

## Long Answer Questions

Q1. Define metals. Write down physical and chemical properties of metals.

Ans. Metals

Metals are the elements which are electropositive and form cations by losing electrons.

Metals can be categorized.

- a. Very reactive: potassium,
- b. Moderately reactive: Zinc, iron, tin and lead.
- c. Least reactive or noble

Physical Properties of Metals

- i. Almost all metals are solids except mercury
- ii. Metals have high melting and boiling points.
- iii. Metals possess metallic luster and can be polished.
- iv. Metals are malleable (can be hammered into sheets), ductile (can be drawn into wires) and give off a tone when hit.

Metals are good conductor of heat and electricity.

Metals have high density.

- vii. Metals are hard (except sodium and potassium).

Chemical Properties of Metals

- i. Metals easily lose electrons and form positive ions.
- ii. Metals readily react with oxygen to form basic oxides.
- iii. Metals usually form ionic compounds with non metals.
- iv. Metals have metallic bonding.

Q2. Write a note on electropositive character of metals.

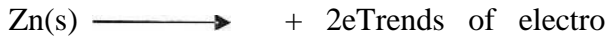
Ans. Electropositive character or Metallic character

Metals have the tendency to lose their valence electrons. This property of a metal is termed as electropositivity or metallic character.

Explanation  
A metal loses its electrons more easily, therefore more electropositive it will be. The number of electrons lost by an atom of a metal is called its valency. For example, sodium atom can lose 1 electron to form a positive ion.



So the valency of sodium metal is 1. Similarly zinc metal can lose two electrons from its valence shell. Therefore, its valency is 2



positivity

In Group

Electropositive character increases down the group because size of atoms increases. For example, lithium metal is less electropositive than sodium which is in turn less electropositive than potassium.

In Period

Electropositive character decreases across the period from left to right in periodic table because size of atoms decrease due to increase of nuclear charge. It means elements in the start of a period are more metallic. This character decreases as we move from left to right along the period.

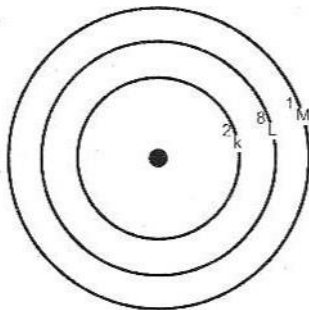
Q3. What is the relationship between electropositivity and ionization energy?

OR

Compare the ionization energies of alkali and alkaline earth metals

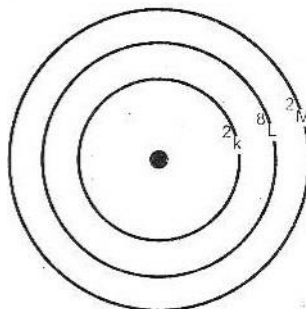
Ans. Relationship between Electropositivity and ionization energy

Electropositive character depends upon the ionization energy which in turn depends on size and nuclear charge of the atom. Small sized atoms with high nuclear charge have high ionization energy. In this way atoms having high ionization energy are less electropositive or metallic. That is the reason alkali metals have the largest size and the lowest ionization energy in their respective periods. Therefore, they have the highest metallic character. For example, a comparison of sodium and magnesium metals is given below for understanding.



Sodium Atom

34 electron configuration  
having atomic size 186pm,



Magnesium Atom

3s<sup>2</sup> electron configuration  
having atomic size 160pm,

and ionization energy 496 KJrn01

and ionization energy  
1450Kdmol

The 1<sup>st</sup> ionization energy of magnesium is high but the 2<sup>nd</sup> ionization energy of magnesium is very high. It becomes very difficult to remove second electron from the Mg<sup>+</sup> ion as nuclear

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charge attracts the remaining electrons strongly. As a result of this attraction, the size of the ion decreases. Similarly all the elements of alkaline earth metals have high ionization energies as compared to alkali metals as shown in table.

| Metal     | Atomic Number | Electronic Configuration | IE  | Metal | Atomic Number | Electronic Configuration | IE1 | IE2  |
|-----------|---------------|--------------------------|-----|-------|---------------|--------------------------|-----|------|
| <b>Li</b> | 3             | [He] 2 s                 | 520 | Be    | 4             | [He] 2 s                 | 899 | 1787 |
| K         | 11            | [Ne] 3 s <sup>1</sup>    | 496 | Mg    | 12            | [Ne] 3 s <sup>2</sup>    | 738 | 1450 |
|           | 19            | Ar 4 s                   | 419 | Ca    | 20            | [Ar] 4 s                 | 590 | 1145 |
|           | 37            |                          | 403 | Sr    | 38            |                          | 549 | 1064 |
|           | 55            |                          | 377 | Ba    | 56            |                          | 503 | 965  |

Note: Low ionization energies of alkali metals make them more reactive than alkaline earth metals.

(24. Write a note on reactivities of Alkali and Alkaline earth metals.

Ans. Alkali and Alkaline earth metals

The elements in first two groups of the periodic table Group-I and Group-2 are called Alkali and Alkaline-earth metals respectively.

Explanation

Alkali metals are extremely reactive elements because of their  $ns^1$  valence electronic configuration. As there is only one electron in the valence shell, it can be easily given out. It is the reason that they are always found in nature as cations with + I oxidation state. Therefore, they readily form salts with non metals.

The alkaline earth metals atoms are smaller and have more nuclear charge, They have two electrons in their valence shells. They are also reactive but less than alkali metals.

Q5. Compare the chemical properties of Alkali and Alkaline earth metals.

Ans Chemical properties of Alkali and Alkaline earth metals

| Alkali Metals | Alkaline Earth Metals                                                                                                                                                                     |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1             | <u>Occurrence</u>                                                                                                                                                                         |
|               | They are very reactive and always occur in combined form                                                                                                                                  |
| 2             | Electro ositivit                                                                                                                                                                          |
|               | They are highly electropositive. They have ionization energy values ranging from 520 kJ.mol <sup>-1</sup> for Li to 376 kJ.mol <sup>-1</sup> for cs.                                      |
| 3             | Reaction with water                                                                                                                                                                       |
|               | They react with water vigorously at room temperature to give strong alkaline solution and hydrogen gas.<br>$2\text{Na} + 2\text{H}_2\text{O} \longrightarrow 2\text{NaOH} + \text{H}_2$   |
|               | They react with water less vigorously and on heating they produce weak bases. Mg + H <sub>2</sub> O → Mg(OH) <sub>2</sub> + H <sub>2</sub><br>M O + H <sub>2</sub> O → M(OH) <sub>2</sub> |

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- |                                                                                                                                                                                          |                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>4 Reaction with O<sub>2</sub><br/>They immediately tarnish in air giving their oxides which form strong alkalis in water</p> $4M + O_2 \rightarrow 2M_2O$ $20H, 20 \rightarrow 2NaOH$ | <p>8 Reaction with Carbon<br/>They are less reactive towards oxygen and oxides are formed on heating. <math>2Mg + O_2 \rightarrow 2MgO</math></p> |
| <p>5 Reaction with Hydrogen They form ionic hydrides with 1-12 at high temperature<br/><math>2Na + H_2 \xrightarrow{P} 2NaH</math></p>                                                   | <p>They give hydrides under strong conditions of temperature and pressure<br/><math>Ca + H_2 \xrightarrow{P} CaH_2</math></p>                     |
| <p>6 Reaction with Halogens They react violently with halogens at room temperature to give halides<br/><math>2Na + Cl_2 \rightarrow 2NaCl</math></p>                                     | <p>They react slowly with halogens to give their halides.<br/><math>Ca + Cl_2 \rightarrow CaCl_2</math></p>                                       |
| <p>7 Reaction with nitrogen<br/>They do not form nitrides directly</p>                                                                                                                   | <p>They form stable nitrides when heated with nitrogen. <math>3M + N_2 \rightarrow 3MN</math></p>                                                 |

They do not react with carbon They give stable carbides on heating with direct carbon.

Q6. Write a comparison of physical properties of alkali metals and alkaline earth metals.

Ans. Physical properties of alkali metals and alkaline earth metals

| Property               | Sodium                                                                      | Magnesium              | Calcium                        |
|------------------------|-----------------------------------------------------------------------------|------------------------|--------------------------------|
| Appearance             | Silvery white having a metallic luster, very soft and can be cut with knife | Silvery white and hard | Silvery grey and fairly harder |
| Atomic/Ionic size (pm) | 186,102                                                                     | 160,72                 | 197,99                         |
| Relative density       | 0.98 gcm <sup>-3</sup> . Floats on water                                    | 1.74 gcm <sup>-3</sup> | 1.55 gcm <sup>-3</sup>         |
| Malleability           | Very malleable and ductile                                                  | Malleable and ductile  | Malleable and ductile          |

|                   |                                        |                                        |                                        |
|-------------------|----------------------------------------|----------------------------------------|----------------------------------------|
| M.P               | 970C                                   | 6500C                                  | 8510C                                  |
|                   | 883 °c                                 | 1090 °c                                | 1484 °C                                |
| Ionization energy | 496 kJ/m01                             | IE1738,1450 J/mol                      | 590 IE1 1145 IE2 kJ/m01                |
| Flame in air      | Golden yellow                          | Brilliant white                        | Brick red                              |
| Conductivity      | Good conductor of heat and electricity | Good conductor of heat and electricity | Good conductor of heat and electricity |

Q7. Explain Inertness of Noble Metals

Ans. Inertness of Noble Metals

The elements in which d-orbital are in the process of filling, constitute a group of metals called transition metals or d-group elements. They exhibit a variety of oxidation states. Figure shows the metals of 4<sup>th</sup>, 5<sup>th</sup> and the 6<sup>th</sup> period of the periodic table which are called transition metals. There are three series of transition elements, each series consisting of ten elements.

| Transition metals (d-block elements) |                       |                     |                        |                        |                       |                      |                       |                     |                     |
|--------------------------------------|-----------------------|---------------------|------------------------|------------------------|-----------------------|----------------------|-----------------------|---------------------|---------------------|
| 3                                    | 4                     | 5                   | 6                      | 7                      | 8                     | 9                    | 10                    | 11                  | 12                  |
| 21<br>Sc<br>Scandium                 | 22<br>Ti<br>Titanium  | 23<br>V<br>Vanadium | 24<br>Cr<br>Chromium   | 25<br>Mn<br>Manganese  | 26<br>Fe<br>Iron      | 27<br>Co<br>Cobalt   | 28<br>Ni<br>Nickel    | 29<br>Cu<br>Copper  | 30<br>Zn<br>Zinc    |
| 39<br>Y<br>Yttrium                   | 40<br>Zr<br>Zirconium | 41<br>Nb<br>Niobium | 42<br>Mo<br>Molybdenum | 43<br>Tc<br>Technetium | 44<br>Ru<br>Ruthenium | 45<br>Rh<br>Rhodium  | 46<br>Pd<br>Palladium | 47<br>Ag<br>Silver  | 48<br>Cd<br>Cadmium |
| 71<br>Hf<br>Hafnium                  | 72<br>Ta<br>Tantalum  | 73<br>W<br>Tungsten | 74<br>Re<br>Rhenium    | 75<br>Os<br>Osmium     | 76<br>Ir<br>Iridium   | 77<br>Pt<br>Platinum | 78<br>Au<br>Gold      | 79<br>Hg<br>Mercury |                     |

Chemical behaviour of the first transition series is similar to active metals except copper. Three transition metals belonging to group I are copper, silver and gold. Out of them gold and silver are relatively inactive metals because they do not lose electrons easily.

Q8, Write a note on silver, gold and platinum.

Ans. Properties of Silver

- i. It is a white lustrous metal .ii. It is an excellent conductor of heat and electricity. iii. It is also highly ductile and malleable metal. iv. Its polished surfaces are good reflectors of light.

v, Formation of thin layer of oxide or sulphide on its surface makes it relatively inactive. Under normal conditions of atmospheres air does not affect silver. It tarnishes in presence of sulphur containing compounds like H<sub>2</sub>S. Uses of Silver

Being is very soft metal, it is rarely used as such. Alloys of silver with copper are widely used in making coins, silver-ware and ornaments. Compounds of silver are widely used in

photographic films and dental preparations. Silver also has important applications in mirror industry.

#### Properties of Gold

1. It is a yellow soft metal. It is most malleable and ductile of all the metals.

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- ii. one gram of gold can be drawn into a wire of one and half kilometer long.
- iii. Gold is very non-reactive or inert metal. It is not affected by atmosphere. It is even not affected by any single mineral acid or base.

#### Uses of Gold

Because of its inertness in atmosphere, it is an ornamental metal as well as used in making coins. Gold is too soft to be used as such. It is always alloyed with copper, silver or some other metal.

- i. It is used to make jewelry items because of its unique characteristics like colour, beauty, strength, flexibility and resistance to tarnish.
- ii. It provides a secure setting for diamonds and other gemstones, enhancing their brilliance
- iii. Platinum alloyed with palladium and rhodium is used as catalyst in auto-mobiles as catalytic convertor, They convert most of the gases being emitted by vehicles into less harmful carbon dioxide, nitrogen and water vapour.

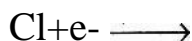
#### Uses of Platinum

Platinum is used in the production of hard disk drive coatings and fiber optic cables, platinum is used in the manufacturing of fiber glass reinforced plastic and glass for liquid crystal displays (LCD).

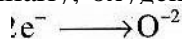
Q9. What are non-metals? Explain electronegative characteristics of non-metals

Ans. Non Metals

Non- metals form negative ions (anions) by gaining electrons. In this way, non-metals are electronegative in nature and form acidic oxides. The valency of some non-metals depends upon the number of electrons accepted by them. For example valency of chlorine atom is 1, as it accepts only one electron in its valence shell.



Similarly, oxygen atom can accept two electrons; therefore, its valency is 2.



0+2 eExplanation

The non-metallic character depends upon the electron affinity and electronegativity of the atom. Small sized elements having high nuclear charge are electronegative in nature, They have high electron affinity. Therefore, they possess non-metallic nature. Hence nonmetallic character decreases in a group downward and increases in a period from left to right up to halogens. That is the reason fluorine is the most non-metallic in character.

The non-metals are, therefore, elements in Group-14 (carbon), Group-15 (nitrogen and phosphorus), Group-16 (oxygen, sulphur and selenium) and in Group-17 halogens (fluorine,



Q12. What is meant by halogens? Compare the reactivity of halogens in detail.

Ans. Halogens

Halogen means salt formers. Elements of Group-17 of the periodic table consist of fluorine, chlorine, bromine, iodine and astatine. They are collectively called halogens.

Explanation

Fluorine and chlorine exist as diatomic gases at room temperature. Interestingly, the intermolecular forces of attraction increases downward in the group due to the increase in the size of atom. Due to this reason bromine exists as a liquid and iodine as solid. Some physical properties of halogens are shown in table.

| Elements | Atomic Numbers | Electronic Configuration | Colour          | Electronegativity values | Melting Point (K) | Boiling Point (K) |
|----------|----------------|--------------------------|-----------------|--------------------------|-------------------|-------------------|
|          | 9              | [He] $2s^2 2p^5$         | Pale yellow     | 4.0                      | 53                | 85                |
|          | 17             | [Ne] $3s^2 3p^5$         | Greenish Yellow | 3.2                      | 172               | 238               |
|          | 35             | [Ar] $4s^2 4p^5$         | Radish Brown    | 3.0                      | 266               | 332               |
| 1        | 53             | [Kr] $5s^2 5p^5$         | Purple Black    | 2.7                      | 387               | 457               |

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In general they have valence shell electronic configuration of  $ns np^5$ . Since halogens have only one electron deficit in their valence shell; either they can readily accept an electron from a metal or they can share, an electron with other non-metals. Thus halogens form ionic bonds with metals and covalent bond with non-metals.

Q13. Explain the significance of non-metals.

Ans. Although non-metals are fewer than metals, yet they are highly significant. They are equally important for human beings, animals and plants, In fact, life would not have been possible without the presence of non-metals on earth,

i. Composition

Major components of earth's crust, oceans and atmosphere are non-metals: oxygen has the highest percentage in earth's crust (47%) and oceans (86%) and it is the second (21%) to nitrogen in atmosphere. It indicates the importance of oxygen in nature. To maintain the balance for the amount of non-metals in nature, different cycles like water cycle,

nitrogen cycle etc have been established naturally .ii. Important role in the composition of living organisms

Non-metals are essential part of the body structure of all living things. Human body is made up of about 28 elements. But about 96% of the mass of the human body is made up of just four elements i.e. oxygen 65% carbon 18% hydrogen 10% and nitrogen 3%. Similarly, plant bodies are made up of cellulose, which is composed of carbon, hydrogen and oxygen. iii. Essential for life

Life owes to non-metals as without  $O_2$  and  $CO_2$  (essential gases for respiration of animals and plants respectively), life would not have been possible. In fact, these gases are essential for the existence of life,

#### iv. Maintenance of life

All eatables like carbohydrates, proteins, fats, vitamins, water, milk etc which are necessary for the growth and development of body are made up on non-metals, carbon hydrogen or oxygen. It shows that non-metals play a vital role for the maintenance of life. V. Essential for the survival of life

The essential compound for the survival of life of both animals and plants is water, which is made up of non-metals, water is not only major part by mass of animals and plants bodies, but it is also essential to maintain the life. We can survive without water for days but not for a long period: its shortage may cause death. vi. Importance of nitrogen

Another important non-metal is nitrogen, which is 78% in atmosphere. It is necessary for the safety of life on earth. It controls the fire and combustion processes, otherwise all the things around us could burn with a single flame.

#### vii. Important role for the communication in life

Non-metals are playing essential role for the communication in life. All fossil fuels which are the major sources of energy, coal, petroleum and gas are made up of carbon and hydrogen. Even the essential component of combustion of fossil fuels, oxygen is also a nonmetal.

#### viii. Mode of protection in our daily life

Non-metals protect us in a way, the clothes we wear are made of cellulose (natural fiber) or polymer (synthetic fiber).

#### ix. Role in industrial goods

In addition to all of these, other items used in daily life such as wooden or plastic furniture, plastic sheets and bags, plastic pipes and utensils are made of non-metallic elements.

#### x. Role in the manufacturing of medicinal items

All the pesticides, insecticides, fungicides and germicides consist of non-metals as major Constituents.

Q14. Discuss the inert character of silver and gold?

Ans. Inert Character of silver

Silver is white lustrous metal. Formation of thin layer of oxides or sulphides on its surface makes it relatively unreactive. Under normal conditions of atmosphere, air does not affect silver. It tarnishes in presence of sulphur containing compounds like  $H_2S$ . Inert Character of Gold;

Gold is yellow soft metal. Gold is very non reactive or inert metal because it is not affected by atmosphere. It is even not affected by any single mineral acid or base.

Q15. What are the physical properties of calcium metal? Give its uses.

Ans. Physical properties of calcium

There are following physical properties of calcium.

i. Calcium is silvery grey and fairly harder.

ii. Its density is  $1.55 \text{ g cm}^{-3}$ .

iii. It is malleable and ductile.

iv. It is good conductor of heat and electricity.

v. Its melting point is  $851^\circ\text{C}$  and boiling point is  $1484^\circ\text{C}$ .

vi. Its flame colour is brick red.

Uses of Calcium

i. It is used to remove sulphur from petroleum products. ii. It is used as reducing agent to produce Cr, U and Zr.

Q16. Why cations are smaller and anions are bigger in size than their respective neutral atoms?

Ans. Cation is smaller than its neutral atom

We know that a cation is formed by the removal of one or more electrons from the atoms. Thus a cation has smaller number of electrons than its parent atom. With the decrease of number of electrons, the magnitude of effective nuclear charge increases, which pulls the electron cloud of the cation near to the nucleus and thus makes the cation smaller in size than its parent's neutral atom.

Anion is bigger in size than its neutral atom.

Anion is formed by addition of electron, the coming electron reduces the attraction of nucleus to electrons that is why, its size increases as compared to neutral atom.

Q18. Discuss why hardness and softness of a metal depends upon its metallic bonding

Ans. Softness and hardness of metals can be explained with the help of metallic bond. Metals are soft if they have weak metallic bond and they have the spaces between the metal atoms that is why they are soft metals. While some metals have strong metallic bond and free

electrons spread the charge in the space, due to strong charge density .Q19. Give the chemical properties of magnesium and its uses.

Ans. Chemical properties of magnesium

Chemical properties of magnesium are following:

i. Reaction with water

It reacts with water less vigorously and on heating produces weak base.



ii. Reaction with oxygen

It reacts with oxygen and oxides magnesium is formed on heating



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### iii. Reaction with Nitrogen

It forms stable nitrides when heated with nitrogen



### Uses of Magnesium

There are following uses of magnesium .

i. Magnesium is used in flash lights and in fire works ii.

It is used in the manufacture of light alloys.

iii. Magnesium ribbon is used in Thermite process to ignite aluminum powder iv.

Magnesium is used as anode for prevention of corrosion

Q20. Give the reaction of sodium with  $\text{I}_2, \text{O}_2, \text{Cl}_2$  and  $\text{H}_2$

Ans. Reactions of Sodium

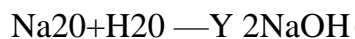
There are following reactions of sodium Reaction of Sodium with water

hydrogen gas.



Reaction of Sodium with Oxygen

Sodium immediately tarnishes in air giving sodium oxide which form strong alkali in water.



Reaction of Sodium with Chlorine

Sodium reacts violently with halogens at room temperature to give halides.



Reaction of Sodium with Hydrogen

Sodium form ionic hydride with  $\text{H}_2$  at high temperature

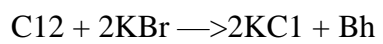
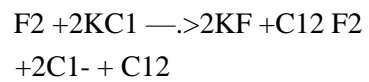


Q21. Explain the important reactions of halogens.

Ans. Important Reactions of Halogens

i. Oxidizing properties

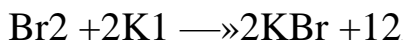
All halogens are oxidizing agents. Fluorine is the strongest oxidizing element while iodine is the least i.e. is mild oxidizing agent. Fluorine will oxidize any of halide ion (X) in solution and changes itself to  $\text{F}^{-1}$  ion. Similarly chlorine will displace  $\text{Br}^{-}$  and  $\text{I}^{-}$  ion from their salt solutions and oxidize them to bromine and iodine.



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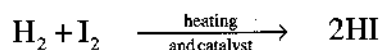
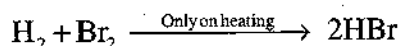
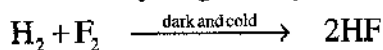
Solution turns from colourless to reddish brown.



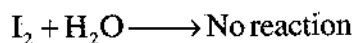
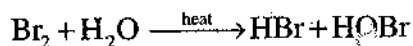
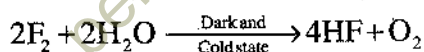
## ii. Reaction with hydrogen

All halogens ( $\text{X}_2$ ) combine with hydrogen to give hydrogen halides ( $\text{HX}$ ). However the chemical affinity for  $\text{H}_2$  decreases down the group from  $\text{F}_2$  to  $\text{I}_2$ . Fluorine combines with hydrogen even in the dark and cold states. Chlorine reacts with hydrogen in the presence of sunlight. Bromine and iodine react with hydrogen only on heating.

## iii. Reaction with water



Fluorine ( $\text{F}_2$ ) decomposes water in cold state and in dark. Chlorine decomposes water in presence of sunlight. Bromine only react with water under special conditions. Iodine does not give this reaction.



## iv. Reaction with methane

Fluorine ( $\text{F}_2$ ) reacts violently with methane ( $\text{CH}_4$ ) in dark. Chlorine ( $\text{Cl}_2$ ) does not react with methane in dark. However in the presence of bright sunlight the reaction is violent.



In presence of diffused sunlight the reaction of chlorine with methane is slow and gives series of compounds i.e  $\text{CH}_3\text{Cl}$ ,  $\text{CH}_2\text{Cl}_2$ ,  $\text{CHCl}_3$  and  $\text{CCl}_4$ .

v. Reaction with Sodium hydroxide.

Chlorine reacts with cold dilute NaOH to give sodium hypochlorite.  $2\text{NaOH} + \text{Cl}_2 \rightarrow \text{NaCl} + \text{NaOCl} + \text{H}_2\text{O}$

$\text{Cl}_2$  reacts with hot conc. NaOH to give sodium chlorate.



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# Short Answer Questions

Q1. Define metal. How metals, can be categorized?

Ans. Metals are the elements which are electropositive and form cations by losing electrons. Metals can be categorized in followings.

1. Very reactive metals
2. Moderately metals
3. Least reactive metals

Q2. Write down any two physical properties of metals.

Ans. Physical properties of metals are:

- (i) Almost all metals are solids.
- (ii) All metals have high melting and boiling

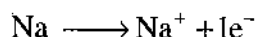
Q3. Write down any two chemical properties of metals.

Ans. Chemical properties of metals are:

- i. Metals can easily lose electrons
- ii. Metals readily react with oxygen to form basic oxides.

Q4. Define electropositive character.

Ans. Metals have the tendency to lose their valence electrons. This property of a metal is called electropositive character or metallic character e.g.



Q5. Write down the trends of electropositive character in periodic table.

Ans. Electropositive character increases down the group and decreases from left to right in a period.

Q6. Why the 2<sup>nd</sup> ionization energy of magnesium is very high than the first one?

Ans. The 2<sup>nd</sup> ionization energy of magnesium is very high because, it is difficult to remove second electron from the Mg ion as nuclear charge attracts the remaining electrons strongly. As a result of nuclear attraction size of the ion decreases. So, it is difficult to remove 2<sup>nd</sup> electron from magnesium ion.

Q7. What type of elements are metals?

Ans. The elements which are electropositive and form cation by losing electrons. This type of elements are metals.

Q8. Name the metal which exists in liquid form.

Ans. Mercury exists in liquid state at room temperature.

Q9. What is the nature of metallic oxides?

Ans. The metallic oxides are basic in nature because they change red litmus paper to blue.

Q10. Which group of metals is highly reactive?

Ans. Group-I of the periodic table is highly reactive in nature.

Q11. Sodium metal is more reactive than magnesium. Why?

Ans. Because sodium is oxidized easily and has low ionization energy where as magnesium is not easily oxidized and has high ionization energy that is why sodium is more reactive.

Q12. Name the metal which can be cut with knife?

Ans. Sodium metal can be cut with knife.

Q13. Name the best ductile and malleable metal

Ans. Cesium is the best ductile and malleable metal.

Q14. Name the metal which is the poorest Conductor of heat?

Ans. Lead metal is the poorest conductor of heat.

Q15. What do you mean by malleable and ductile?

Ans. Malleable means can be hammered into sheets and ductile means can be drawn into wires.

Q16. What do you mean by metallic character?

Ans. Metals have the tendency to lose their valence electrons. This property of metal is termed as metallic character.

Q17. Why metallic character increases in group and decreases in a period?

Ans. Metallic character increases in group and decreases in a period because top to bottom in a group atomic size increases and left to right in a period atomic size decreases.

Q18. Define transition elements.

Ans. The elements in which d-orbitals are in the process of filling, constitute a group of metals called transition metals.

Q19. Give the application of silver

Ans. Silver has important applications in mirror industry Q20.

Why silver is not used in pure form?

Ans. \*Because, the formation of oxide or sulphide layer on the surface of silver, makes it relatively inactive in nature, therefore, silver is not used in pure form.

Q21. What do you mean by 24 carat of Gold?

Ans. Purity of gold is shown by carats. That indicates the number of parts by weight a gold that is present is 24 parts of alloy. 24 carat gold is pure in nature.

Q22. Why gold is used to make jewelry?

Ans. Because of its inertness in atmosphere, it is an ornamental metal so it is used to make jewelry

Q23. Why platinum is used for making jewelry?

Ans. Platinum is used to make jewelry items because of its unique strength, flexibility and resistance to tarnish.

Q24. Write down the difference between steel and stainless steel.

Ans. Difference between steel and stainless steel

| Steel                                                                         | Stainless steel                                    |
|-------------------------------------------------------------------------------|----------------------------------------------------|
| Pure steels is the alloy of iron with other metals like nickel, tungston etc. | Stainless steel is the alloy of iron with chromium |

Q25 How platinum is used as a catalyst in automobile and what we advantage of this

Ans. Platinum alloyed with palladium and rhodium is used as catalyst in automobiles as catalytic converter. They convert most of the gases being emitted by vehicles into less harmful carbon dioxide, nitrogen and water vapours.

(226. What are non-metals?)

Ans. Non-metals form negative ions (anions) by gaining electrons. In this way non met Is are electronegative in nature and form acidic oxides.

Q27. On what factor non-metallic character depends?

Ans. The non-metallic character depends upon the electron affinity and electronegativity of the atom.

Q28. Write down the non-metallic character in periodic table

Ans. Non-metallic character decreases from op to bottom in any group and increases left to right in a period.

Q29. Write down two physical properties of non metals.

Ans. Physical properties of non metals are:

i. Non metals are non conductor of heat and electricity.

ii. Non metals have low melting and boiling points.

Q30 Write down two chemical properties of non letals. Ans.

Chemical properties of non metals are:

i. Non metals form ionic compounds with metals and covalent compounds by reacting with one another e.g.  $\text{CO}_2$  ,  $\text{NO}$  etc.

ii. Non metals usually do not react with water.

(231. What are halogens?)

Ans. Halogen means salt former. Elements of group-17 of the periodic table consist of fluorine, chlorine, bromine iodine and astatine. They are collectively called halogens.

Q32. Write down the physical properties of halogens.

Ans. Both fluorine and chlorine exist in gases form, bromine exists in liquid form and iodine exists in solid form.

Q33 Why valency of chlorine is 1?

Ans. Valency of chlorine atom is 1 because it accepts only 1 electron in its outermost shell.

Q34. Which factor controls the non metallic character of the elements?

Ans. The non metallic character depends upon the electron affinity and electronegativity of the atom.

Q35. Why fluorine is more non-metallic than chlorine?

Ans. Because non-metallic character decreases in a group downward and increases in a period from left to right. Fluorine is the first member of group 17 and non metallic character decreases down the group that is why fluorine is more non metallic than chlorine.

Q36. Iodine exists in solid state; can it be beaten with hammer to form sheets?

Ans. No, only solid substances or metals that have the ability to change in sheets by beaten with hammer.

Q37. Can liquids and gases be brittle?

Ans. No, because it is not the property of liquids and gases.

(238. Why the oxygen is called non-metal?

Ans. Oxygen is non metal because all non metals form negative ions by gaining electrons. 🐦

Q39. Name two non metals which are both brittle and non ductile.

Ans. Silicon and graphite are two non metals

Q40. Name the most abundant

Ans. Oxygen has the highest percentage in earth

Q41. Give the non metallic trend of halogenç.\*

Ans. Non metallic character decreases from top to bottom in halogens because of increasing atomic size of atoms.

Q42. Why do the non metals accept electrons readily?

Ans. The non metals accept electrons readily because non metals are electronegative in nature and electron deficient in nature so they form an anion by gaining electrons.

(243. Why non metals do not react with dilute acids while metals do react with acid? Ans. The non metals do not react with dilute acids because non metals are themselves electron acceptors and metals lose electrons readily.

Q44. How can we distinguish a metal from a non metal by simple physical method? Ans. Difference between metals and non metals are

|      | Metal                                             |      | Non metal                                            |
|------|---------------------------------------------------|------|------------------------------------------------------|
|      | Metals are good conductor of heat and electricity | i.   | Non Metals are bad conductor of heat and electricity |
| n.   | Metals possess high melting and boiling points.   | ii.  | Non Metals possess low melting and boiling points.   |
| iii. | Metals bear positive charge                       | iii. | Non metals bear Negative charge                      |

Q45. How we can distinguish a substance is metal or non metals with the help of an acid?

Ans. Yes, we can distinguish a substance is metal or non metal with the help of an acid

| Metal                                                                         | Non metals                                                                                      |
|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Metals react with dilute acids because metals are themselves electron donors. | Non metals do not react with dilute acids because non metals are themselves electron acceptors. |

Q46. Why is HCl a weak acid?

Ans. Because HF does not release its acidity due to presence of hydrogen bonding Q47. Write down the names of very reactive metals.

Ans. Potassium, sodium, calcium, magnesium and aluminum are the very reactive metals.

(248. Write down the names of moderately reactive metals.

Ans. Zinc, iron, tin and lead are the moderately reactive metals.

(249. Write down the names of least Reactive or Noble metals.

Ans. Copper, mercury, silver and gold are the least reactive metals.

(250. Why reactivity of metals increase down the group?

Ans. The reactivity of metals increases down the group because of increasing atomic size,

(251. State the physical properties of metals

Ans. i. Metals have high melting and boiling point ii.

Metals are good conductor of heat and electricity

(252. Why nitrogen forms compounds with alkaline earth metals directly?

Ans. Because alkaline earth metals form stable nitride when heated with nitrogen directly.

Q53. Why the second ionization energy of magnesium is higher than the first one?

Ans. It becomes very difficult to remove the second electron from the magnesium ion  $Mg^{+1}$  because nuclear charge attracts the remaining electrons strongly as the result of this attraction the size of the ion decreases.

Q54. How does oxygen react with group II metals?

Ans. Alkaline earth metals are less reactive towards oxygen. They form oxides when heated with oxygen.



Q55. What is the relationship between electro positivity and ionization energy?

Ans. Electro positivity depends upon the ionization energy which in turn depends upon size and nuclear charge of the atoms. So smaller sized atoms with high nuclear charge have high ionization energy. Atoms having high ionization energy are less electro positive or metallic.

(256. Why does electro positivity decrease from left to right in a period?

Ans. Because electro positive character depends upon the size of the atom. Electro positive character decreases across the period due to decrease in atomic size.

Q57. How does electro positivity depend upon the size and nuclear charge of an atom? Ans. Electro positive character depends upon the size of the atom, greater the size of the atom, greater will be the electro positive character and less nuclear charge. Smaller the size of the atom, smaller will be the electro positive character and greater nuclear charge



Q58. Why ionization energies of alkaline earth metals are higher than alkali metals? Ans.  
Ionization energy of alkaline earth metals is high than alkali metals because the atomic size of alkaline earth metals are smaller and ocenter nuclear charge.

Q59 Why silver and gold are less reactive?

Ans. Silver and oold are less reactive becausc gold and silver are relatively inactive metals and they do not loss electron easily that's why gold and silver are less reactive, Q60. Can pure gold be used lbr making ornaments? If not why?

Ans. No, pure gold cannot be used for making ornaments because gold is too soft and it always used in alloy form With copper, silver or some other metals.

Q61. Why copper is used for making electrical wire?

Ans. Because it is good conductor of heat and electricity.

Q62. What is the trend of variation of in densities of alkali metals?

Ans. Densities of alkali metals increasc down the group -z in atomic mass.

Q63. Which metal is used for metal work?

Ans. Metal work means fire work. The metals used for the metal works or fire work due to its characteristics flame colour when they ignite in atr for example sodium gives golden yellow colour and calcium gives red colour flame.

Q64. Why magnesium is harder than sodium?

Ans. Magnesium is harder than sodium because magnesium has high ionization energy and styonger metallic bond than sodium.

(265. Why calcium is more electropositive than magta'sium?)

Ans. Calcium and magnesium are belonged to the same group and electro positivity of met', s increases when we move from top to bottom in a group, that is why calcium is more electropositive than magnesium.

Q66. Why ionization energy of sodium is less than magnesium?

Ans. Because sodium has greater size than magnesium that is why the ionization of sodium is less than maanesiurn,

Q67. Why the ionization energy of sodium is more than potassium?

Ans. Because electro positive character depends upon the ionization energy which in turn depends on size and nuclear charge of the atom. So the electro positive character increases down the group and ionization value decreases, it become easier to lose their electrons.

That' s why ionization energy of sodium is more than potassium.

Q68. Write down the uses of Sodium

Ans. Uses of Sodium

- i. Sodium-potassium alloy is used as a coolant in nuclear reactor.

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ii. It is used to produce yellow light in sodium vapour lamp.

iii. It is used as a reducing agent in the extraction of metals like Ti.

Q69. Write down the uses of Calcium.

Ans. Uses of Calcium

i. It is used to remove sulphur from petroleum products.

ii. It is used as reducing agent to produce Cr,U,Zr.

(270. Write down the uses of Magnesium.

Ans. Uses of Magnesium

1. Magnesium is used in flash lights and in fire works.

2. It is used in the manufacture of light alloys.

3. Magnesium ribbon is used in Thermite process to ignite aluminum powder.

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4. Magnesium is used as anode for prevention of corrosion.

## Multiple Choice Questions

Multiple Choice Questions

Put a (V) on the correct answer

1. Metals can form ions carrying charges:

- (a) Uni positive (b) Di positive  
(c) Tri positive (d) All of them

2. Which one of the following metals burn with a brick red flame when heated in air?

- (a) Sodium (b) Magnesium  
(c) Iron (d) Calcium

3. Sodium is extremely reactive metal, but it does not react with:

- (a) Hydrogen (b) Nitrogen  
(c) Sulphur (d) Phosphorus

4. Which one of the following is the lightest and floats on water?

- (a) Calcium (b) Magnesium  
(c) Lithium (d) Sodium

5. Pure alkali metals can be cut simply by knife but iron cannot because of alkali metals have:

- (a) Strong metallic bonding  
(b) Weak metallic bonding  
(c) Non-metallic bonding  
(d) Moderate metallic bonding

6. Which of the following is less malleable?

- (a) Sodium (b) Iron  
(c) Gold (d) Silver

7. Metals lose their electrons easily because:

- (a) They are electronegative  
(b) They have electron affinity  
(c) They are electropositive  
(d) Good conductors of heat

8. Which one of the following is brittle?

- (a) Sodium (b) Aluminum

(c) Selenium (d) Magnesium 9. Which one of the following non-metal is lustrous?

(a) Sulphur (b) Phosphorus

(c) Iodine (d) Carbon 10. Non-metals are generally soft, but which one of the following is extremely hard?

(a) Graphite (b) Phosphorus

(c) Iodine (d) Diamond 11. Which one of the following will not react with dilute HCl?

(a) Sodium (b) Potassium

(c) Calcium (d) Carbon

12. Metals are the elements which

(a) Electropositive character

(b) Electronegative character

(c) Both a & b (d) None of these

13. Which one is very reactive metal?

(a) Potassium (b) Sodium

(c) Calcium (d) All of these

14. Which one is a moderately reactive metal?

(a) Copper (b) Mercury

(c) Silver (d) All of these 15. metal

exists in liquid form at room temperature?

(a) Sodium (b) Potassium

(c) Mercury (d) None of these 16.

Metals are conductor of heat and electricity.

(a) Good (b) Bad

(c) Moderately conductor

(d) All these

17. All metals bear:

(a) Positive charge

(b) Negative charge.

(c) Both a & b

(d) None of these

18. Metals possess

(a) Ionic bond

(b) Covalent bond

(c) Co-ordinate bond

(d) Metallic bond

19. Sodium metal has electrons

(a) 10 (b) 12

(c) 11 (d) 14

Which group of elements has low ionization energies?

(a) Alkali Metals

(b) Alkaline earth metals

(c) Halogens

(d) Noble

1. Density of sodium metal is:

(a) 0.98 gcm<sup>-3</sup> (b) 1.74 gcm<sup>-3</sup>

(c) 1.55 gcm<sup>-3</sup> (d) 1.60 gcm<sup>-3</sup> 22.

Density of magnesium is:

(a) 0.98 gcm<sup>-3</sup> (b) 1.74 gcm<sup>-3</sup>

(c) 1.55 gcm<sup>-3</sup> (d) 1.60 gcm<sup>-3</sup> 23.

Deesity of calcium is:

(a) 0.98 gcm<sup>-3</sup> (b) 1.74

gcm<sup>-3</sup> (c) 1.55 gcm<sup>-3</sup> (d)

1.60 gcm<sup>-3</sup>

24. Melting point of sodium is:

(a) 97 °C (b) 650 °C (C) 851 °C (d)

801 °C

25. Melting point of calcium is:

(a) 97 °C (b) 650 °C

(C) 851 °C (d) 801 °C

26. Boiling point of sodium is:

(a) 883 °C (b) 1105 °C 1494 °C (d)

1500 °C

27. Boiling point of magnesium is:

(a) 880 °C (b) 1105 °C

(C) 1090 °c      (d) 1500 °c

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28. Boiling point of calcium  
 (a) 880 °C (b) [ ] 494 OC
29. Flame colour of sodium  
 (a) Golden yellow  
 (b) Brilliant white  
 (c) Brick red  
 (d) Purple
30. The flame colour of magnesium is:  
 (a) Golden yellow  
 (b) Brilliant white  
 (c) Brick Red  
 (d) Purple
31. The flame Color of calcium is:  
 (a) Golden yellow  
 (b) Brilliant white  
 (c) Brick Red  
 (d) Purple
32. The elements in which d-orbital the process of filling constitute of metals called:  
 (a) Alkali Metal (b) Alkaline Earth Metal  
 (c) Transition Metals  
 (d) Noble gases
33. Which metal belongs  
 (a) Copper  
 (c) Gold
34. Which compounds are widely in photography films and preparations?  
 (a) Silver  
 (c) Platinum
35. which of the following metal?  
 (a) Gold  
 (c) Platinum
36. 22 carat gold means that 22 part pure gold is alloyed with 2 parts of (a) Silver (b) Copper  
 (c) Platinum (d) both a & b
37. Platinum alloyed with which metal are used as catalyst in automobiles as catalytic convertor?  
 (a) Palladium (b) Rhodium  
 (c) Gold (d) both a & b
38. Non metals form:  
 (a) Positive ion (b) Negative ion  
 (d) None  
 es are:  
 (c) Neutral
39. Non metallic oxides are:  
 (a) Basic in nature  
 (b) Acidic in nature  
 Amphoteric (b) All
40. Metals oxides are:  
 (a) Basic in nature  
 (b) Acidic in nature  
 (c) Neutral (d) None
- Non-Metals are conductor of heat and electricity:  
 (a) Good (b) bad  
 (c) Moderately (d) None
42. The melting and boiling points of non metals are:  
 (a) High (b) low

(c) Moderately (d) None 43.  
Which element has high electronegativity value?

- (a) Fluorine (b) Oxygen Chlorine (d)  
Nitrogen

44. Group 17 elements are called:

- (a) Alkali Metals  
(b) Alkaline Earth Metals  
(c) Halogens  
(d) Noble gases

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