EXERCISE

Q1. Select the right answer from the choices given with each question.

1) Oxides and hydroxides of Group I elements are:

a) Acidic
b) Alhaline
c) Neutral
d) Amphoteric

2) The flame colour of sodium metal or its compounds is:

a) Bright crimson
b) Violet
c) Golden yellow
d) Bright blue

3) When sodium burns in air. it forms sodium:

a) Monoxide
b) Peroxide
c) Oxide
d) Superoxide

4) The carbonates of alkali metal are not affected by heat except: a) Li_2 CO_3 b) Na2CO3

a) Li_2Co3
b) Na_2CO_3
c) K2CO3
d) Rb_2CO_3

5) Green is characteristic flame colour of:

a) Calcium
b) Barium
c) Strontium
d) Sodium

6) All the carbonates, sulphates and phosphates of alkaline earth metals are in water.

a) Sparingly
b) Soluble
c) Insoluble
d) Less soluble

7) The first ioniziation energy is higher for the:

a) Alkaline earth metals
b) Alkali metals
c) Halogens
d) Nobel gases

8) Which one of the element has the maximum electron affinity?

a) F b) Cl c) Br d) 1

9) Which pair has both members from same period of periodic table?

a) Na - Ca b) 'Na - Cl c) Ca - Cl d) Cl – Br

10) Melting points and boiling points of alkali metals:

a) Decreases from top to bottom
b) Increases from top to bottom
c) First increases then decreases
d) Remains uncharged

11) Which of the following oxides is amphoteric in nature?

a) Rubidium oxide b) Barium oxide

c) Antimony d) Sulphur oxide

12) Oxidizing power of halogen depends upon:

a) Energy of dissociation b) Electron affinity

c) Heat of vaporization d) All of above

13) Which of following oxides amphoteric is nature?

a) MgO b) Be0 c) CO_2 d) SnO_2

14) Select the correct increasing order of atomic radius?

a) Ne > 0 > S > Al b) Ne < 0 > S> Al

c) Ne < 0 > S > Al d) Ne > 0 < S > Al

15) Due to inert pair effect ___________ oxidation state is more stable than ___________ For Sn *and* Pb.

a) 2+, 4+ b) 1+, 4+ c) 4+, 2+ d) 2+, 3+

16) Highest electron affinity is shown by?

a) F2 b) 1_2 c) Br_a d) $C1_2$

17) Which is the strongest reducing agent?

a) HF b) HCl c) Br2 d) HBr

18) Substance boiling at higher temperature among following is?

a) HI b) HF c) HCl d) HBr

19) Group VII-A elements are generally called:

a) Halogens b) Nobel gases

c) Inert gases d) Metalloids

20) The radioactive element in halogen group is:

a) Radon b) Radium c) Astatine d) Bromine

Answers

1)	b)	**2)**	c)	3)	**b)**	4)	**a)**	5)	**b)**
6)	c)	**7)**	d)	8)	**b)**	9)	**b)**	10)	**a)**
11)	b)	**12)**	b)	13)	**b)**	14)	**c)**	15)	**a)**
16)	c)	**17)**	d)	18)	**b)**	19)	**a)**	20)	**c)**

Q2: Give brief answers for the following questions.

Q1. Although Na and P are present in the same period their oxides *are* different in nature Na_2O is basic while P_2O_5 is acidic why?

Answer

Na and P are present in same period But Na20 is basic and P_20_5 is acidic:

Na is an alkali metal present in IA group and has one electron in its outermost shell, It gives a strong base (NaOH) on dissolving in water.

$$Na_20 + H_20 \rightarrow 2NaOH$$

Phosphorus is member of group — VA. It is non-metal and has five electrons on its outermost shell. P_20_5 on dissolving in cold water produce meta phosphoric acid and on dissolving in hot water give orthophosphoric acid.

$$P_2O_5 + H_2O \rightarrow 2HP0_3 \text{(metaphosphoric acid)}$$

(Cold)

$$P2O5 + 3H_20 \rightarrow 2H3PO4 \text{ (orthophosphoric acid)}$$

(Hot)

Q2. How acidic basic *and* amphoteric behaviour of oxides is explained?

Answer

Basic, Acidic and amphoteric behaviour of oxides:

Odides of alkali metals are basic in nature.

$$Na_20 + H_2SO_4 + H20 \rightarrow Na_t SO_4$$

(Base) (Acid)

Oxides of Be Saluminium are amphoteric in nature e.g $SO_3 + P_20_5$

$$SO_3 + Na_2O \rightarrow Na_2SO_4$$

(acid) (Base) (Salt)

Oxides of Be saluminium are amphoteric

$$BeO + 2NaOH \rightarrow Na_2BeO_2 + H_2O$$

(Acid) (Sodium beryllate)

$$BeO + H2SO4 \rightarrow BeSO4 + H_2O$$

(Base)

Q3. Why the elements of group 1 are called alkali metals?

Answer

Elements of group IA are metals and their oxides and hydroxides are alkaline in nature.

e.g $Na_20 + H2SO_4 \rightarrow Na_2SO_4 + H_2O$

$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

Q4. Why all group of metals have low ionization energies?

Answer

All IA — group elements have one electron on their outermost shell. Except lithium all alkali metal has strong shielding or screening effect. As a result, pull of nucleus on outermost electron decreases that's why outermost electron of alkali methods may be removed easily using low energy.

Q5. Why do the group 1 metal show strong electropositive character?

Answer

The metals which lose outermost electrons easily and give a stable cation are called (electropositive. And group IA metals lose their outermost single electron easily to complete their outermost stable octet Therefore they are electropositive metals.

Q6. Why do group 1 metals show strong reducing properties?

Answer

All alkali metals have one electron in their outermost shell and on losing one outermost electron their octet is completed which is a stable state. Therefore, they try to lose their valence electron and all as good reducing agent.

Q7. Why different colours are imported by the atoms of the group 7 metals to the flame?

Answer

The outermost electron of group IA is $ns^{\prime}$. This electron is loosely hold with the nucleus.

When an element is brought to a flame of a burner the electron absorbs some energy and goes to higher energy orbital and is called excited. This excited electron absorbs energy during process of excitation Atoms of different elements absorb different energies therefore on deexcitation they impart different colours to flame.

Q8. Why the elements of group 2 are called alkaline earth metals?

Answer

II — A group members are metals; their salts are found in earth and their oxides & hydroxides alkaline in nature. Therefore, they are called alkaline earth metals.

e.g $CaO + H_2SO_4 \rightarrow CaSO_4 + H_2O$

$Ca(OH)_2 + H_2SO_4 \rightarrow CaS0_4 + 2H_20$

Q9. Why do the group 2 earth metals have high melting and boiling points than alkali metals?

Answer

The alkaline earth metals have two electrons in their outermost shell whereas group II — A have one electron in their outermost shell. Therefore, there are strong metal bonds among group IIA. Therefore II — A members are harder and stranger than group

I—A members. Therefore, the melting and boiling point of group II–A members are higher than group I — A members.

Q10. How do group 1 metals resemble with group 2 metals?

Answer

Both group I—A and group II—A members

1) are metals.

2) are iso-electronic up to subshell.

e.g Li = 3 Is^e, 2S'

Be = 4 $Is^2, 2S^2$

3) have alkaline oxides and hydroxides

e.g Na20, Mg0

NaOH, $CaCOH_2$

4) are good conductors for heat and electricity can react with halogens to form salts. e.g NaCl, $CaCl_2$

Q11. How do group 1 metals differ from group 2 metals?

Answer

Group IA Metals	Group IIA Metals
1) They have one electron in their outermost cell.	Their atoms have two electrons in their outermost cell.
2) They are monovalent i.e. M^{+1}	They are divalent i.e. M^{+2}
3) They are soft metals	They are hard metals

4) Their melting boiling points are lone	Their melting and boiling points are high
5) Their carbonates are soluble in water	Their carbonates are insoluble in water
6) Their carbonates are stable towards heat $Na_2CO_3 \rightarrow X$	Their carbonates decompose on heating $CaCO_3 \rightarrow CaO + CO_2$
7) Their hydroxides are stable towards heat $NaOH \rightarrow X$	Their hydroxides decompose on heating $Ca(OH)_2 \rightarrow CaO + H_2O$

Q12. Discuss the metallic and non-metallic character of group 4 elements.

Answer

Metallic and Non-Metallic character of Group IV A Elements. Metallic character of Group iv — A elements increase from top to bottom.

iv -- A.

C ⎤ Non - metals
Si ⎦

Ge – semi metals

Sn ⎤
Pb ⎦ - Metals

Q 13. Discuss the general trends of group 7 elements.

Answer

General Group Trends of Group VII — A Elements

i) Trends in physical states:

As attractive forces among their molecules increase from F2 to 12, therefore.

gases

F_2 ⎤ Gases
Cl_2 ⎦

Br_2 - Liq

I_2 - Solid

Trends in Electronegativity

Electronegativity decrease from top to bottom in halogen group. i.e. Decreases from F to I.

iii) Trends in Electron Affinity

Due to high electron density, the E.A value of E is low. And E.A value of remaining halogens decrease from Cl to I.

iv) Bond Enthalpy in halogens

Due to very' small size and high electron density F atoms repel each other in F2. As a result the bond dissociation. Energy of F_2 is lower than the remaining halogens B D E of remaining halogens decrease from Cl_2 to I_2

v) Trends as oxidising agents

Oxidising ability of halogens decrease from F_2 to I_2.

$$F_2 > Cl_2 > Br_2 > I_2$$

vi) Trends of Activity of Halogen halides

Due to strong H — bonds, the HF ionizes slightly, therefore is a weak acid. Other halo acids ionize completely and are strong acids.

Their acidic strength increases from HF to HI

$$H\,F < HCI < H\,Br < HB$$

(weakest acid) (Strong acid)

Q14. Why the term halogen is used for group 7 elements.

Answer

Halogen means salt forming. The elements of Group VII—A on reaction with alkali and

alkaline earth metals form salts. e.g.

$$2Na + C1_2 \longrightarrow 2NaCl \text{ (Salt)}$$

$$2K + Br_2 \longrightarrow 2K\,Br \text{ (Salt)}$$

$$Ca + C1_2 \longrightarrow CaC1_2 \text{ (Salt)}$$

Q I5. Why does fluorine differ from other members of its group?

Answer

Fluorine differs from its Group members in following respects.

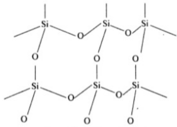
1) Very small size of F atom and F ion.
2) Very high I st Ionization Energy and Electronegativity.
3) Low BDE of F2 as compared to C12 to Br2.
4) Restriction of valence shell to an octet.
5) CaF2 & Mg F_2 are insoluble in water whereas $CaC1_2$ f $CABr_2$ are soluble.

Q16. What is the structure of C02 and Si02 and why they differ?

Answer

Structure of CO_2 & SiO_2 & their Difference

CO_2 is a Linear shaped molecule (O = C = O) having zero dipole moment. Therefore, exists as gas. Si is a big sized atom as compared to C. That is why Si02 molecule is tetra hederal in shape. Therefore, it has a strong network. And that is why it exists in solid crystalline form.



(Network of SiO_2 molecules)

Q17. CO_2 is a gas while SiO_2 is a solid although C and Si belong to the same group.

Answer

Please see answer of Q 16.

Q18. Explain why nitrates and carbonates of Li are not stable?

Answer

Li+ is very small in size and has high charge density. It takes 0^2 from nitrate as well in carbonate and forms Li_2O on heating i.e. $4Li\ N0_3 \xrightarrow{} 2Li_2O + 4NO_2 + O_2$

$$Li_2\ CO_3 \xrightarrow{} Li_2O + CO_2$$

Q19. Differentiate the behaviour of Li and Na with atmospheric oxygen.

Answer

Behaviour of Li & Na with atmospheric O_2

On burning in air, Li forms normal oxides whereas Na forms peroxide.

$$Li + O_2 \xrightarrow{} Li_2\ O \quad \text{(Lithium oxide)}$$

$$2Na + O_2 \xrightarrow{} Na_2O_2 \quad \text{(Sodium peroxide)}$$

Q20. Alkali metals carbonates are more soluble that alkaline earth metal carbonates. Why?

Answer

Alkaline earth metals have 2+ charge on their cations. And have high charge density. On heating they take 0^{2-} from their carbonates and from Metal oxide releasing CO_2 gas.

e.g $CaCO_3 \xrightarrow{} CaO + CO_2$

$MgCO_3 \rightarrow MgO + CO_2$

On the other hand, alkali metal ions have 1+ charge o them and have low charge density. These ions with low charge density cannot take O^{2-} ion to form metal oxide. Therefore, they are stable towards heat and don't decompose.

Q21. Explain why stability solubility of earth metal carbonates decreases down the group.

Answer

Carbonates decreases down the Group

Upper alkaline earth metals have high charge density which may by hydrated some white. But lower alkaline earth nucleus of group II — A have low charge density and are not hydrated easily.

That is why the solubility of their carbonates decreases down the group.

Q22. Oxidizing power of F2 is greater than 12. Why?

Answer

Fluorine atom is small sized atom which has very high Electronegativity. It may attract the with more force than large sized, low Electronegative Iodine.

Q23. HF is weak acid than HI Why?

Answer

Please see answer of short Q. No. 56.

Q24. On what factors does the oxidizing power of halogens depends?

Answer

Factors on which oxidising power of Halogens depend

i) High Electron Affinity

Halogens have high electron affinity therefore they accept the electrons and oxidise other elements.

ii) Tendency to accept electrons

Outermost shell of halogens needs one electron to complete then octet therefore they easily take electron and oxidise other elements.

Q3: Give detailed answer of the following questions

Q1 (a) The pattern of first ionization energy and Melting & Boiling points is not smooth. Justify it.

Answer

Melting point of Be is very high due to its very small atomic size and very strong interatomic forces of attraction.

But in case of Mg, the charge to size ratio make it neutral and nonpolarizable. As a result, the M.P of Mg decreases.

In case of Ca the charge density increases and inter-atomic forces also increase. As a result, the M.P and boiling points increases.

In case of Sr and Ba, atomic sizes increase too much and charge density decreases. As a result, the melting point and boiling point decreases down the group. That is why the melting to boiling point decrease from Ca to Ba.

Q1 (b) Why Atomic radius in Group and decreases along the period?

Answer

In periodic Table, with in a group. There is increase in no of shells from top to bottom. As a result, atomic size increase with in a period. The nuclear charge increases from left to right due to increase in no. of protons in nucleus the pull of nucleus on outer most electrons increase. As a result, atomic size decrease from left to right.

Q1 (c) Describe the trends in reaction of 3 rd period elements with water.

Answer

3rd period elements are:

Na, Ma. Al. Si. P. S. Cl Rate of I

Reaction of water with 3 rd period elements decrease from left to right

Na reacts with water vigorously and produced hydrogen catch fire due to evolved heat that is why Na burns when placed in water. And produce NaOH

$$Na + H_2O \longrightarrow NaOH + \tfrac{1}{2} H_2$$

Mg reacts with cold water slowly while it reacts with steam and produce white MgO and H2(a)

$$Mg + H_2O \longrightarrow MgO + H_2O$$

Al and Si both are semi-metals which have no reaction water in cold or hot state. P reads without water and produce a mixture of phosphorus acid (H3P03) and phosphoric acid (H3P04).

$$\underset{\text{(Hot)}}{P} + \underset{\text{(Steam)}}{H_2O} \longrightarrow H3PO4 + H3PO4$$

C12 reacts with water and produce HCl and HOCl (Hypochlorous acid)

$$Cl_2 + H_2O \longrightarrow HCl + HOCl$$

Q1 (d) The melting and boiling points of the elements increase from left to right up to the middle in 3rd period elements and decrease onward. Why?

Answer

3rd period elements are:

Na, Mg, Al, Si, P, S, Cl, Ar

Metallic character decreases upto mid of the periodic table. And inter-atomic forces of attraction increase from Na to Si due to increase in number of electrons in valance shell

Na	Mg	Al	Si
Very good metal	good metal	metal	Semi-metal

From phosphorus to argon are non-metals. contains 5 electrons in its outermost shell and exists as white, red and black phosphorus which are soft and hard solids. Sulphur has 6 electrons in its outer-most shell which requires 2 electrons to complete its octate therefore exists as amorphous and crystalline solids.

Cl has 7- electrons in its outer-most shell and repqirs l-electrons to complete its octate, therefore exists as Cl_2(gas)

Ar has completely filled outermost shell and exist as inter gas.

Q2. Discuss the metallic oxides and silicon dioxide under the following headings:

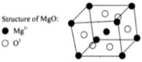
i) Structure **ii) Melting and Boiling points**

iii) Electrical conductivity

Answer

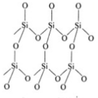
i) Structures of Metallic Oxides:

Metallic oxides are giant structures of ions having layers of ions. Oxides are Na, Mg, Al are like structure of NaCl.



Structure of SiO_2

Silicon atom has a tetrahedral linkage with oxygen atoms Si02 forms a strong network of Si02 molecules.



Structure of SiO_2

ii) Melting and Boiling Points of metallic oxides

Points of metallic oxides increase from left to right upto mid of periodic table.

If we consider the melting point of 3rd period oxides Na20 has very low melting point MgO has higher melting point whereas $Al2O_3$ has very higher melting point.

Melting and Boiling points of SiO_2

There is a strong network of Si and 02 atoms bonded through covalent bonds. That is why the melting and boiling point of Si02 is very high which is about 3000^{0}C.

iii) Electrical conductivity of metallic oxides

In solids state metallic oxides are non-conductor as metallic oxides are offently ionic oxides on melting they produce ions therefore, are good conductors for electricity.

Electrical conductivity of $Si0_2$

$Si0_2$ is purely covalent compound and is non-conductor in solids as well as in fused slate.

Q3. Discuss acid-base behaviour of

i) Aluminium oxide **ii) Sodium oxide**

Answer

i) Acid base behaviour of Aluminium oxide (Al_3O_3).

$A1_2O_3$ is an amphoteric oxide and behaves acid are well as base.

$$Al_2O_2 + NaOH \longrightarrow NaA1O_2 .2H_20$$

$$Al_2O_3 + 3H_2SO_4 \longrightarrow Al_2 (SO_4)_3 + 3H_2O$$

ii) Acid Base Behaviour of Na2

Na20 is metallic oxide and is strongly basic in nature.

NS20+ HCl → 2NaCl + H20

Q4. a) Why are different types of oxides formed as you go down the group?

b) How Beryllium differs from other members of its group?

c) Why is Beryllium chloride covalent and not ionic?

Answer

a) Why are different types of oxides formed as you go down the group?

Due to addition of new shells atomic size increases from top to bottom. That is why the ability of oxide to lose O- ion increase from top to bottom within a group.

If we consider the example of group I—A, Li02 is amphoteric i nature Na20 is basic in nature, K20 is stronger base and the basic character increase. From top to bottom.

b) How Beryllium differs from other members of its group?

Answer

Beryllium differs from other members of its group due to its very small size. The main points of differences are as follows:

i) II—A group members are soft metals but beryllium is as hard as steel and hard enough to scratch ii) The melting and boiling points of beryllium are much higher than remaining members of its group

	Be	Mg	Ca	Sr	Ba
Melting Points ^{o}C	1277	650	838	703	714
Boiling Points ^{0}C	2770	1107	1440	1380	1640

iii) All II—A group members reduce water but beryllium due to forming of an insoluble oxide layer does not reach with water vigorously.

iv) All II—A group members reads with acids but beryllium is resistant towards complete oxidation due to formation of BeO coating on its surface.

v) Beryllium is the only members of group II—A which react with NaOH.

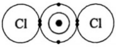
$$2Be + 2NaOH \rightarrow Na_2Be_2O + M_2$$

(Sodium Beryllode)

c) Why is Beryllium chloride covalent and not ionic?

Answer

Beryllium is a very small atomic size and does not lose an electrons to forms ions therefore BeC12 is covalent in nature.



Cl – Be – Cl

Q5. a) Why do some metals form peroxides on heating in oxygen?

b) **Why do group 2 elements form nitrides on heating in air?**

c) **Discuss the trend in solubility of hydroxide of group 2 elements.**

Answer

a) **Why do some metals form peroxides on heating in oxygen?**

The attachment of oxygen with a metal depends upon its charge to size ratio (charge density) small sized metal atoms high charge density forms normal oxides large sized low charge density forms peroxide and very large sized metals formed super-oxide. For example, Li forms normal oxide (Li20). Na forms peroxide (Na202) and K forms super-oxide (K20) due to very low charge density and large size of metal atom.

b) **Why do group 2 elements form nitrides on heating in air?**

Answer

Attachment of N^{-3} with a metal depends upon charge density of metal ion high charge density cations as II—A group metal ions have high charge density so they form nitrates. In alkali metals only Li^{+1} form nitrate.

c) **Solubility of hydroxides of group II—A elements**

Answer

The solubility of hronxides depends upon the charge density of cations, of high chare density are hydrated easily. For example, hydroxides of calcium (Ca) and Magnesium (Mg) are soluble in water. On the other hand, the solubility of hydroxides decreases down the group.

Q6. Discuss the trends in thermal stability of carbonate and nitrates.

Answer

Thermal stability of carbonate and nitrates

The thermal stability of carbonates and depends upon the charge density of cations. Carbonates and nitrates having a metal of high charge density when are heated the metal cation takes oxide ion (0^{-2}) and forms metal oxide and release $CO_{2(ps)}$. For example:

$$LiCO3 \rightarrow Li_2O + CO_2$$

$$CaCO_3 \rightarrow CaO + CO_2$$

Trends in group I—A

In group I—A only LiC03 and LiN03 decompose on heating due to high charge density of Li^{+1} Ion whereas carbonates and nitrates of other elements of group I—A don't decompose on heating due to low charge density of cations.

Trends in group II—A

As all alkaline earth metal cations have high charge density and on heating take O^{-2} ion so decompose on heating and form metal oxide. For example

$$CaCO_3 \rightarrow CaO + CO_2$$

$$2Ca(NO_3)_2 \rightarrow 2CaO + 4NO_2 + O_2$$

Q7. Explain with examples that Beryllium hydroxide is amphoteric?

Answer

Beryllium hydroxide as amphoteric

Beryllium hydroxide is acid as well las a base and behaves amphoteric due to high charge density of Be^{+2} ion

$$Be(OH)_2 + 2NaOH \rightarrow Na_2BeO_2 + 2H_2$$

(As Acid)

$$Be(OH)_2 + H_2SO_4 \rightarrow BeSO_4 + 2H_20$$

(As Base)

Q8. Explain the trends in oxidation states with suitable examples.

Answer

Trends in Oxidation State

The ability of an atom to lose or gain the number of electrons is called its oxidation state.

Trends within a Period

When we move from left to right oxidation state increases from upto mid of the periodic table

Q9. Discuss the inert pair effect in the

i) **Formation of ionic bonds** ii) **Formation of covalent bonds**

Answer

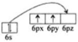
Inert pair Effect and Ionic Bond

In ground state the electronic configuration of group IV-A elements is n^2p^2. When we move down the group atomic size increases due to addition of new shells. They lose electrons leaving the s^2 pair unused this is called inert pair. For example, to form Pb^{+2} ion lead will lose two 6p— electrons but the 6s — electrons will be left unused as an inert pair. Also, the ionization energy decreases to form 2 + ions therefore the chances of formation of ionic bonds increases specially in case of Sn to form Sn^{+2} and Pb to form Pb^{+2} that is whey Sn and Pb like to form ions bonds.

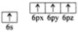
ii) **Inner pair Effect and Covalent Bond**

According to theory of relativity the behaviour elements like Sn, Pb, Pt, Si difficult to remove the electros due to relativistic contact on. This effect "S" electrons more than P electrons. And one electron moves from S-orbital to empty p-orbital

Electrons configuration of Pb in ground state.



Electronic configuration of Pb in exited state =



The energy is released when atoms of halogen like chlorine come to attach with tin or lead. Therefore, no extra energy is needed to promote an electron from 6s orbital to 6porbital. Now these four unpaired electrons like to form covalent bonds.

Q10. Discuss in detail acid base trend of group IV—A oxides?

Answer

Acid-base trends in group IV—A oxides.

Group IV—A oxides are as follows:

SiO_2
GeO_2 - Neutral
SnO
PbO_2 - Basic

Top most oxide of group IV—A are acidic in nature. C02 on dissolving in water produce carbonic acid

$$CO_2 + H_2O \rightarrow H_2CO_3 \text{ (carbonic acid)}$$

Lowermost oxide of group IV—A may gave O- ion which on dissolving in water produce OH ion and behave as Lu- flood bases.

$$PbO_2 \rightarrow Pb^{4+} + 2O^{2-}$$

$$0^{-2} + H_2O \rightarrow 20H^{-1}$$

QI 1. Explain in detail the trends in group VII— of following physical properties.

i) Electronegativity **ii) Electroneffinity**

Answer

Trends of Electronegativityin group VIII—A

Due to increase in atomic size and increase in shielding effect the electronegativity in group VII—A decreases from top to bottom

Element	E.N
F	4.0
Cl	3.2
Br	3.0
I	2.5
At	2.2

Trends of Electron effinity in group VII—A

Electron effinity of F has thick value due to high charge density (thick electronic cloud) whereas electron effinity in group VII—A decreases from Cl to At. Element Electron effinity -322 -349

Element	E.N
F	-322
Cl	-349
Br	-325
I	-295
At	-270

Q12.a) Why is the bond enthalpy of F—F less as compared to Cl — Cl and Br— Br?

b) Explain the order F>Cl> Br>I with respect to oxidizing agent or

power.

Answer

a) Why is the bond enthalpy of less as compared to Cl — Cl and Br— Br?
Due to very high electronegativity of F attract the towards their nuclei with greater force which hardly allows the electrons to be shared to form a covalent bond.

Small amount of supply of energy increases the Kinetic energy of atom and break the bond between atoms.

In case of C12 and Br2 the electronegativity of Cl and Br atoms are moderate and easily allow atoms to share the electrons to form stable covalent bond therefore C12 and Br2 exist stable gaseous molecules.

The order F>Cl> Br>I with respect to oxidizing agent

The electronegativity order of halogen is:

i) Element F> Cl > Br > I

Electronegativity 4.0 >, 3.2 >, 3.0 >, 2.5

Due to highest value of electronegativity F may attract and lake the electron from a substance and oxidize with more force as the order of electronegativity decreases towards I therefore oxidizing power towards I also decreases.

Q13.a) Why is fluorine much stronger oxidizing agent than chlorine?

b) HCl is strong acid as compared to HF. Why?

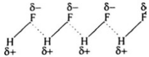
Answer

a) Why is fluorine much stronger oxidizing agent than chlorine?

The electronegativity of F is 4.0 which is maximum in periodic table due to its high electronegativity it may take an electrons from a sub stance to complete its octate whereas Cl has somewhat lower electronegativity and has low oxidizing power.

b) HCl is strong acid as compared to HF. Why?

Due to very high electronegativity F, the molecule HF is highly polar. There are strong hydrogen bonds between I-IF molecules.



As a result, the power of HF to release proton is decreases. As a result, HF behaves as weaker acid than HCl which is completely ionized on dissolving in water.

MULTIPLE CHOICE QUESTIONS

1) s and p block element is a measure of the tendency of an atom to attract a bending pair of electrons.

a) Ionization energy b) Electron affinity

c) Electronegativity d) Atomic radius

2) Magnesium and aluminium are _____ although in slightly different ways.

a) 12— coordinated b) 16— coordinated

c) 20— coordinated d) 2— coordinated

3) _____ has a giant covalent structure just like diamond.

a) Caron b) Silicon

c) Oxygen d) Magnesium

4) Sulphur burns in air an oxygen on gentle heading with a

a) Pale blue flame b) Pinkish colour

c) Pale orange flame d) Pale Red flame.

5) _________ oxide is one which shows both acidic and basic properties.

a) Metallic Oxide b) Acidic Oxide

c) Basic Oxide d) Amphoteric Oxide

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6) In sodium oxide, the solid is held together by attraction between.

a) l + and 2 — ions b) 3 + and 4 — ions

c) 6+ and 3 — ions d) 3 + and 3 — ions

7) In magnesium oxide, the attraction are between.

a) 2 + and 2 — ions b) 8 + and 4 — ions

c) 6 + and 3 — ions d) 3 + and 3 — ions

8) Complete the following reaction.

a) Al_2CO_3 + 6HCl → ? b) $2AlCO_3$ + $3H_2O$

c) $AlCO_3$ + H_2O d) $2Al_2CO_3$ + $3H_2O$

9) Hydrogen after losing one electron from H+. In this property, it resembles.

a) Transition element b) Alkaline earths

c) Halogens d) Alkali metals

10) Which of force halogens has the highest electron affinity?

a) Fluorine b) Chlorine

c) Bromine d) Iodine

11) When potassium reacts with cold water violently it guesses?

a) H_2 and KOH b) $H_2$and NaOH

c) H_2 and LiOH d) None

12) Complete the following reaction.

a) $P_4O_{10} + 6H_2O \rightarrow$? b) $4H_2PO_4$

c) $2H_4PO_4$ d) $6H_4PO_4$

13) Complete the following reaction.

a) $Na_2HPO_4 + 2H_2O$ b) $Na_2HPO_4 + 2H_2O$

c) $Na_3HPO_4 + 3H_2O$ d) $NaHPO_4 + 3H_2O$

14) Complete the following reaction.

a) $2NaOH + Cl_2O_7$ --> ? + ? b) $NaC1O_4 + H_2O$

c) $3NaClO_4 + 2H_2O$ d) $NaClO_4 + 3H_2O$

15) Complete and Balance the following equation.

$C1_2O + H_20 \Leftrightarrow$?

a) 2HOCl b) HOCl

c) 2HOCl + H_2O d) $HOC1_2 + H_2O$

16) Aluminium chloride is a solid which sublimes readily at about

a) 160°C b) 100°C

c) 180°C d) 130°C

17)_________ and ________ are ionic and consist of giant ionic lattices at room temperature.

a) Aluminium and chlorine

b) Magnesium and sodium chloride

c) Carbon chloride and aluminium chloride

d) Potassium chloride and magnesium oxide

18) Sodium and magnesium are ionic and so with undergo electrolysis when they are:

a) Solid b) Molten

c) Room temperature d) Mixture

19) Aluminium chloride and phosphorus chloride cases; the solid doesn't conduct electricity because.

a) Ions aren't 't free to move b) Ions are freely move

c) Ions are arranged is symmetry d) Electrons are freely

20) Magnesium chloride dissolve in H20 to give a faintly:

a) Basic solution b) Amphoteric Oxide

c) Acidic solution d) Neutral solution

21) Write down the formula of Hexa aqua magnesium ions are formed.

a) $[Mg(Al_2O_3)_6]^{2+}$ b) $[Mg(Mg_2O_3)_6]^{2+}$

c) $[Mg(Na_2O_3)_6]^{2+}$ d) $[Mg(H_2O_3)_6]^{2+}$

22) Complete the following reaction.

$MgCl_2 + 6H_2O \rightarrow ? + ?$

a) $[Mg(Al_2O_3)_6]^{2+} + 2Cl^+$ b) $[Mg(Mg_2O_3)_6]^{2+} + 2Cl^+$

c) $[Mg(Na_2O_3)_6]^{2+} + 3Cl^+$ d) $[Mg(H_2O_3)_6]^{2+} + 2Cl^+$

23) Silicon tetra chloride is a:

a) Odour less Liquid b) Tasteless Liquid

c) Colour less Liquid d) Bitter in taste

24) Phosphorus trichloride is a liquid because there are only:

a) Van der Waals and dispersion forces

b) Strong intermolecular forces

c) Strong attractive forces

d) Repulsive force

25) At room temperature solid aluminium chloride has an ___________ with a lot of covalent character.

a) Covalent character b) Covalent lattice

c) Ionic lattice d) Metallic luster

26) Phosphorus (V) chloride has a violent reaction with water producing fumes of:

a) Phosphorus chloride b) Hydrogen chloride

c) Potassium hydroxide d) Hydrogen peroxide

27) ________like aluminium Oxide, is amphoteric it has both basic and acid properties.

a) Potassium hydroxide b) Hydrogen peroxide

c) Aluminium hydroxide d) Sodium hydroxide

28) Sulphuric acid and chloride (VII) acids are both very:

a) Strong Base b) Weak Base

c) Strong acid d) Strong Base

29) Atomic radii increase as we move from:

a) Lithium to caesium b) Caesium to Lithium

c) Caesium to carbon d) Carbon to caesium

30) __________**is the energy required to remove the most loosely held electron from each of one mole of gaseous atom.**

a) Electro negativity
b) Atomic radii
c) Atomic size
d) Ionization energy

31) The property of alkali metal to give coloration in the because flame has been used to detect their presence in salts by a task, known as:

a) Iodine test
b) Flame test
c) Chlorine test
d) Iodometry test

32) Due to small size Be^{2+} ion, BCO is__________ which other oxide are ionic?

a) Covalent
b) Ionic
c) Coordinate covalent
d) Metallic

33) Complete the following reaction.

$3Ca + N_2 \rightarrow$?

a) Ca_4N_2
b) Ca_3N_2
c) Ca_2N_2
d) CaN_2

34) The melting and Boiling point of C and Si are notably high because of these elements to form __________

a) Complex structure
b) Giant molecule
c) 12 coordinate molecule
d) Covalent Bond

---

35) Silicon from only __________ with oxygen atoms while carbon forms double bond.

a) Triple bond
b) Double bond
c) Single bond
d) Co-ordinate covalent bond

36) The simplest formula of silica is:

a) SiO_4
b) SiO_2
c) SiO_6
d) SiO_3

37) Complete the following equation.

$NaOH + CO \rightarrow$?

a) HCOONa
b) HCONaO
c) H_2COONA
d) NaCO + OH

38) The dioxide will react with hot concentrated sodium hydroxide solution to give soluble complexes of the form.

a) XO
b) $20k\text{-}r^2$
c) 20H-
d) $[X(OH)_6]$

39) Atomic radius ____as we go down the group due to increase no of shell.

a) Constant
b) Decreases
c) Increases
d) Remain same

40) Fluorine and chlorine are___________at ordinary temperature.

a) Liquid b) Solid
c) Gas d) Metal

41) Br is a _____ at ordinary temperature

a) gas b) liquid
c) solid d) Metal

42) Iodine is______________at ordinary temperature.

a) Solid b) Gas
c) Liquid d) Metal

43) The halogens due to high electron affinity values have a great tendency to accept electron and at as:

a) Reducing agent b) Oxidising agent
c) Polar compound d) Non polar compound

44) Oxidising power of halogen depends upon:

a) Energy of dissociation b) Electron affinity
c) Heat of vaporization d) All of above

45) Which is the strongest reducing agent?

a) HF b) HCl
c) HI d) HBr

Answers

1)	c	2)	a	3)	b	4)	a
5)	d	6)	a	7)	a	8)	a
9)	d	10)	a	11)	c	12)	b
13)	c	14)	a	15)	a	16)	c
17)	b	18)	b	19)	a	20)	c
21)	d	22)	d	23)	c	24)	a
25)	c	26)	b	27)	c	28)	c
29)	a	30)	d	31)	b	32)	a
33)	b	34)	b	35)	c	36)	b
37)	a	38)	d	39)	c	40)	c
41)	b	42)	a	43)	b	44)	b
45)	c						

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Short Answers and Questions

QI: Why the element of group 1 are called alkali metals?

Answer

The elements of group I are called alkali metal because they produce alkalis with H_2O.

Q2: Describe the trends in atomic radius.

Answer

The number of shells in all the elements of a given periods remains the same but the value of effective nuclear charge, increases from left to right. The increased effective nuclear charge pulls the electron cloud of the atom nears to the nucleus and thus the size of the atoms and ions goes on decreasing from left to right. This in going from left to right in a period of S and P block elements atomic and ionic radii decreased with the increase of atomic number.

Q3: Describe the trends in electronegativity?

Answer

Electronegativity is a measure of tendency of an atom to attract a bonding pair of electrons. The Pauling scale is the most commonly used. Fluorine (the most electronegative element is assigned a value of 4.0, and values range down cesium and francium which are least electronegative at 0.7.

I) On moving from left to right in a period, there is a decrease in the size of atoms, smaller atoms have greater tendency to attract the electrons towards themselves. Smaller atoms have higher electronegativity values. ·

2) On a moving from left to right in a period there is an increase of ionization energy and electron affinity of the elements. The atoms of the elements which have higher value of ionization energies and electron affinities also have higher electronegativities.

Q4: Explain that sodium magnesium and aluminium all have metallic structure.

Answer

In sodium only on electron per atoms is involved in the metallic bond the single 3S electron. In magnesium both of its outer electrons are involved and in aluminium in all there. Sodium is 8 — coordinated each sodium atom is touch by only 8 other atoms.

Both magnesium and aluminium are 12 — coordinated. This is more efficient way to pack atoms, leading to less wasted space in the metal structure and to stronger bonding in the metal.

Q5: Silicon has a giant covalent structure just like diamond structure justify it.

Answer

Silicon has a giant covalent structure just like diamond. A tiny part of the structure is held together by strong covalent bonds in all three dimensions.

Q6: Sodium, magnesium and aluminium are good conductors of electricity? Why?

Answer

Sodium, magnesium and aluminium are good conductor of electricity. Conductivity increases as you go from sodium to magnesium to aluminium as they have free electrons. Silicon is a semiconductor.

The 3 metals conduct electricity because the delocalized electrons are free to move throughout solid or the liquid metal.

Q7: Phosphorus, sulphur chlorine and argon on have lower melting and boiling points than those of first four member of the period which have giant structure justify it.

Answer

Phosphorus, sulphur, chlorine and argon are simple molecular substances with only van der walls attraction between the molecules. The size of the melting and boiling point is governed by the sizes of the molecules.

Phosphorus: contain P_4 molecules. To melt phosphorus, you dent have to black any covalent bond forces between the molecules.

Sulphur: Sulphur consists of S8 rings of atoms. The molecule are bigger than phosphorus molecules and so the van der walls attraction will be stronger, leading to a higher melting and boiling point.

Chlorine: Chlorine C12 is a much smaller molecule with comparatively week van der waals attraction and so chlorine will have a lower melting and boiling point than sulphur or phosphorus.

Argon: Argon molecules are just single argon atom. Ar. The scope for van der waals attractions between these is very limited and so the melting and boiling on it of argon are lower again.

Q8: Write down the chemical Reaction of the period 3 element with oxygen and chlorine?

Answer

Reaction with oxygen

Sodium

For the simple oxide.

$$4Na + O_2 \longrightarrow 2Na_2O$$

For peroxide

$$2Na + O_2 \longrightarrow 2Na_2O_2$$

Magnesium:

Mg burn in oxygen with an intense white flame to give while solid magnesium oxide.

$$2M + O_2 \rightarrow 2$$

Silicon:

Silicon will burn in oxygen if heated strongly. Silicon dioxide is produced.

$$S + S_2 \rightarrow SO_2$$

Phosphorus:

For the phosphorus (III) oxide.

$$P_4 + 3O_2 \longrightarrow P_4O_6$$

For phosphorus (V) oxide.

$$P_4 + SO_2 \longrightarrow P_4O_{10}$$

Sulphur:

Sulphur burn in air or oxygen or gentle heating with a pale blue flame.

$$S + S_2 \rightarrow SO_2$$

Chlorine and argon:

Despite having several oxides. Chlorine won't react directly will oxygen. Argon doesn't react either.

Q9: Write down the reaction of Aluminium and phosphorus with chlorine?

Answer

Aluminium is often reacted with chlorine by passing dry chlorine over aluminium foil heated in a long tube. The aluminium burns in the stream of chlorine to produce very pale yellow aluminium chloride. This sublime and collects further down the tube where it is cooler.

$$2Al + 3Cl_2 \rightarrow 2AlCl_3$$

White phosphorus burns in chlorine to produce a mixture of two chlorides, phosphorus

(III) chloride and phosphorus (V) chloride (phosphorus trichloride and phosphorus pentachloride.

Phosphorus (III) chloride is a colourless fuming liquid.

$$P_4 + 6Cl_2 \rightarrow 4PCl_3$$

Phosphorus (V) chloride is an off white (going towards yellow) solid.

Q10: Write down the reaction of silicon and sulphur with chlorine.

Answer

When chlorine is passed over silicon powder heated in a tube, it reacts to produce silicon tetrachloride. This is a colourless liquid which vaporizes and can be condensed further along the apparatus.

$$Si + 2C1_2 \rightarrow SiC1_4$$

Sulphur: When a stream of chlorine is passes over some heated sulphur, it reacts to form an orange, will smelling liquid disulphur dichloride S2C12.

$$2S + C12 \rightarrow S_2PCl_2$$

Q 11: Write down physical properties of Phosphorus oxides.

Answer

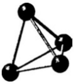
Phosphorus Oxide has two common oxides

I) Phosphorus (III) oxide. P_4O_6

2) Phosphorus (V) oxide P_4O_{10}

Phosphorus oxides

Phosphorus (III) oxide is a white solid, melting at 24°C and boiling at 173 °C. The structure of its molecule it best worked out stating from a P4 molecules which is a little tetrahedron.



P4 molecule

The phosphorus is using only 3 of its outer electrons (the 3 unpaired P electrons) to forms bonds with the oxygens.

Phosphorus (V) oxide

Phosphorus oxide is also a white solid, subliming at 3000C. In this case the phosphorus uses all five of its outer electrons in the bonding.

Solid phosphorus (V) oxide exists in several different forms some of them polymeric. The force oxygens are attached to the faces phosphorus atoms in a double bond.

Q12: Write down the Physical properties of sulphur oxide.

Answer

Sulphur has two common oxides, sulphur dioxide S02 and sulphur trioxide SO_3.

Sulphur dioxide

Sulphur dioxide is a colourless gas at room temperature will on easily choking smell. gt consists of SO_2 molecules.

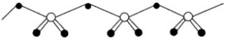
The sulphi8r uses 4 of its outer electrons to form the double bond with the oxygen leaving the outer two as a lone pair on the sulphur. The bent shape of s02 is due to this lone pair.

Sulphur trioxide

Sulphur trioxide is awhile solid with a low melting consist of simple S03 molecules in which all six of the Sulphur's outer electrons are involved in the bonding.

There are various forms of solid sulphur trioxide. The simplest one is a trimer S309 where 3 S03 molecules are joined up and arranged in a ring.

There are also polymeric forms in which the S03 molecules join together in long chains.



The simple molecules join up in this way to make bigger structures is what makes the sulphur trioxide is a solid rather than a gas.

Q13: Write down the physical properties and structures of chlorine oxides.

Answer

Chlorine forms several oxide chlorine (I) oxide Cl_2O and chlorine (VII) oxide

Chlorine (1) oxide

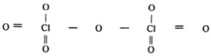
Chlorine (I) oxide is a yellowish red gas at room temperature. It consists of simple small molecules.

In this structure chlorine uses its one outer electron and bonds with oxygen.

Chlorine (VII) oxide

Chorine (VII) oxide is a colourless oily liquid at room temperature.

In chlorine (VII) oxide the chlorine uses all of its seven outer and bonds with oxygen. This produces a much bigger molecule.



$$O=\overset{O}{\underset{O}{\overset{|}{\underset{\|}{Cl}}}}-O-\overset{O}{\underset{O}{\overset{|}{\underset{\|}{Cl}}}}=O$$

Q14: Why the melting and boiling points of metal oxide and silicon dioxide is high?

Answer

The metal oxide s and silicon dioxide (the giant structures) will have high melting and boiling point because a lot of energy is needed to break the strong bonds operating in 3 dimensions.

The attractive forces between the oxides of phosphorus, sulphur and chorine will be van der waals dispersion and dipole dipole interaction. These way in size depending on the size shape and polarity of the various molecules but will always be much weaker than the ionic on covalent bonds need to break in a giant structure.

Q15: Write down the reaction of sodium oxide (Na_2O) with acids and H_2O.

Answer

Sodium oxide (Na_20) is a simple strongly basic oxide. It is basic because it contains the oxide ion, 0^{2-} which is very strong base with a high tendency to combine with hydrogen ions.

Rex with H_2O

Na_2O reacts exothermically will cold H_2O produce sodium hydroxide solution.

$$Na_2O + H_2O \rightarrow 2Na_2OH$$

Rex with acids

$$Na_2O + 2HCl \rightarrow 2NaCl + H_2O$$

Ql6: Write down the reaction of Magnesium Oxide (MgO) with H_20 and acids.

Answer

MgO is simple basic oxide because it also it also contains oxide ions. In Magnesium oxide case the attraction is between 2 + and 2 — it takes more energy to break these.

Rex with H_2O

If your shake some write magnesium oxide with H_2O it doesn't look as if it reacts. If you test the PH of the liquid, you find that it is somewhere around PH 9. The must be some slight rex with H_20 to produce hydroxide ions in solution. Some $Mg(OH)_2$ is formed in the reaction, but this is almost insoluble and so not many hydroxide ions actually get into solution.

Rex with acid

MgO react with acid to form $Mg\,C1_2$ solution.

$$MgO + 2HCl \rightarrow MgC1_2 + H_2O$$

Q17: Write down the reaction of phosphorus (V) oxide (P_4O_{10}) with H_2O and Base?

Answer

Phosphorus (V) oxide reacts violently with H_2O to give a solution containing a mixture of acids, the nature of which depends on the conditions, use usually ust consider one of these, phosphoric acid H_3PO_4 (also known just as phosphoric acid or as orthophosphoric acid).

$$P_4O_{10} + 6H_2O\ 4H_3PO_4 \dashrightarrow 4H_3PO_4$$

Reactions with Base

$$NaOH + H_3PO_4 \rightarrow NaH_2PO_4 + H_2O$$

$$2NaOH + H_3PO_4 \rightarrow Na_2HPO_4 + 2H_2O$$

$$3NaOH + H_3PO_4 \rightarrow Na_3HPO_4 + 3H_2O$$

Again, if you were to react phosphorus (V) oxide directly with sodium hydroxide solution rather than making the acid first you would end up with the same possible salts.

This is getting ridiculers, and so will only give one example out of the possible equations.

$$12NaOH + P_4O_{10} \rightarrow 4Na_3PO_4 + 6H_2O$$

Q18: Write down the reaction of sulphur dioxides ($S0_2$) with H_20 and base?

Answer

Reaction with H_2O

Sulphur dioxide is fairly soluble in 1-120 reacting which it to give a solution of sulphur acid H_2SO_3.

$$SO_2 + H_2O \rightarrow H_2SO_3$$

Reaction with Base

As it is acidic so it reacts with NaOH and CAO as follows.

$$SO_2 + H_2O \rightarrow Na_2SO_3 + H_2O$$

$$Ca + SO_2 \rightarrow CaSO_3$$

Q19: Write down the reaction of sulphur trioxide with Base?

Answer

Sulphur trioxide reacts violently with H20 to produce a fog of concentrated sulphuric acid dioplets.

$$SO_3 + H_2O \rightarrow H_2SO_4$$

Rex with Base

$$2NaOH + H_2SO_4 \text{——.>} Na_2SO_4 + 2H_2O$$

Sulphur trioxide itself will also reacts directly will bases to form sulphates. e.g. it. will react with CaO to form calcium sulphates.

$$CaO + SO_3 \rightarrow CaSO_4$$

Q20: Write down the reaction of chlorine oxides ($C1_20$) with H_20 and Base.

Answer

Chlorine forms several oxides but the only two are chlorine (VII) oxide C1207 and chlorine (I) oxide, CIO, and chlorine (I) oxide, C120. Chlorine (VII) oxide is also known is dichlorine heptoxide and chlorine (I) oxide as dichlorine monoxide.

Chlorine (VII) oxide

Chlorine (VII) oxide is the highest oxide of chlorine the chlorine is in its maximum oxidation state of +7. It continues the trend of the highest oxides of the period 3 elements towards being stronger acids.

Reaction with H_20

Chlorine (VII) oxide reacts with H_20 to give the very strong acid chloric (VII) acid also known as perchloric acid. The PH of typical solution will sulphuric acid. The PH of typical solution will sulphuric acid be around O.

$$Cl_2O_7 + H_2O \text{—>} 2HClO_4$$

Reaction with Base

Chloric (VII) acid reacts with NaOH solution to form a solution of sodium chlorate (VII).

$$NaOH + HClO_4 \rightarrow NaClO_4 + H_2O$$

Chlorine (VII) oxide itself also react with sodium hydroxide solution to give the same product.

$$2NaOH + Cl_2O_7 \rightarrow 2NaClO_4 + H_2O$$

Q21: Write down the reaction of chlorine (1) oxide with Base?

Answer

Chlorine (I) oxide is for less acidic than chlorine (VII) oxide. It reacts with water to some extent to give chloric (I) acid, HOCl also known as hypochlorous acid.

$$Cl_20 + H_20 \rightarrow 2HOCl$$

Reaction with Base

Chloric (I) acid reacts with sodium hydroxide solution to give a selection of sodium chlorate (I) (sodium hypochlorite).

$$NaOH + HOCl \rightarrow NaOCl + H_20$$

Chlorine (I) oxide also reacts directly with sodium hydroxide to give the same product.

$$2NaOH + Cl_2O \rightarrow 2NaOCl + H_2O$$

Q22: Give a detail note on sodium chloride NaCl.

Answer

Sodium Chloride is a simple ionic compound consisting of a giant array of sodium and chloride ions.

The strong attractions between the positive and negative ion need a lot of heat energy to break, and so sodium chloride has high melting and boiling points.

If doesn't conduce electricity in the solid state because it hasn't any mobile electrons and the ions aren't free to move. However, when it melts it undergoes electrolysis. Sodium chloride simply dissolves in H_2O to give a neutral solution.

Q23: Give an electric note on Magnesium chloride $MgC1_2$.

Answer

Magnesium chloride is also ionic, but with a more complicated arrangement of the ions to allow for having twice as many chloride ions as magnesium ions.

Again, lots of heat energy is needed to overcome the attractions between the ions, and so the melting and boiling points are again high.

Solid magnesium chloride is a nonconductor of electricity because the ions aren't free to move. However, it undergoes electrolysis when the ions become free on melting.

MgC12 dissolves in H20 to give a faintly acidic solution (PH = approximutely 6). When magnesium ions are broken off the solid lattice and go into solution, there is enough action between the 2+ ions and the water molecules to get co-ordinate bonds formed between the magnesium ions and lone pairs on surrounding H20 molecules.

Hexaaquamagnesium ions are formed $[Mg(H_2O)_6]^{2+}$

$MgCl_2 + 6H_2O \rightarrow [Mg(H_2O)_6]^{2+} + 2Cl^{+}$ ions are acidic.

Q24: Give a detail note on Aluminium chloride AlC13.

Answer

At room temperature, solid aluminium chloride has an ionic lattice with a lot of covalent character.

At temperature around 180 — 190ºC (depending on the pressure aluminium chloride connects to a molecular form A12C16. This causes it to melt or vaporize because there are now only comparatively weak inter molecular attractions. As the temperature increases a bit more, it increasingly breaks up into simple AlC13 molecules.

Solid aluminium chloride doesn't conduct electricity at room temperature because the ion are not free to move.

Molten aluminium chloride doesn't conduct electricity because there are not any ions any more.

The aluminium chloride react with H20 ratio than just dissolving in it. In the first existence, hexaaquaaluminium ions are formed together with chloride ions.

$AlCl_3\ 6H_2O \rightarrow [Al(H_2O)_6]^{3+} + 3Cl^{+}$

Q25: Write down the details note on silicon tetrachloride SiC14.

Answer

SiC14 is a simple covalent chloride between the silicon and the chlorine for the two to form ionic bonds.

Silicon tetrachloride is a colourless liquid at room temperature which fumes in moist air. The only attractions between the molecules are van der Waals dispersion forces.

It doesn't conduct electricity because of the lake of ions mobile electrons.

It fumes in moist air because it least with H20 in the air to produce hydrogen chloride. If you add H20 to silicon tetrachloride there is a violent reaction to produce silicon dioxide and fumes of hydrogen chloride.

In a large excess of H_2O the hydrogen chloride will of cause, dissolve to give a strongly acidic solution containing hydrochloride acid.

$$SiC14 + 2H_2O \rightarrow SiO_2 + 4HCl$$

Q26: Write down the reaction of phosphorus chlorides with H_2O.

Answer

There are two phosphorus chlorides phosphorus (III) chloride, Pc13 and phosphorus (V) chloride Pc15. Phosphorus (III) chloride (phosphorus bichloride) Pc13.

This is simple covalent chloride-again a fuming liquid at room temperature. Phosphorus (III) chloride react violently with H20. ,

$$PC1_3 + 3H_2O \rightarrow H_3PO_3 + 3HCl$$

Phosphorus (V) chloride (Phosphorus pentachloride) $PC1_5$

Phosphorus (V) chloride is a white solid which sublime at 163 °C. The higher the temperature goes above that, the more the phosphorus (V) chloride dissociate to give phosphorus (III) chloride and chlorine.

$$PC1_5 \longleftrightarrow PC1_3 + C1_2$$

Solid phosphorus (V) chloride contain ions that is a solid at room temperature. The formation of ions molecules two molecules of PCls.

Phosphorus Chloride has a violent reaction will H_2O producing fumes of hydrogen chloride.

As with the other covalent chlorides, if there is enough H_2O present, these will dissolve to give a solution containing hydrochloric acid.

$$PCl_5 + H_2O \longleftrightarrow POC1_3 + 2HCl$$

If H_2O is boiling, the phosphorus (V) chloride reacts further to give phosphorus (V) acid and more HCl. Phosphoric (V) acid is also known just as phosphoric acid or as ortho phosphoric acid.

$$POC1_3 + 3H_2O \rightarrow H_3PO_4 + 3HCl$$

The overall equation in boiling H20 is just a combination of these.

$$PCl_5 + 4H_2O \rightarrow H_3PO_4 + 5HCl$$

Q27: Write down the formula of following:

1) Ortho silicic acid

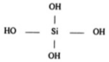
2) Phosphoric acid

3) Sulphuric acid

4) Chloric acid

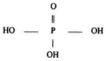
Answer

Orthosilicic acid.



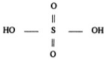
$$HO - \overset{OH}{\overset{|}{\underset{\underset{OH}{|}}{Si}}} - OH$$

Phosphoric acid



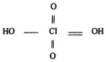
$$HO - \overset{O}{\overset{\|}{\underset{\underset{OH}{|}}{P}}} - OH$$

Sulphuric acid



$$HO - \overset{O}{\overset{\|}{\underset{\underset{O}{\|}}{S}}} - OH$$

Chloric acid



$$HO - \overset{O}{\overset{\|}{\underset{\underset{O}{\|}}{Cl}}} = OH$$

Q28: Aluminium hydronuclie is amphoteric. Justify it.

Answer

Aluminium hydroxide is amphoteric like Na and Magnesium hydroxides, it will least will acids. This is showing the basic side of its nature.

With dilute hydrochloric acid, a colourless solution of aluminium chloride is formed.

$$Al\ (OH)3 + 3HCl \rightarrow AlC13 + 3H_2O$$

But aluminium also has an acidic side to its nature. It will react with sodium

hydroxide solution to give a colourless solution of sodium tetrahydro aluminate.

$$Al\ (OH)_3 + NaOH \rightarrow NaAl + (OH)_2$$

Q29: Why atomic Radii increases as we move from Li to caesium?

Answer

As we move from lithium to caesium an extra shell of electrons of an extra shelt increases there in an in increases of atomic ionic radii (of M+ cons) as we move from lithium to caesium.

Q30: Define ionization energy and why Alkali metals have low ionization energy? Answer

First ionization energy is the energy needed to remove the most loosely held electron from each of one mole of gaseous atoms to make one mole of singly charged gaseous ions, in other words for I mole of this process.

$$^{x}(g) \rightarrow X^{+}\ e$$

As you go down the graph ionization energy falls. Alkali metal have only one electron in their outermost shell (nsl electron). The nsl electron is so weekly held with the nucleus that it can be removed very easily. Alkali metals therefore have low ionization energies.

As the distance nsl electron from the nucleus increases on moving from Li to Cs its removal becomes more and more easy as are proceed from Li to Cs i.e the amount of energy used in the removal of nsl electron is maximum in case of energies of alkali metals go on decreasing from Li to Cs.

The second ionization energies are fairly high, since the loss of the second electron from M+ cation which has a noble gas configuration is quite difficult.

Q31: Define electronegativity. And write down its trend in alkali metals.

Answer

Electronegativity is a measure of the tendency of an atom to attract a bonding pair of electrons. In alkali metals to the outer electron of the atom of alkali metals is loosely held with the nucleus and hence ft can be easily excited to the higher energy levels even by a small amount of heat energy. During the excitation process the electron absorbs some energy and when this excited electron comes back to its original position, it gives out absorbed energy in the form of light in visible region of the electromagnetic. Since the amount of energy absorbed during the excitation process is different in different atoms, different colours are impacted by the atom to the flame. The property of alkali metal to give coloration in the burn flame has been used to detect their presence in salts by a test, known as flame test.

Q32: Why the melting and boiling point of group 1 elements go down the group?

Answer

The melting and boiling points are very low because of the presence of weak inner atomic bonds in the solid state of the alkali metals. These bonds are due to their atomic radii and mainly due to their electronic configuration having a single valance electron are compared to large number of available vacant orbital.

As the size of the metal atoms increases the repulsion of non-bonding electrons decreases the melting and boiling points of alkali metals when we move from Li to Cs.

Q33: The densities of alkali metal are low, why?

Answer

The densities of alkali metals are low due to large atomic volumes Li, Na, and K are" lighter than H20. The densities increase with the increases in atomic from Li to Cs indicating the greater atomic with more than compensates for the bigger size of the atoms. K is however lighter than Na which is due to an__________ increase in atomic size of K.

Q34: Write down the reaction of first group alkali metal will oxygen.

Answer

Alkali metal lead with 02 01 air rapidly and thus banished due to the formation of their oxide on the surface of the metals. It is for this reason that alkali metals are stored in kerosene or paraffin oil.

$$4Li + O_2 \rightarrow Li_2O$$

Na when burnt in 0_2 from sodium peroxide Na_2O_2.

$$2Na + O_2 \rightarrow Na_2O_2$$

Other alkali metal reacts with 0_2 to from space oxide of MO_2 type.

$$M + O_2 \rightarrow MO_2$$

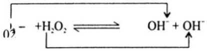
Normal oxides of alkali metals other than that of Li (Li_20) are not formed by the direct reaction b/w the metals and 0_2 they formed by indirect methods by producing peroxides, nitrates, nitrate with metals itself.

$$2Na_2O_2 + 4Na \rightarrow 4Na_2O$$

$$2Na_2O_2 + 6Na \rightarrow 4Na_2O + N_2$$

$$2Na_2O_2 + 10Na \rightarrow 6Na_2O + N_2$$

Normal oxide reacts with H_2O to form hydroxides by proton exchange.



The peroxides (O_2^{2}-) and superoxides (O_2^{2}-) are strong oxidising agent and react with H_2O to give H_2O_2 and O_2.

$$O_2^{2}- + 2H_2O_2 + H_2O_2 + 2H_2O_2$$

$$2[O — O] + 2H_20 \rightarrow H_2O + O_2$$

Q35: Write down effect of Nitrates, carbonates and hydrogen carbonates.

Answer

Group I compounds are non-stable to heat than the corresponding compounds in group 2. Li compound behave similarly to group 2 compounds but the rest of group I are in same way difference.

Nature of carbonates, bicarbonates and Nitrates

The carbonates (M_2C0_3) and bicarbonates (MHCO) a highly stable to heat with increase of electropositive character from Li to Cs, the ability of these salts increases.

Their nitrates decompose a strong heating to the corresponding nitrate and 0_2.

$$2NaNO_3 \rightarrow 2NaNO_2 + O_2$$

Q36: Explaining the trend in terms of the polarizing ability of the positive ion. Justify.

Answer

When alkali metal cations approach near an anion attracts the outer most electron of the anion and repels the molecules. Thus the distortion of polarization

of the anion talks place. This distortion usual showing of electron L/w two oppositely charged ions the bond between the cations and anion becomes partly covalent in character. In general, the smaller cations polarize the anions more effectively than bigger one. Therefore, the lithium salts are slightly covalent which other alkali metal salts are ionic.

Q37: Define flame test? And the property of alkali metals to give also reaction in the Bunsen flame has been used to detect the presence in salts by a test known as flame test? Justify.

Answer

Flame test are used to identify the presence of a relatively small number of metal ions in a compound.

We have seen that outer of atom of alkali metals is loosely hold will nucleus and hence it can easily excited to the higher energy links even by a small amount of heat energy. During the excitation process the absorbs some energy and under this excited electron comes back to its original position, it guesses out absorbed energy in the form of light in visible region of the electromagnetic spectrum and hence the colour is imparted by the atoms to the flame. Since the amount of energy absorbed to the flame. The property of alkali metals to give coloration in the Bunsen flame has been used to detect their presence in salts by a test known as flame test.

Q38: Alkaline earth metals have higher nuclear charge which tends to draw the orbit electrons towards the nucleus?

Answer

Because of the addition of a shell of to each element from Be to Ra, the atomic volume increases from Be to Ra. With the increase of atomic volume, the atomic

and ionic radii (of M2+ ions) also increases from Be to Ra. The atomic radii of these elements are however smaller than those of alkali metals have higher nuclear charge which tends to draw the electrons towards the nucleus. The smaller values of atomic radii result in that the alkaline earth metals are harder, have higher densities and higher melting points than alkali metals.

Q39: Mg $(OH)_2$ is weakly basic while Be $(OH)_2$ is the amphoteric why?

Answer

Be $(OH)_2$ is not all basic infant it is amphoteric since it reacts with acids to from salts and with alkalis to give beryllates.

$$\text{Be }(OH)_2 + 2HCl \rightarrow BeCl_2 + 2H_2O$$

$$\text{Be }(OH)_2 + 2NaOH \rightarrow Na_2BeO_2 + 2H_2O$$

The hydroxides or other metals are basic character. Their basic character increase on moving down the group. Thus Ma (OH) is weekly basic while Be $(OH)_2$ Be $(OH)_2$ is the amphoteric. The increase in basic character of the hydroxides on moving down the group is due to the fact that will the increase in size of M^{2+} cation both the polarity of M— OH bond and the internuclear distance between oxygen of OH ion and the metals atom increase. As a result of this there is greater ionization of $M(OH)_2$ and hence basic character increases.

Due to high polarising power of small Be^{2+} in $Be(OH)_2$ are almost insoluble in H20 while the hydroxides of other metals are slightly soluble. Their solubility increases on moving down the group as shown by the increasing value of the solubility products of these hydroxides.

Q40: Discuss the effects of heat on the group 2 nitrates.

Answer

All the nitrates in this group undergo thermal decomposition to give the metal oxide nitrogen dioxide and oxygen.

The mixtures are while solids, and the oxides produced are also white solids. Brown nitrogen dioxide gas is given off together with oxygen, Magnesium and calcium nitrates normally have water of crystallization and the solid may dissolve in its over 1-120 of crystallization to make a colourless Skelton before its starts to decompose.

$$2x\,(NO_3)_2 \rightarrow 2\,x\,O + 4NO_2 + O_2$$

As go down the group mixtures also have to be heated more strongly before they will decompose.

Q41: How Beryllium differ from Members of its family?

Answer

Be the first element of the group differs from rest of alkaline earth metals due to its small atomic size and comparatively high electronegativity.

Hardness and Melting and boiling point

Be is hardest by all the element of its group and their melting and boiling point are also high.

Formation of Covalent Bond

Be has a tendency to form covalent compounds. Thus when its react with other elements the electronegativity difference is __________ layer and the bond is therefore Covalent.

Reaction with H_2O

Be does not react with H_20 even at high temperature other alkaline earth metal decompose water liberating H_2 gas.

$$Mg + H_2O \rightarrow MgO + H_2$$

Rex with alkalis

Be react with alkalis to form hydrogen

$$Be + 2NaOH \rightarrow Na_2 BeO_2 + H_2$$

Behaviour of oxides and hydroxides

The oxides and hydroxides of Be are amphoteric dissolve in both acid and alkalis to form salts.

$$Be O + H_2SO_4 \rightarrow BesO_4 + H_2O$$

Q42: Write down the number of molecules of H_20 of crystallization of Be^2 +.

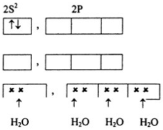
Answer

The salts of Be^{2}+ ion cannot have more than four molecules of H_20 of crystallization while other alkaline earth melts have more than four molecules of H_2O of crystallization. This is explained as follow. In case of Be^{2}+ ion there are only four orbitals (namely one orbital can accept lone pairs of electrons stenosed by O — atoms on each of the H_20 molecules are as.

Valance shell electronic configuration of Be atom = $2s^2$, $2P^o$

Valance shell configuration of Be^{2+} ($2S^o$, $2P^o$)

Attachment of $4H_2O$ molecules with Be^{2+} ion



Other alkaline earth metals like Mg can their coordinate ion no to six by using one their outer most shells.

Q43: The melting and boiling pointing C to Pb are gradually decreases down the group. Why?

Answer

As we move down the group from c to Pb the melting point as well as boiling points generally decreases, although the decrease is not in a regular order. This decrease in melting points as well as in boiling point indicates that inter-atomic forces also decreases in the same direction. The melting and boiling point of c and Si are notably high because of the tendencies of these elements to form giant molecules. The low .value for tin's melting point compared with lead is presumably due to forming a distorted 12 co — ordinate structure rather than a pore one.

Q44: Carbon and silicon doesn't conduct electricity.

Answer

Carbon as diamond doesn't conduct electricity. In diamond the electrons are all tightly

bond and not free to move.

Unlike diamond (which doesn't conduct electricity) silicon, germanican and grey tin are semiconductor.

White tin and lead are normal conductors of electricity. There is clear trend from the typically non-metallic conductivity behaviour of carbon as diamond, and the typically metallic behaviour of white tin and lead.

Q45: Electronegativity or ionization energy decreases of moving down type group from c to Pb. Why?

Answer

Carbon is the most electronegative element of this sub group and the electronegativities decreases with like of atomic no but not a regular manner. This is probably due to the filling of the d orbitals in case of Ge and Sn and orbitals in case of Pb.

The ionization energy values decrease on moving down the group from c to Pb although the decreases do not occur in a regular order. The irregulating in the decreases of those values is due to the filling of interviewing d — orbitals in case of Ge and Sn and f— orbitals in case of Pb which are not able to seen the valance electrons effectively in elements.

Q46: Carbon and silicon show +4 oxidation state while occurrence of +2 and +4 oxidations states in case of Ge, Sn and PB. Explain.

Answer

Carbon and silicon show + 4 oxidation state while occurrence of + 2 and +4 oxidation states in case of Ge, Sn and Pb are when only two np electrons from the ns^2P^2 configuration are lost. The element in +2 oxidation states remain infect and hence are not lost in the formation of M^{2+} cations. This pair of ns^2 electrons is called inter pair of electrons. Since the group the stability of +2 oxidation state also increases from Ge^{2+} to Pb^{2+} i.e. Ge2+ < Sn^{2+}<Pb^{2+}.

When all four ns^2 P^2 electrons are lost we get the elements in +4 oxidation state i.e. M^{4+} cations are formed. On decreasing the group stability of +4 oxidations state decreases

i.e. the stability of M^{4+} cations decreases from Ge^{4+} to Pb^{4+}. i.e. Ge^{4+} >Sn^{4+} >Pb^{4+}.

Q47: The dipole moment of CO_2 and explain it?

Answer

The dipole moment of CO_2 is zero. Therefore, it is a linear molecule.

O = C = O

Q48: Draw and explain the structure of SiO_2.

Answer

It is a macro molecular compounds in which silicon and oxygen atoms are linked together covalently in tetrahedral basic unit.

In crystallite, these unit are joined as in diamond, circle in quartz and they are arranged spirally around an axis. Because of its structure of SiO_2 is nonvolatile and hard unlike CO. Triatomic molecules of $Si0_2$ and $C0_2$, carbon and silicon are similar in having

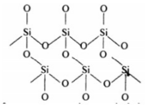
1) 4 valence electrons

2) 4 covalent bond formation

But they show a lot of difference in their physical properties. It is due to the fact that.

1) Silicon atoms are much layer is size than c atoms and thus tend to be surrounded by more oxygen atoms.

2) Silicon from only single bond with oxygen atom while carbon forms double bonds.



Si atom is bound to four oxygen atoms in a tetrahedral structure which result in the formation of SiO_2 crystal. The simplest formula for silica is SiO_2.

Q49: Write down the trends of electronegativity of Halogens and also its first electron of finally.

Answer

Halogens have high values of electronegativity in the group. These value decreases as the proceed from F to I in the group. Large electronegativities values of halogen atom indicates that x atoms have a strongly tendency to form x ions. Electron affinity values decreases from Cl to I.

Q50: Define bond enthalpies and also explain the bond enthalpies in halogens?

Answer

Bond enthalpy is the heat needed to break one mole of a covalent bond to produce individuals' atoms, stating from the original substance in the gas state, and ending with gaseous atoms.

The bond enthalpies of the Cl—Cl, Br — Br and I—I bonds fall just as you would except but the F — F bond is deviated from the sequence. This is because duet to very small F—F bond length very large as compared to other x— x bond

lengths. This makes the F atoms in F_2 molecules repel each other and helps the dissociation of F_2 molecules into factors.

X — X bonds in $C1_2$, Br_2 and I_2 molecules is stronger than F—F bond in F_2 molecule. This is due to the possibility of the existence of multiple bond in x — x bonds involving d — orbitals.

Q51: HF is the weakest acid. Why?

Answer

HF ionizes only slightly while HCl, HBr, and HI ionize completely. Hence is the weakest acid and strength of these acids increases from HF to HI

i.e. I-IF (weakest acid) < HCl < HBr < HI.

The weakest acidic nature of HF is due to the fact that the dissociation energy of H—F bonds is HF molecule is the highest and hence this molecule has least tendency to splits up into and F- ion in aqueous selection.

Q52: Define open Hearth process.

Answer

A fie furnace is used to remove the impurities of metals. It is lined inside with fire bucks and is just like a room. Burning gases are entered from one side and exhaust gases are removed from the opposite end. The process is operated from opposite ends after an interval. Metals melts in a shorter time by this two-way heating.

Q53: Write down the application of bleaching powder.

Answer

Bleaching powder is actually a mixture of calcium hypochlorite ($Ca(OCl)_2$) and the basic chloride $CaCl_2$, H_2O will some stalked lime $Ca(OH)_2$.

Bleaching powder is used for the disinfection of drinking H_2O or swimming pools H_2O. It is used as a sanitizer in outdoor swimming pool in combination with a cyanuric acid stabilizer which reduces the loos of chlorine due to ultraviolet radiation.

The calcium content hardness the H_20 and tends to clog up some filters hence some produce containing calcium antiscaling agents.

Bleaching powder is used for bleaching cloth and limen. It is also used in bathroom, cleaners, household disinfectant sprays, mors and algae removers and cured.

In addition, bleaching powder may be used to manufacture chloroform. Bleaching powder is used also in sugar industry for bleaching sugar cane juice before its crystallization.

Q54: Define Goiter?

Answer

The term goiter refers to the abnormal enlargement of thyroid gland due to deficiency of iodine in diet. It results in swelling in neck. It is important to know that the presence of goiter does not necessarily mean that the thyroid gland is malfunctioning hypothyroidism. A goiter can also occur in a gland that is producing too much thyroid hormone (hyperthyroidism) or even the current amount of hormone (euthyroidism) goiter indicates there is a condition present which is carrying the thyroid to grow abnormally.

Q55: Define fluoride deficiency and toxicity?

Answer

Fluoride Toxicity

Fluoride toxicity or fluoride poisoning is a condition in which more fluoride is taken than the amount required for normal growth development and metabolism. Fluoride toxicity is characterized by a variety of signals and symptoms poisoning most commonly occurs following ingestion of conspicuous amount of fluoride entraining products. Symptoms or set usually occurs within minutes of exposure. Fluoride is formed in many common household products toothpaste, insecticides etc..

Fluoride deficiency

Fluoride deficiency result when the amount of its up taken is less than required. Fluoride deficiency results in Brittle bones or demineralization of bones. Fluoride deficiency can lead to a higher like hood of developing bone fractures and possibly even steoporesis.

We can combine these two half equations to give the overall reaction asfollows:

$$H_2SO_4 + 2H+ + 2BR^{-l} \rightarrow BR_2 + SO_2 + 2H_2O$$

Q56. What happen when HI is added to conc. H_2S0_4?

Answer

Iodide ions are stronger reducing agents they are oxidized to 12 to 12 by the conc.

$$H_2SO_4. (2I-^{1} \rightarrow I_2 + 2e^-)$$

The reduction of the sulphuric acid is more complicated than before. The iodide ions are powerful enough reducing agents to reduce it. This reduction takes place in following steps:

i) First to sulphur dioxide (oxidization state of S = +4).

ii) Then to sulphur itself (oxidation state of S = O).

iii) Then formation ofH2S (oxidation state of S = — 2).

The most important of this mixture of reduction products is probably the H2S. The half reaction for its formation is:

$$H_2SO_4 + 8H^+ + 8e^- \rightarrow H_2S + 4H_2O$$

On combing these text two half equations

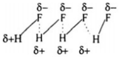
$$H_2SO_4 + 8H^+ + 8e^- \rightarrow 4I_2 + H_2S + 4H_2O$$

Quick Quiz

Q57. HI is stronger acid then HF why?

Answer

Due to very high electronegativity of F (EN = 4). HF is highly polar molecule. Due to this reason strong hydrogen bonds are formed ammg H—F molecules.

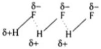


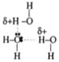
On the other hand, I^0 is a large sized atom which can exist more freely. So, HI releases more hydrogen ions. That is why HI is stronger acid then I-IF.

Q58. Although hydrogen bonding in HF is stranger than in H_2O but H_2O has much higher boiling point then that of H_2O, Why?

Answer

HF molecule may form one hydrogen bond whereas one H_2O molecule may form two H-bonds.





That is why boiling point of H_20 (100^{0}C) is higher than that of HF (98^{0}C).

Q59. The acidic character of hydrides of group VII—A elements increases on descending the group, Why?

Answer

Atomic sizes of halogens increase from F to I in group VII—A as a result stability of halogen ions increases. That's why the ability of halo acid to release ion increases, from I-IF to H.

Q60. Illustrate the oxidizing properties of halogens by giving examples of two typical reactions.

Answer

A substance which as high electronegativity and ability to accept one or more electrons is said to show oxidizing property. Also, the electron affinity values of halogens are high. But the electron affinity decreases from F to I. So, the oxidizing power of halogens, also decrease from F to I.

Upper halogen in group VII—A may displace lower halogen that is F2 may displace lower halogen that is F_2 may displace Cl- ions then Ct2 may displace Br- I ions from their solution.

$$F_2 + 2C^{-1} \longrightarrow 2F^{-1} + Cl_2$$

$$Cl_2 + Br\text{-}I \longrightarrow 2Cl — Br_2$$

Q61. Give reason

i) F is better oxidizing agent then Cl ii) Electronegativity of halogens decreases in the order F>Cl>Br>I

Answer (i)

F has the highest electronegativity (EN = 4) whereas Cl has electronegativity (EN = 3.2). Therefore, F may attract the electrons with more force and may order any substance more than that of Cl.

Answer (ii)

Atomic sizes of halogens increase from F to I due to increase in number of shells from F to I as a result pull of nucleus to attract the shared pair of electrons decreases from F to I.

F > Cl > Br > I

F > Cl > Br > I

E.N = value = 4.0 3.2 3.0 2.5

Q62. Give different steps to obtain iron from its ores.

Answer

Iron has the following ores:

Magnetite	Fe_3O_4
Hematite	Fe_2O_3
Limonite	$Fe_2O_3 . 3H_2O$

Iron is mostly obtained from magnetite and hematite.

Stops to extract from their ores:

i) **Removal of gangue or matrix:**

In this step useless material from ores is removed manually or mechanically.

ii) **Crushing**

In this step large pieces are broken down in to small pieces with the crushers.

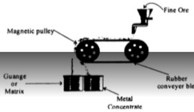
iii) **Grinding**

Teema Ball mill is oftenly used to grind the ores without contamination.

iv) **Concentration (Magnetic concentration of Iron)**

Different methods are used to concentrate the ore before sending to furnace. In case of iron magnetic separation method is used.

In this method powdered iron ore is passed over a magnetic pulley using rubber conve belts.



vi) Refining of metals (Open hearth Process)

In this process metal is heated is a fire bricks linening furnace. Hot air is through the molten metal which oxidized paned and remove the impurities on the top of molten metal or skimmed off.

Q63.What is bleaching powder? Give its common applications.

Answer

Bleaching powder is a mixture of calcium hypo chloride and calcium chloride $Ca(OCl)_2CaCl_2$, with some slaked lime ($Ca(OH)_2$).

Application of bleaching powder

i) Removal of stains

Bleaching powder is used to remove stain from clothe and different materials to climinate mildew and other stubborn stains.

ii) To Disinfect and sterilize the baby toys and other home applications.

iii) Removal of weeds, moss and algae from gardens and walkways.

iv) Bleaching powder is used to keep freshness of cut flowers by adding it to the solutions in which flowers are placed as it kills bacteria.

v) Disinfection of drinking water and swimming pool water. vi) Bleaching of sugar in sugar industry.

Q64. Give different uses of halogens.

Answer

i) Manufacturing Teflon: (Polytetra flowroethlene) i.e.

Teflon is used to store HF and other acids which corrode metals.

Fluorine issued in extraction of uranium and their isotope. Separation UF6 is manufactured to separate ^{238}U and ^{235}U.

$$UF_{4(s)} + F_{2(g)} \rightarrow UF_{6(5)}$$

Q65. Write notes a toxicity of fluorides and deficiency of fluorides.

Answer

Flouride Toxicity

Flouride toxicity or fluoride poisoning is a condition is which more fluoride is takes than the amount required for normal growth, development and, metabolism. Flouride toxicity is characterized by a variety of signs and symptoms. Poisoning most commonly occurs following ingestion of conspicuous amount of fluoride entraining products symptoms or set usually occurs within mixtures of exposure. Flouride is found in many common household products e.g. toothpaste, dietary supplementary insecticides rodenticide etc. fluoride toxicity results.

1) Arthritis
2) Stiff painful joints with or wistful swelling.
3) Asthma, especially after showering.
4) Painful bony lumps where tendons and ligaments attach to bones.

Q65.What problems are caused in human body by deficiency of Iodine?

Answer [redacted]

As human body cannot synthesize iodine so it is an essential element. The deficiency of iodine in human body leads to a disease goiter.

Goiter

The term goiter refers to abnormal enlargement of thyroid glands due to deficiency of iodine in diet. It results in swelling in neck. The presence of goiter does not mean that the thyroid gland is malfunctioning (hypothyroidism): A goiter can also occur in a gland that is producing too much thyroid ramones (hyperthyroidism).

I-A	II-A	III-A	IV-A
+1	+2	+3,5	2+,4+,6

Trends within a Group

The oxidation state of group I—A and II—A elements is fixed. But in P—block when we move from top to bottom the atomic size increases as a result the ability of atoms to lose electrons also increases.

For example, in group IV—A

C and Si show +4 oxidation state. In case of Ge, Sn and Tb only two np electrons from the ns^2P^2 configuration are lost. We get the elements in +2 oxidation sates remain inert and hence are not lost in the formation of M^{2+} cations. This pair of ns^2 electrons is called inert pair of electrons. Since the group the stability of +2 oxidation state also increases from Ge^{2+} to Pb^{2+} i.e $Ge^{2+} < Sn^{2+} < Pb^{2+}$.

When all the foru ns^2P^2 electrons are lost we get the element in +4 oxidation state, i.e. M^{4+} cations are formed. On descending the group stability of +4 oxidation state decreases i.e the stability of M4+ cations decrease from Ge^{4+} to Pb^{4+} i.e. $Ge^{4+} > Sn^{4+} >$ Pb4+.

Compounds of Ge^{2+} are less stable than those of Ge^{4+} and hence the compounds of Ge^{2+} are readily charged oxidized into those of Ge^{4+} act as strong reducing agents while those of Ge^{4+} act as oxidising agents.

$$Ge^{2+}\text{ Compounds} \longrightarrow Ge^{4+}\text{ compounds}$$

(Less stable) (More stable)

Reducing agent oxidising agent

On similar grounds it can be shown that the compounds of Sn^{2+} are less stable than those of Sn + into those of Sn^{4+}. In other words, compounds of Sn^{2+} act as strong reducing agents while those of Sn^{4+} act as oxidising agents.

$$Sn^{l+}\text{ Compounds} \longrightarrow Sn^{4+}\text{ compounds}$$

(Less stable) (More stable)

Reducing agent oxidising agent

When we compare the stability of the compounds of Pb^{2+} and Pb^{4+} ions, we find that Pb^{2+} than those of Pb^{4+} (PbC14) and hence the compounds of Pb^{4+} are readily charged (reduced) into those of Pb^{2+}. In other words, compounds of Pb^{4+} act as strong oxidising agents while those of Pb^{2+} act as reducing agents.

Pb^{2+} Compounds $\longrightarrow$ Pb^{4+} compounds

(Less stable) (More stable)

Reducing agent. oxidising agent

[redacted]