CHAPTER

3 Metals and Non-metals

CASE STUDY / PASSAGE BASED QUESTIONS

1

Read the following and answer any four questions from 1(i) to 1(v).

The chemical reactivity of an element depends upon its electronic configuration. All elements having less than eight electrons in the outermost shell show chemical reactivity. During chemical reactions, atoms of all elements tend to achieve a completely filled valence shell. Metals are electropositive in nature. They have tendency to lose one or more electrons present in the valence shell of their atoms to form cations and achieve nearest noble gas configuration. The compounds formed by the transfer of electrons from one element to other are known as ionic or electrovalent compounds.

Syllabus

Properties of metals and non-metals;

Reactivity series; Formation and properties of ionic compounds.

(i) The electronic configurations of three elements *X*, *Y* and *Z* are :

X : 2 *Y* : 2, 8, 7 *Z* : 2, 8, 2

Which of the following is correct regarding these elements?

(a) *X* is a metal. (b) *Y* is a metal.

(c) *Z* is a non-metal. (d) *Y* is a non-metal and *Z* is a metal.

(ii) Element *X* reacts with element *Y* to form a compound *Z*. During the formation of compound *Z*, atoms of *X* lose one electron each whereas atoms of *Y* gain one electron each. Which of the following properties is not shown by compound *Z*?

(a) High melting point

(b) Low melting point

(c) Occurrence as solid

(d) Conduction of electricity in molten state

(iii) Which of the following is correct representation of formation of magnesium chloride?

(a) $Mg : + \times\underset{\times\times}{\overset{\times\times}{Cl}}\times \longrightarrow (Mg^{2+}) \left[\times\underset{\times\times}{\overset{\times\times}{Cl}}\times^{-}\right]_2$

(b) $Mg : + \times\underset{\times\times}{\overset{\times\times}{Cl}}\times \longrightarrow (\dot{M}g) \left(\times\underset{\times\times}{\overset{\times\times}{Cl}}\times\right)$

(c) $Mg : + \underset{\times\times}{\overset{\times\times}{Cl}}\times \longrightarrow (Mg^{2+}) \left[:\underset{\times\times}{\overset{\times\times}{Cl}}\times^{2-}\right]_2$

(d) None of these

(iv) The electronic configuration of sodium ion is

(a) 2, 8, 8 (b) 2, 8, 2 (c) 2, 6 (d) 2, 8.

(v) Which of the following represents an electropositive element?

(a) 2, 8, 6 (b) 2, 8, 8 (c) 2, 8, 8, 1 (d) 2, 7

2

Read the following and answer any four questions from 2(i) to 2(v).

The arrangement of metals in a vertical column in the decreasing order of their reactivities is called the reactivity series or activity series of metals. The most reactive metal is at the top position of the reactivity series. The least reactive metal is at the bottom of the reactivity series.

Hydrogen, though a non-metal, has been included in the activity series of metals only for comparison. Apart from it, the hydrogen atom also has tendency to lose its valence electron and form cation which behaves like metal.

$$H \rightarrow H^+ + e^-$$

(i) Which metal can be displaced by copper from its salt solution?

(a) Zinc (b) Silver (c) Iron (d) Lead

(ii) An element '*X*' after reacting with acids liberates hydrogen gas and can displace lead and mercury from their salt solutions. The metal '*X*' is

(a) copper (b) gold (c) calcium (d) hydrogen.

(iii) The most reactive metal is

(a) potassium (b) barium (c) zinc (d) calcium.

(iv) The metal which does not liberate hydrogen gas after reacting with acid is

(a) zinc (b) lead (c) iron (d) gold.

(v) Which of the following metals does not react with water at all?

(I) Sodium (II) Copper (III) Aluminium (IV) Lead

(a) I and III only (b) IV only (c) II and IV only (d) I, II, III and IV

3

Read the following and answer any four questions from 3(i) to 3(v).

Metals as we know, are very useful in all fields, industries in particular. Non-metals are no less in any way. Oxygen present in air is essential for breathing as well as for combustion. Non-metals form a large number of compounds which are extremely useful, *e.g.*, ammonia, nitric acid, sulphuric acid, etc.

Non-metals are found to exist in three states of matter. Only solid non-metals are expected to be hard however, they have low density and are brittle. They usually have low melting and boiling points and are poor conductors of electricity.

(i) _____ is a non-metal but is lustrous.

(a) Phosphorus (b) Sulphur (c) Bromine (d) Iodine

(ii) Which of the following is known as 'King of chemicals'?

(a) Urea (b) Ammonia (c) Sulphuric acid (d) Nitric acid

(iii) Which of the following non-metals is a liquid?

(a) Carbon (b) Bromine (c) Iodine (d) Sulphur

(iv) Hydrogen is used

(a) for the synthesis of ammonia
(b) for the synthesis of methyl alcohol
(c) in welding torches
(d) all of these.

(v) Generally, non-metals are bad conductors of electricity but '*X*' which is a form of carbon is a good conductor of electricity and is an exceptional non-metal. '*X*' is

(a) diamond (b) graphite (c) coal (d) coke.

4

Read the following and answer any four questions from 4(i) to 4(v).

Ionic compound is a chemical compound in which ions are held together by ionic bonds. An ionic bond is the type of chemical bond in which two oppositely charged ions are held through electrostatic forces. We know that, metal atoms have loosely bound valence electrons in their valence shell and non-metal atoms need electrons in their valence shell to attain noble gas configuration. The metal atom loses the valence electrons while non-metal atom accepts these electrons. By losing electrons, metal atoms change to cations and by accepting electrons, non-metals form anions. Ionic compounds are generally solid and exist in the form of crystal. They have high melting and boiling points.

(i) Which of the following can change to a cation?

(a) Fluorine (b) Oxygen (c) Potassium (d) Neon

(ii) Which of the following can change to an anion?

(a) Iodine (b) Magnesium (c) Calcium (d) Xenon

(iii) Ionic compounds are soluble in _____ .

(a) Kerosene (b) Petrol (c) Water (d) None of these

(iv) Which of the following statements is correct about ionic compounds?

I. They conduct electricity in solid state.
II. They conduct electricity in solutions.
III. They conduct electricity in molten state.

(a) I only (b) II only (c) III only (d) II and III only

(v) Select the incorrect statement.

(a) Ionic compounds are generally brittle.
(b) Ions are the fundamental units of ionic compounds.
(c) Formation of ionic bonds involve sharing of electrons.
(d) NaCl is an ionic compound.

5

Read the following and answer any four questions from 5(i) to 5(v).

An element is a pure substance made up of same kind of atoms. At present, nearly 118 elements are known but all of them do not occur free in nature, some of them have been synthesized by artificial methods. Based on their properties, they are mainly classified as metals and non-metals. Metals are those elements which lose electrons and form positive ions *i.e.,* they are electropositive in nature. They are generally hard, good conductors of heat and electricity, malleable, ductile and have striking lustre. They have a significant role to play in our daily life.

(i) Metals which are of vital importance to the national defence, energy and industry sector are called strategic metals. Which of the following is a strategic metal?

(a) Titanium (b) Zirconium (c) Manganese (d) All of these

(ii) Which metal is the best conductor of electricity?

(a) Silver (b) Platinum (c) Nickel (d) Iron

(iii) Which of the following metals is not a coinage metal?

(a) Copper (b) Silver (c) Iron (d) Gold

(iv) Which of the following are the most malleable metals?

(I) Sodium (II) Gold (III) Potassium (IV) Silver

(a) (I) and (IV) (b) (II) and (III) (c) (III) and (IV) (d) (II) and (IV)

(v) Identify the correct statement(s).

(I) The wires that carry current in our homes have a coating of PVC or a rubber like material.

(II) School bells are made of metals.

(III) Metals do not conduct electricity.

(IV) Metals which produce a sound on striking a hard surface are said to be non-sonorous.

(a) (I) and (III) (b) (I) and (II) (c) (III) and (IV) (d) Only (II)

6

Read the following and answer any four questions from 6(i) to 6(v).

The chemical properties of metals are mostly linked with the electron releasing tendency of their atoms. Greater the tendency, more will be the reactivity of the metal. They react with oxygen, water, hydrogen, acids, etc. Since they can lose electrons, they act as reducing agents. Some reactions of metals are given as :

Metal + Oxygen $\longrightarrow$ Metal oxide

Metal + Water $\longrightarrow$ Metal hydroxide + Hydrogen

Metal + $Acid_{(dilute)}$ $\longrightarrow$ Metal salt + Hydrogen

Metal X + Salt solution of metal Y $\longrightarrow$ Salt solution of X + Y (Displacement reaction)

(i) Metals such as _____ and _____ react so vigorously that they catch fire if kept in the open. Hence, to protect them and to prevent accidental fires, they are kept immersed in _____.

(a) phosphorus, magnesium, water (b) sodium, potassium, kerosene oil

(c) sodium, potassium, water (d) tin, lead, alcohol

(ii) Which of the following pairs will give displacement reaction?

(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

(iii) There are four metals K, L, M and N. Identify them by using the hints given below.

K forms basic oxide.

L forms amphoteric oxide.

Oxide of M dissolves in water to form alkali.

N does not react with water at all.

(a) $K \rightarrow$ Zn, $L \rightarrow$ Al, $M \rightarrow$ Na, $N \rightarrow$ Fe (b) $K \rightarrow$ Fe, $L \rightarrow$ Na, $M \rightarrow$ K, $N \rightarrow$ Zn

(c) $K \rightarrow$ K, $L \rightarrow$ Cu, $M \rightarrow$ Pb, $N \rightarrow$ Na (d) $K \rightarrow$ Cu, $L \rightarrow$ Zn, $M \rightarrow$ K, $N \rightarrow$ Pb

(iv) Which metal does not react with dilute hydrochloric acid?

(a) Iron (b) Sodium (c) Zinc (d) Copper

(v) 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.

7

Read the following and answer any four questions from 7(i) to 7(v).

On the basis of reactivity of different metals with oxygen, water and acids as well as displacement reactions, the metals have been arranged in the decreasing order of their reactivities. This arrangement is known as activity series or reactivity series of metals.

The basis of reactivity is the tendency of metals to lose electrons. If a metal can lose electrons easily to form positive ions, it will react readily with other substances. Therefore, it will be a reactive metal. On the other hand, if a meal loses electrons less rapidly to form a positive ion, it will react slowly with other substances. Therefore, such a metal will be less reactive.

(i) Which of the following metals is less reactive than hydrogen?
(a) Copper (b) Zinc (c) Magnesium (d) Lead

(ii) Which of the following metals is more reactive than hydrogen?
(a) Mercury (b) Platinum (c) Iron (d) Gold

(iii) Which of the following metals reacts vigorously with oxygen?
(a) Zinc (b) Magnesium (c) Sodium (d) Copper

(iv) Which of the following represents the correct order of reactivity for the given metals?
(a) Na > Mg > Al > Cu (b) Mg > Na > Al > Cu (c) Na > Mg > Cu > Al (d) Mg > Al > Na > Cu

(v) Hydrogen gas is not evolved when a metal reacts with nitric acid. It is because HNO_3 is a strong oxidising agent. It oxidises the H_2 produced to water and itself gets reduced to any of the nitrogen oxides (N_2O, NO, NO_2). But _____ and _____ react with very dilute HNO_3 to evolve H_2 gas.
(a) Pb, Cu (b) Na, K (c) Mg, Mn (d) Al, Zn

8

Read the following and answer any four questions from 8(i) to 8(v).

Non-metals are highly electronegative in nature. They have a tendency to gain electrons in their valence shell to achieve nearest noble gas configuration. Thus, they form anions and act as good oxidising agents.

$$\underset{\text{(non-metal atom)}}{X} + ne^- \longrightarrow \underset{\text{(anion)}}{X^{n-}}$$

They react with air or oxygen on heating to form oxides which react with water to form acids. Thus, non-metal oxides are acidic in nature. Non-metals do not react with dilute acids at all. This is because they are electronegative and therefore, cannot displace hydrogen from acids but they form covalent hydrides when heated with hydrogen.

(i) The acid formed when sulphur trioxide reacts with water is
(a) sulphurous acid (b) sulphuric acid (c) both (a) and (b) (d) none of these.

(ii) An element '*X*' forms an oxide XO_2, which is a very useful gas used in the process of photosynthesis. The element '*X*' is
(a) sulphur (b) nitrogen (c) carbon (d) phosphorus.

(iii) Non-metals generally act as
(a) oxidising agents (b) reducing agents (c) both (a) and (b) (d) none of these.

(iv) Which of the following elements produces basic oxide on reacting with oxygen?
(a) Chlorine (b) Sulphur (c) Phosphorus (d) Magnesium

(v) Which of the following is a covalent hydride?

(a) CH_4 (b) NH_3 (c) H_2S (d) All of these

9

Read the following and answer any four questions from 9(i) to 9(v).

Although there is no sharp line of distinction between metals and non-metals yet there are some distinctive differences. The main points of differences are :

Property	Metals	Non-metals
Electronic structure	They have 1 to 3 electrons in the outermost shell of their atoms.	They have 4 to 8 electrons in the outermost shell of their atoms.
State of existence	They are mostly solid at room temperature except mercury and gallium which are liquid.	They are either solids or gases at room temperature (except bromine which is a liquid).
Density	They have high density.	They have low density.
Nature of ions	They are electropositive elements and hence, lose one or more electrons to form positive ions.	They are electronegative elements and hence, gain one or more electrons to form negative ions.
Nature of chlorides	They generally combine with chlorine to form solid ionic chlorides which conduct electricity in the aqueous solution or in the molten state.	They combine with chlorine to form covalent chlorides. These are either gases or liquids. Non-metal chlorides do not contain ions, therefore, they do not conduct electricity.
Nature of oxides	They form basic oxides, though some oxides are amphoteric also.	They form acidic or neutral oxides.
Displacement of hydrogen from acids	Metals which lie above hydrogen in the reactivity series displace hydrogen from acids.	They do not displace hydrogen from acids.

(i) Match column-I with column-II and select the correct option using the given codes.

Column-I	Column-II
P. A metal that forms amphoteric oxides	(I) Ga
Q. A metal which melts when keep on our palm	(II) Au
R. A metal that has highest density	(III) Al
S. A metal which cannot displace hydrogen from acids	(IV) Os

(a) P-(II), Q-(I), R-(III), S-(IV) (b) P-(III), Q-(I), R-(IV), S-(II)

(c) P-(IV), Q-(II), R-(III), S-(I) (d) P-(III), Q-(II), R-(I), S-(IV)

(ii) State True (T) or False (F) for the following statements.

(I) Non-metals react with acids to give a salt and hydrogen gas.

(II) Zinc oxide is amphoteric in nature.

(III) Copper oxide is basic in nature.

(IV) Hydrogen gas is evolved when a metal reacts with dilute acid.

(V) Copper reacts vigorously with dilute HCl.

	(I)	(II)	(III)	(IV)	(V)
(a)	F	T	F	T	T
(b)	T	F	T	F	F
(c)	F	T	F	F	T
(d)	F	T	T	T	F

(iii) Tick (✓) the correct statements and cross (×) the incorrect statements.

(I) Non-metals are either solids or gases except mercury which is a liquid.

(II) Sodium is a metal and can lose its electrons easily.

(III) Most non-metals produce acidic oxides when dissolved in water. Most metals produce basic oxides on reaction with water.

(IV) Graphite is a conductor of electricity.

	(I)	(II)	(III)	(IV)
(a)	✓	×	✓	×
(b)	×	✓	×	✓
(c)	×	✓	✓	✓
(d)	×	✓	✓	×

(iv) An element *X* (atomic number 12) reacts with another element *Y* (atomic number 17) to form a compound *Z*. Which of the following statements are true regarding this compound?

I. Molecular formula of *Z* is XY_2.

II. It is soluble in water.

III. *X* and *Y* are joined by sharing of electrons.

IV. It would conduct electricity in the molten state.

(a) II and III only (b) I and II only (c) I, III and IV only (d) I, II and IV only

(v) Which of the following metals form an amphoteric oxide?

(a) Zn (b) Ca (c) Na (d) Cu

10

Read the following and answer any four questions from 10(i) to 10(v).

Sample pieces of five metals *P, Q, R, S* and *T* are added to the tabulated solutions separately. The results observed are shown in the table given below :

Metal	Solutions			
	$CuSO_4$	$ZnSO_4$	$FeSO_4$	$AgNO_3$
P	No change	No change	No change	A coating on metal
Q	Brown coating	—	Grey deposit	A coating on metal
R	No change	No change	No change	No change
S	—	No change	No change	Brown deposit
T	Brown deposit	New coating	New coating	New coating

Based on the observations recorded in the table answer the following questions :

(i) Which is the most reactive metal?

(a) *Q* (b) *R* (c) *S* (d) *T*

(ii) Which is the least reactive metal?

(a) *P* (b) *R* (c) *T* (d) *Q*

(iii) Activity series of elements is

(a) the arrangement of elements in increasing order of reactivity.

(b) the arrangement of elements in decreasing order of reactivity.

(c) the arrangement of oxides of elements in increasing order of reactivity.

(d) none of these.

(iv) Which of the following metal is least reactive?

(a) Zn (b) Cu (c) Ag (d) Fe

(v) Decreasing order of reactivity is

(a) $P > Q > R > S > T$ (b) $Q > T > R > S > P$

(c) $T > Q > S > P > R$ (d) $S > R > Q > T > P$

ASSERTION & REASON

For question numbers 11-30, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below :

(a) Both A and R are true, and R is correct explanation of the assertion.

(b) Both A and R are true, but R is not the correct explanation of the assertion.

(c) A is true, but R is false.

(d) A is false, but R is true.

11. Assertion : Different metals have different reactivities with water and dilute acids.
Reason : Reactivity of a metal depends on its position in the reactivity series.

12. Assertion : Iron is the most widely used metal. But it is never used in its pure state.
Reason : Pure iron is very soft and stretches easily when hot.

13. Assertion : Gold occurs in native state.
Reason : Gold is a reactive metal.

14. Assertion : The property of beating a metal into sheets is called ductility.
Reason : Gold and silver are most malleable metals.

15. Assertion : Silver and gold do not react with oxygen even at high temperatures.
Reason : Silver and gold are less active metals.

16. Assertion : The oxides of sulphur and phosphorus are acidic in nature.
Reason : Metal oxides are basic in nature.

17. Assertion : Bromine cannot displace chlorine from its salt solution.
Reason : Chlorine is more reactive than bromine.

18. Assertion : MgO exists in liquid state.
Reason : The electrostatic forces of attraction between Mg^{2+} and O^{2-} ions constitute ionic bond.

19. Assertion : On reacting with water, calcium starts floating over water.
Reason : Calcium reacts with cold water at room temperature.

20. Assertion : The arrangement of metals in order of decreasing reactivities is called reactivity series.
Reason : Metals at the top of series are very reactive and metals at the bottom are least reactive.

21. Assertion : Non-metals are electronegative in nature.
Reason : They have tendency to lose electrons.

22. Assertion : Ionic compounds have high melting and boiling points.
Reason : A large amount of energy is required to break the strong inter-ionic attraction in ionic compounds.

23. Assertion : Metals in general have very high melting and boiling points.
Reason : Metals have the strongest chemical bonds which are metallic in nature.

24. Assertion : Electrovalency of Na is +1.
Reason : The number of electrons which an atom either loses or gains in the formation of an ionic bond is known as its valency.

25. **Assertion :** Metals generally act as reducing agents.
Reason : The reducing character is expressed in terms of electron releasing tendency.

26. **Assertion :** Magnesium reacts with oxygen upon heating and burns brightly to form magnesium oxide.
Reason : Magnesium oxide is basic in nature.

27. **Assertion :** The reaction of calcium with water is less violent in comparison to that of sodium.
Reason : The heat evolved is not sufficient for the hydrogen to catch fire.

28. **Assertion :** C and N do not react with dil. HCl and dil. H_2SO_4.
Reason : Metals do not react with dil. HCl and dil. H_2SO_4.

29. **Assertion :** Copper displaces silver from silver nitrate solution.
Reason : Copper is more reactive than silver.

30. **Assertion :** Aluminum oxide and zinc oxide are acidic in nature.
Reason : Amphoteric nature means that substance have both acidic and basic character.

HINTS & EXPLANATIONS

1. **(i) (d)**

(ii) (b): '*Z*' is an ionic compound.

(iii) (a): $\underset{2,8,2}{Mg} \longrightarrow \underset{2,8}{Mg^{2+}} + 2e^-$

$\underset{2,8,7}{Cl} + e^- \longrightarrow \underset{2,8,8}{Cl^-}$

$Mg^{2+} + 2Cl^- \longrightarrow MgCl_2$

(iv) (d): $\underset{2,8,1}{Na} \longrightarrow \underset{2,8}{Na^+} + e^-$

(v) (c) : (a) and (d) represent electronegative elements and (b) represents a noble gas.

2. **(i) (b) :** Copper is more reactive than silver thus, it can displace silver from its salt solution.

(ii) (c) : Calcium is more reactive than lead and mercury.

(iii) (a) : Potassium is present at the top of the activity series.

(iv) (d): Gold is below hydrogen in the reactivity series so, it does not liberate hydrogen gas on reaction with acids.

(v) (c) : Metals such as lead, copper, silver and gold do not react with water at all.

3. **(i) (d) :** Iodine is a lustrous non-metal.

(ii) (c) : H_2SO_4 is known as 'King of Chemicals'.

(iii) (b): Bromine exists as a liquid.

(iv) (d)

(v) (b): Graphite conducts electricity because of the delocalised electrons in its structure.

4. **(i) (c) :** Potassium, being a metal, can change to cation by losing its valence electron.

(ii) (a) : Iodine, being a non-metal, can change to anion by gaining electron.

(iii) (c) : Ionic compounds are generally soluble in water and insoluble in kerosene and petrol.

(iv) (d): Ionic compounds do not conduct electricity in solid state as ions are very closely packed and are free to move.

(v) (c) : Formation of ionic bonds involve complete transfer of electrons from metal atom to non-metal atom.

5. **(i) (d):** Titanium, zirconium and manganese are used in defence equipments as they are light and durable and therefore, are called strategic metals.

(ii) (a)

(iii) (c) : Copper, silver and gold are called coinage metals because they are used in making coins, jewellery etc.

(iv) (d)

(v) (b): Metals conduct electricity. Metals which produce a sound on striking a hard surface are said to be sonorous.

6. **(i)** **(b)**

(ii) **(d):** As copper is more reactive than silver, it displaces silver from silver nitrate solution.

(iii) **(d):** CuO is basic in nature, ZnO is amphoteric in nature.
Oxide of potassium dissolves in water to form alkali.
$K_2O_{(s)} + H_2O_{(l)} \longrightarrow 2KOH_{(aq)}$
Pb does not react with water at all.
Thus, *K*, *L*, *M* and *N* are Cu, Zn, K and Pb respectively.

(iv) **(d)**

(v) **(c):** Zinc being more reactive than tin can react with food elements kept in food cans.

7. **(i)** **(a):** Copper is placed below hydrogen in activity series therefore, it is less reactive than hydrogen.

(ii) **(c):** Iron is placed above hydrogen in activity series therefore, it is more reactive than hydrogen.

(iii) **(c)** **(iv)** **(a)**

(v) **(c)**

8. **(i)** **(b):** $SO_3 + H_2O \longrightarrow H_2SO_4 + \text{heat}$

(ii) **(c):** Carbon forms CO_2 on reaction with oxygen. During photosynthesis plants take in CO_2.

(iii) **(a):** Non-metals act as oxidising agents since they can accept electrons.

(iv) **(d):** Magnesium, being a metal, produces basic oxide on reaction with oxygen.

$$2Mg + O_2 \longrightarrow 2MgO$$

(v) **(d):** Carbon, nitrogen and sulphur are non-metals hence, they form covalent hydrides.

9. **(i)** **(b)** **(ii)** **(d)**

(iii) **(c)**

(iv) **(d):** An element (*X*) with atomic number 12 is Mg. Element (*Y*) with atomic number 17 is Cl. Therefore, compound (*Z*) will be $MgCl_2$. It is soluble in water. It is an ionic compound and it conducts electricity in the molten state.

(v) **(a)**

10. **(i)** **(d):** The most reactive metal is *T*.

(ii) **(b):** The least reactive metal is *R*.

(iii) **(b)** **(iv)** **(c)**

(v) **(c):** $T > Q > S > P > R$

11. **(a):** The metals placed at the top of the series are most reactive.

12. **(a)**

13. **(c):** Gold is a noble metal.

14. **(d):** The property of beating a metal into sheets is called malleability.

15. **(a)**

16. **(b):** Sulphur and phosphorus are non-metals. Non-metals form either acidic or neutral oxides.

17. **(a)**

18. **(d):** MgO exists in solid state.

19. **(b):** Calcium floats over water because the bubbles of hydrogen gas formed get stick to the surface of the water.

20. **(b):** Metals at the top of the series are very reactive and therefore, they do not occur free in nature. The metals at the bottom of the series are least reactive and therefore, they normally occur free in nature.

21. **(c):** Non-metals have a tendency to gain electrons.

22. **(a)** **23.** (a)

24. **(a)**

25. **(b):** Metals have a strong tendency to lose electrons and hence they behave as reducing agents.

26. **(b):** Metals react with oxygen to form metal oxides which are basic in nature.

27. **(a)**

28. **(c):** Metals react with dilute HCl and dil. H_2SO_4. Non-metals do not react with dilute acids.

29. **(a)**

30. **(d):** Aluminum and zinc oxides are amphoteric in nature.