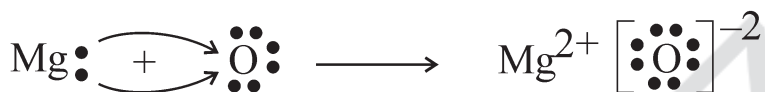
Magnesium

Q.24. (i) Show the formation of Na_2O and MgO by the transfer of electrons.

(ii) What are the ions present in these compounds?



Na^+ ions (cations) and O^{2-} ions (anions) are present in Na_2O



Mg^{2+} ions (cations) and O^{2-} ions (anions) are present in MgO

Q.25. Define the following terms :

(i) Mineral; (ii) Ore; (iii) Gangue.

Ans. Mineral : A natural material containing metals in free or combined state is called a mineral.

Ore : A mineral, which does not contain objectionable impurities, such that a given metal can be conveniently and profitably extracted from it, is called an ore.

Gangue : The unwanted impurities, such as sand, stone, mud, lime stone, mica, etc., associated with naturally occurring ore, is called gangue.

Q.26. Metallic oxides of zinc, magnesium and copper were heated with the following metals.

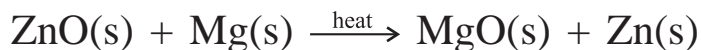
Metal	Zinc	Magnesium	Copper
Zinc oxide			
Magnesium oxide			
Copper oxide			

In which cases will you find displacement reactions taking place ?

Ans. 1. (i) Zinc oxide will not react with copper as copper is placed lower in metal activity series.

(ii) Zinc oxide will not react with zinc metal.

(iii) Zinc oxide will react with magnesium to form magnesium oxide and zinc.



2. (i) Magnesium oxide does not react with zinc, magnesium or copper.
3. (i) Copper oxide will not react with copper.
- (ii) Copper oxide react with zinc and magnesium to form their respective oxides and copper metal is displaced.



Q.27. Differentiate between metals and non-metals on the basis of their chemical properties.

- Ans.**
1. Metals form basic oxides, whereas non-metals form acidic or neutral oxides.
 2. Active metals displace hydrogen from water, whereas non-metals do not displace hydrogen from water.
 3. Active metals displace hydrogen from dilute acids, whereas, non-metals do not displace hydrogen from dilute acids.
 4. Metals donate electrons to form cations, whereas, non-metals accept electrons to form anions.

Q.28. Give reasons :

- (a) **Platinum, gold and silver are used to make jewellery.**
- (b) **Sodium, potassium and lithium are stored under oil.**
- (c) **Aluminium is a highly reactive metal, yet it is used to make utensils for cooking.**
- (d) **Carbonate and sulphide ores are usually converted into oxides during the process of extraction.**

Ans. (a) Platinum, gold and silver are highly malleable and ductile and do not corrode by moist air easily.

(b) Sodium, potassium and lithium are highly reactive metals and catch fire in air as well as water. Thus, to prevent them from catching fire in moist air, they are kept under oil.

(c) Aluminium metal forms a very thin and highly sticky layer of aluminium oxide on its surface in the moist air. This layer does not allow the moist air to further oxidise it. Thus, in a way aluminium is self protecting metal and is used for making utensils.

(d) Carbonates and sulphides do not get reduced by reducing agents such as coke, carbon monoxide, hydrogen etc. However, oxides can be easily reduced. Thus, carbonates and sulphide ores are converted into oxides.

Q.29. Why is sodium kept immersed in kerosene oil?

Ans. Sodium is a very reactive metal. It reacts with oxygen and water even at room temperature. So, it is kept immersed in kerosene oil.

Q.30. Samples of four metals A, B, C and D were taken and added to the following solutions one by one. The results obtained have been tabulated as follows :

Metal	Iron (II) sulphate	Copper (II) sulphate	Zinc sulphate	Silver nitrate
A	No reaction	Displacement		
B	Displacement		No reaction	
C	No reaction	No reaction	No reaction	Displacement
D	No reaction	No reaction	No reaction	No reaction

Use the table above to answer the following questions about metals A, B, C and D.

- (i) Which is the most reactive metal?
- (ii) What would you observe if B is added to a solution of copper (II) sulphate?
- (iii) Arrange the metals A, B, C and D in the order of decreasing reactivity?

Ans. (i) B is the most reactive metal.
(ii) When B is added to copper sulphate solution, it will displace copper.
(iii) The arrangement of metals in order of decreasing reactivity is, $B > A > C > D$.

Q.31. Which of the following pairs will give displacement reactions?

- (a) NaCl solution and copper metal.
- (b) $MgCl_2$ solution and aluminium metal.
- (c) $FeSO_4$ solution and silver metal.
- (d) $AgNO_3$ solution and copper metal.

Ans. (d) $AgNO_3$ solution and copper metal.

Q.32. Give reasons copper is used to make hot water tanks and not steel (an alloy of iron).

Ans. Copper is used to make hot water tanks because it is a very good conductor of heat. The conductivity of steel is less than that of copper.