

CHAPTER – 3

SECTION – SHORT QUESTIONS

GROUP III – A AND GROUP IV – A ELEMENTS.

1. Why is aluminium not found as a free element?

FBD-2008

Ans: Aluminium is a reactive metal and does not exist in Free State. Aluminum is third abundant element (8.13%), of earth crust and mostly found in form of aluminosilicates. Some aluminium is also found as oxides like, Corundum, Gibbsite, Bauxite, Etc.

2. What is Borax?

Ans: Borax is sodium salt of tetraboric acid, $\text{H}_2\text{B}_4\text{O}_7$. It is most important than all other borates. Its chemical name is sodium tetraborate decahydrate. Its formula is $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$.

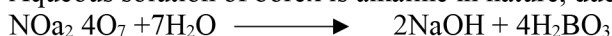
Occurrence of Borax:

Borax occurs as a natural deposit called tincal in the dried up lakes of Tibet and California.

3. What is the action of an aqueous solution of borax on litmus?

SWL-2014,FBD-2015,LHR-2015, LHR-2016,SGD-2014,RWP - 2017

Ans: Aqueous solution of borex is alkaline in nature, due to hydrolysis of borax.

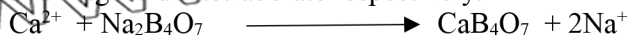


Due to the formation of alkali red litmus changes to blue and no effect on blue litmus paper. pH of solution is more than 7

4. How does borax serve as a water softening agent?

MTN- 2009

Ans: Borax can be used as water softener. Borax can remove Cu^{2+} and Mg^{2+} ions from water as calcium tetraborate and magnesium tetraborate respectively.



5. What is boric acid?

Ans: It is white crystalline chemical substance, sparingly soluble in cold water (2.6% at 40 °C) but dissolves readily in hot water (37% at 107 °C). This temperature variation in solubility forms the basis for its separation and purification.

6. How will you convert boric acid into borax and vice versa?

DGK-2008, LHR-2013,GRW-2013

Ans: **Boric acid to Borax.**



Boric Acid Borax

Borax to Boric Acid



7. Give equations to represent the following reactions.

a) Borax is heated with CoO

b) Al_2O_3 is heated with NaOH

Ans: a) $\text{Na}_2\text{B}_4\text{O}_7 + \text{CoO} \longrightarrow \text{Co}(\text{BO}_2)_2 + 2\text{NaBO}_2$



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8. Explain: CO_2 is non-polar in nature. BWP-2009,2015,LHR-2009,GRW-2011,SGD-2015

Ans: CO_2 is non-polar due to its linear structure. Both dipoles are cancelled out due to opposite direction and same magnitude. Dipole moment of CO_2 is zero.

9. What are silicates? Give one example. RWP-2008,GRW-2009,SWL-2014, LHR-2014

Ans: Silicates are the compounds which are derived from meta silicate acid (H_2SiO_3) e.g. Talc $\text{Mg}_3\text{H}_2(\text{SiO}_3)_4$, Asbestos $\text{CaMg}_3(\text{SiO}_3)_4$

10. Give a brief summary of the principal properties of silicones.

Ans:

1. Low molecular mass silicones are liquid and used as lubricants.
2. High molecular mass silicones are solid and mostly used as rubber.
3. Small change in viscosity takes place by changing temperature in silicones.
4. They are excellent insulator and water repellent.

11. Why are liquid silicones preferred over ordinary organic lubricants?

LHR-2008,SGD-2009, GRW-2008,FBD-2014, MTN-2017, RWP-2018

Ans: Liquid silicones are good lubricant than hydrocarbons or petroleum oils. Small change in viscosity takes place in silicones as compared to petroleum oil. If temperature of petroleum oil is drop from 100°C to 0°C , the increase in viscosity in **Hundred folds**. If same change in temperature take place in silicones, the increase in viscosity is only **four folds**. In the presence of air or oxygen at temperature as high as 300°C , silicone oils remain free from acid formation and oxidation process. Organic liquid decomposes at high temperature.

12. Discuss the effect of temperature on semiconductor.

GRW - 2016

Ans: When a metal is heated, its resistance increase but when a semiconductor is heated its resistance decreases.

13. Write four uses of Borax.

GRW-2015, SGD-2010, LHR-2012, BWP-2014, GRW, DGK-2014, MTN, GRW, DGK-2015, DGK, RWP-2016, DGK-2017

Ans:

- i) It is used in softening of water
- ii) It is used in metallurgical operations
- iii) It is used in leather industry for tanning and dyeing
- iv) It is used in making washing powder.

14. What is Borax Bead Test and procedure?

RWP-2005, 2010, GRW-2008,SWL-2014,2015, DGK,GRW-2017

Ans: It is a test used to identify metallic cations from the color or beads from them. They react with fused borax. This test is based upon the fact that same metal cations form color beads on reacting with B_2O_3 .

Procedure:

Prepare a loop at the end of a platinum wire. Heat the wire and take a little powdered borax on the hot loop. Heat again, borax first swells up and then melts into colorless, glass-like beads on the loop. Now put a few grains of the substance, under examination, on the beads and re-heat it first in the oxidizing flame and then in the reducing flame. Note the colour of the beads.

15. Give two similarities between carbon and silicon.

LHR - 2015

Ans: Similarities between carbon and silicon.

- (i) Both have four electrons in their valence shells.
- (ii) Both also form four covalent bonds

16. Write four properties of vitreous silica.

BWP -2017

Ans:

1. High transparency to light
2. Highly refractory does not soften below $1500-1600^\circ\text{C}$
3. Hard brittle and elastic
4. Low coefficient of thermal expansion

17. Aluminium is not found free in nature comment the statement? **FBD - 2008**

Ans: It occurs primarily as alumino-silicate minerals found in the rocks of the outer portion of the earth. So, Aluminium is not found free in nature.

18. Write the behavior of Al with (conc). HNO_3 ?

Ans: Aluminium does not react with nitric acid at any concentration probably because of the formation of protective layer of aluminium oxide.

19. What is meant by chemical garden?

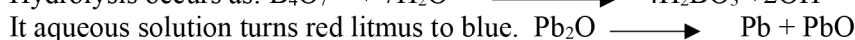
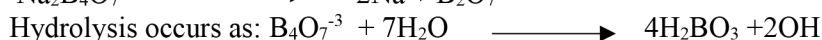
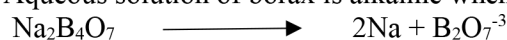
MTN-2008, DGK-2008, GRW-2009, SGD-2009, BWP-2014, LHR, MTN, DGK, -2014, FBD-2015, SWL-2016, LHR-2017, LHR, GUJ-2018

Ans: When crystals of soluble coloured salts like nickel chloride, ferrous sulphate, copper sulphate or cobalt nitrate, etc. are placed in 1M solution of sodium silicate, they produce a very beautiful growth, like plants, which is called chemical garden.

20. How aqueous solution of borax is alkaline?

SWL-2014, F.B-2015, LHR-2015, LHR-2016, SGD-2014

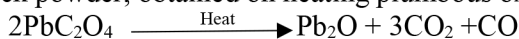
Ans: (i) Aqueous solution of borax is alkaline when dissolved in H_2O . It ionizes as.



21. How lead sub-oxide (Pb_2O) is prepared. What is use of lead Sub-oxide?

LHR-2014

Ans: It is black powder, obtained on heating plumbous oxalate in the absence of air



Plumbous oxalate Lead sub-oxide

Pb_2O is decomposed by heat into Pb and PbO. Oxidation state of lead is +1. Other than pigments, it is used in the manufacture of lead storage batteries.

22. How clay Articles are glazed.

Ans: Clay articles are glazed by boric acid because borate glazes possesses a higher from hardening to rapidly. The addition of gypsum increase the setting time of cement.

23. Discuss use of PbCrO_4 in paints?

GRW, LHR-2014

Ans: It is used as a pigment under the name of chrome yellow. Orange or red basic lead chromates are formed when lead chromate is boiled with dilute alkali hydroxide and are used as pigments. The stable yellow modification of lead chromate is monoclinic. Mixture of lead chromate with lead sulphate or barium sulphate is also used as yellow pigment.

24. Outline any four uses of aluminium?

BWP-2008, DGK-2008, SGD-2016, GRW-2017

Ans: (i) It is non-magnetic and is thus use din navigational equipment.
(ii) It is non-toxic and can be used for making food and brewing, equipment's and in packaging.
(iii) Aluminium readily form alloys with other metals like copper, magnesium, nickel and zinc.
(iv) At home, aluminium is found in the form of cooking utensils, window frame and kitchen foil.

25. Three properties of Borax.

Ans: 1. Borax is a white crystalline solid.
2. It is sparingly soluble in cold water but more soluble in hot water. In 100 g of water at 10°C only 3g of borax is soluble but at 100°C its solubility is 99.3 grams.
3. If a saturated solution of borax be allowed to crystallize above 62°C , octahedral crystals of pentahydrate $\text{Na}_2\text{B}_4\text{O}_7 \cdot 5\text{H}_2\text{O}$ separates out, but if temperature is below 62°C decahydrate crystals $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ are formed.

26. Outline the principal uses of borax.

Ans: **Uses of borax:**

1. It is used to prepare borate glass, which is heat resistant.
2. It is used in softening of water.
3. It is employed in borax bead test, for the detection of metallic cations.
4. It is used in metallurgical operations.
5. It is used as a flux in welding and metallurgy.
6. It is employed in making washing powders.
7. It is used in leather industry for tanning and dyeing.
8. It is used in cosmetics, soaps, textiles, paints, medicine, and match industry and as a preservative.

27. Uses of Boric Acid.

AJK-2015, SWL, SGD -2017

- Ans:
1. Boric acid is used in medicine as an antiseptic, e.g. dusting powder, boric ointment and boric solution is used as an eye-wash.
 2. It is used in pottery as a glaze because borate glazes are more fusible than silicate glazes and possess a higher coefficient of expansion.
 3. It is also used in candle industry for stiffening of wicks.

28. Why is CO_2 a gas at room temperature while SiO_2 is a solid?

LHR-2006, BWP-2006, MTN-2008, DGK-2008, SGD-2010, LHR-2012, GRW-2013

LHR, RWP, MTN, SWL-2014, SGD-2015, AJK, FBD-2016, RWP, FBD-2017, MTN, LHR-2018

Ans: Both carbon and silicon are the members of group IV A and have four electrons in their valence shell. Size of carbon atom is smaller than the size of silicon atom. In CO_2 each carbon atom forms two double bonds with two oxygen atoms. CO_2 is an independent molecule.



In case of SiO_2 , each silicon atom is covalently bonded with four oxygen atoms and each oxygen atom is attached with two silicon atoms. This networking of bonds is due to bigger size of silicon than carbon. SiO_2 has three dimensional regular arrangement of silicon and oxygen. Due to this network of strong covalently bonded atoms of Si and oxygen are present at their fixed position and it exists as solid at room temperature.

29. Write four uses of Sodium Silicate.

LHR, FBD, DGK-2014, DGK-2015, AJK, MTN, LHR-2016, MTN, SGD-2018

- Ans:
1. It is used as a filler for soap in soap industry.
 2. It is used in textile as fire proof.
 3. It is used as furniture polish.
 4. It is also used in calico printing. Calico printing is a special printing on cotton fabrics.

30. What are silicones? Write their uses.

FBD-2005, 2010, LHR-2008, 2009, SGD, MTN-LHR-2014, DGK-2015, FBD, SWL-2017, BWP-2018

Ans: *"These are polymeric chain compounds consisting of a backbone of alternately linked silicon and oxygen atoms and alkyl or aryl groups are attached to the silicon atoms."*

Uses of silicones:

- (i) A silicon film covers the surface and repels water like a grease film.
- (ii) Much of the leak of electricity through the moisture film on ceramic electrical insulators can be prevented by a silicon film.
- (iii) Methyl silicones of high molecular mass resemble rubber and are used in making rubber and are used in making rubber-like tubing and sheets.

31. Define Semiconductors. Give example. **BWP-2008, 2009, GRW-2010**

Ans: "A semiconductor is a solid, crystalline material with an electrical conductivity intermediate between that of metals and insulators".

Example: Si, Ge, Se

32. Write types of semi-conductors.

Ans: Semiconductor are of two types.

N-Type Semiconductor:

Semiconductor in which mobile phase is electrons and stationary phase in positive ions.

P-Type Semiconductor:

The semiconductor in which mobile phase are holes and stationary phase in negative ions.

33. Semi-conductors are used as transistors, explain it. **BWP - 2014**

Ans: another special property of semiconductors is the way they behave when they are joined to another material, which may be a metal or a different semiconductor. The junction between the different materials forms a boundary. It allows electricity to pass more properly and is used in transistors. Transistors are much smaller and less complicated than old fashioned electronic tubes. They are used in radio, television, computers and calculators.

34. Four uses of lead compounds in paints.

- Ans:
1. It is used for manufacture of lead storage batteries.
 2. It is used as red pigment in paints.
 3. Mixture of linseed oil and red lead is applied to steel and iron to prevent corrosion.
 4. It is an important ingredient for the manufacture of flint glass, matches and ceramic glazes.

35. Uses of lead monoxide.

- Ans:
1. It is usually used in preparing flint glass and paints.
 2. If litharge is boiled with water and olive oil, lead oleate is formed which is a sticky adhesive mass.
 3. A paste of litharge and glycerin harden on standing and yield a cement that is stable towards water and is often employed to seal drain pipes of sinks.
 4. It is also used as glaze for decorating ceramic objects.

36. Show that H_3BO_3 is monobasic acid? **LHR- 2011**

Ans: H_2BO_3 is a very weak acid and ionizes to a very limited extent mainly as a monobasic acid.

37. How Al finds its uses in metallurgy and photoflash bulbs? **LHR - 2014**

Ans: **Use of Al in metallurgy:**

Because of its ability to combine with both oxygen and nitrogen the metal is often used to remove air bubbles from molten metals.

Uses Al in Photoflash Bulbs:

Aluminium sheets are said to be corrosion-free, However if the aluminum powder is heated to $800^\circ C$ and above, the metal will react with air to form aluminium oxide, and aluminium nitride, the reaction is accompanied by the evolution of heat and intense white light. This property of aluminium is made use of in flash lights photography.

38. Borate glazes are better than silicate glazes. Explain. **LHR - 2012**

Ans: Boric acid is used in pottery as a glaze because borate glazes are more fusible than silicates glazes and possess a higher coefficient of expansion.

39. White lead is not a good pigment. Give reason? **RWP - 2016**

Ans: Basic lead carbonate $2PbCO_3 \cdot Pb(OH)_2$ is an amorphous white pigment. White lead is not suitable for use as good pigment since it is darkened by the hydrogen sulphide which is frequently present in the atmosphere.

40. What is asbestos? Give its two uses.

DGK - 2016

Ans: Asbestos is hydrated calcium magnesium silicate $\text{CaMg}_3(\text{SiO}_3)_4$. It is commonly used in making incombustible fabrics and hard boards, etc.

41. Write short note on white lead and lead chromate?

Ans: **White Lead:**

Basic lead carbonate $2\text{PbCO}_3 \cdot \text{Pb(OH)}_2$ is an amorphous white pigment. It mixes readily with linseed oil and has a good covering power. White lead is not suitable for use as a good pigment since it is darkened by the hydrogen sulphide which is frequently present in the atmosphere.

Lead Chromate:

It is used as a pigment under the name of chrome yellow. Orange or red basic lead chromates are formed when lead chromate is boiled with dilute alkali hydroxide and are used as pigments. The stable yellow modification of lead chromate is monoclinic. Mixture of lead chromate with lead sulphate or barium sulphate are also used as yellow pigments.

42. Boron differs from its family members. Discuss?

LHR - 2012

- Ans: (i) Boron is only element in Group III A which is non-metallic in behavior.
 (ii) It is the only element with less than four electrons in the outermost shell which is not a metal.
 (iii) One of the outstanding features of the chemistry of boron is its ability to form molecular addition compounds.
 (iv) Boron does not form ionic compounds with sulphate, nitrate or other anions because boron does not form a stable cation.

43. Write a formula of.

(i) Colemanite (ii) Cryolite (iii) Tale soapstone (iv) Tincal (v) Mica (vi) Bauxite

(vii) Borax

Ans: (i) Colemanite	Formula	$\text{Ca}_2\text{B}_4\text{O}_7 \cdot 5\text{H}_2\text{O}$	SGD - 2015, 2016
(ii) Cryolite	Formula	Na_2AlF_6	SGD - 2016
(iii) Tale soapstone	Formula	$\text{Mg}_3\text{H}_2(\text{SiO}_3)$	
(iv) Tincal	Formula	$\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$	SGD-2015
(v) Mica	Formula	$\text{KH}_3\text{Al}_3(\text{SiO}_4)_3$	
(vi) Bauxite	Formula	$\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$	
(vii) Borax	Formula	$\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$	MTN - 2014

44. Why boric acid cannot be titrated by NaOH.

DGK - 2016

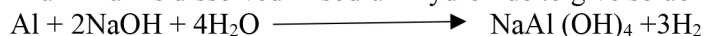
Ans: Boric acid is partially neutralized by caustic soda to give borax so, boric acid cannot be titrated by

$$4\text{H}_3\text{BO}_3 + 2\text{NaOH} \longrightarrow \text{Na}_2\text{B}_4\text{O}_7 + 7\text{H}_2\text{O}$$

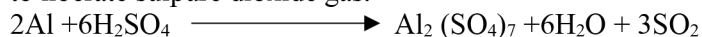
45. How does Aluminium react with (a) NaOH (b) H_2SO_4 (c) HCl

BWP-2008, LHR-2013, MTN-2008, SWL-2008, GRW-2014, MTN - 2015

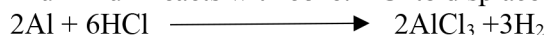
Ans: Aluminium is dissolved in sodium hydroxide to give soluble aluminate, with the evolution of hydrogen.



Aluminium does not react with dilute sulphuric acid. However, it is oxidized by hot concentrated sulphuric acid to liberate sulphur dioxide gas.



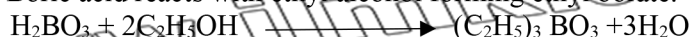
Aluminium reacts with conc. HCl to displace hydrogen.



46. Reaction of Boric acid with (a) Ethyl alcohol (b) NaOH

LHR-2014, LHR-2015, SWL-2016, BWP, LHR - 2017

Ans: (a) Boric acid reacts with ethyl alcohol forming ethyl borate.



(b) Boric acid partially neutralized by caustic soda to give borax.



47. Write the names of four oxides of lead used as pigments. **DGK-2015, BWP-2017, SWL-2018**

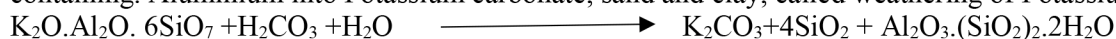
Ans:	(i)	Lead suboxide:	Pb ₂ O	Colours	Black
	(ii)	Lead monoxide	PbO	Colours	Pale yellow to reddish yellow
	(iii)	White lead	2PbCO ₃ .Pb(OH) ₂	Colours	White
	(iv)	Lead Chromate	PbCrO ₄	Colours	Yellow
		Or chrome yellow			

48. Weathering of Potassium Feldspar takes place? Give chemical equation also?

MTN-2008, LHR-2010, GRW-2014

Ans: Weathering of Potassium Feldspar:

The boiling and freezing of water in the rocks and the chemical action of water and CO₂ convert the compounds containing Aluminium into Potassium carbonate, sand and clay, called weathering of Potassium feldspar.



49. Which elements and compounds can act as semiconductors?

RWP - 2014, LHR-2018

Ans:	(i)	Germanium	(ii)	Selenium	(iii)	silicon
	(iv)	Cadmium sulphide	(v)	Lead sulphide	(vi)	Silicon carbide
	(vii)	Lead telluride	(viii)	Gallium arsenide	(ix)	Indiumantimonide

50. Give four common properties of element of group IV A of periodic table.

FBD - 2017

Ans: Following are the common properties of elements of group IV A.

- (i) They all show a valence of four
- (ii) They all form hydrides MH₄
- (iii) They all form tetra chlorides MCl₄
- (iv) They all form dioxide MO₂

51. Give peculiar behavior of carbon with IV-A group elements. Give two points of differences.

MTN-2005, LHR-2010, FBD, GRW-2014, GRW-2015, SGD, MTN-2017

- Ans:
- (i) Carbon behaves differently from the remaining members of group IV A in the following respects.
 - (ii) Carbon has a tendency to form long chains of identical atoms. The type of linkage of identical atoms with each other is called catenation or self-linkage. The property of catenation decreases on moving down the group from carbon to lead.

52. Give the formulas of four boric acids with names.

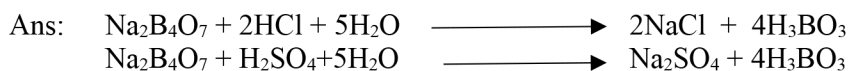
Ans: **Boric acids formulas:**

- | | | |
|-------|-----------------|---|
| (i) | Orthoboric acid | (H ₃ BO ₃) |
| (ii) | Metaboric Acid | (HBO ₂) |
| (iii) | Tetraboric Acid | (H ₂ B ₄ O ₇) |
| (iv) | Pyroboric Acid | (H ₆ B ₄ O ₉) |

SGD - 2015

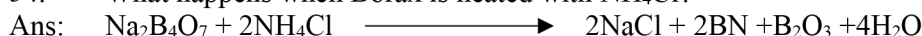
53. How borax can be converted to orthoboric acid?

LHR-2014, MTN-2015, RWP-2017



54. What happens when Borax is heated with NH₄Cl?

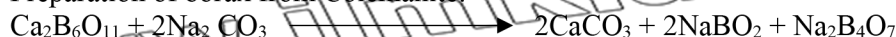
BWP - 2014



55. How will you prepare Borax from colemanite and Boric Acid?

RWP, DGK - 2014

Ans: Preparation of borax from Colemanite:



NaBO₂ is reacted with Carbon dioxide to prepare more borax along with sodium carbonate.



56. Give the formulas of different acids of Boron?

SGD - 2015

Ans: Name of Minerals of Boron Chemical formula
 Borax or Tincal $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$
 Colemanite $\text{Ca}_2\text{B}_6\text{O}_{14} \cdot 5\text{H}_2\text{O}$
 Orthoboric Acid H_3BO_3
 Cryolite Na_2AlF_6

57. Explain structure of CO_2 ?

LHR -2015

Ans: Carbon dioxide exists in the gaseous state as linear molecules. The observed C-O bond distance is 115 pm and is in agreement with the structure shown. Solid CO_2 has a face-centered cubic structure. Being linear its dipole moment is zero.

58. What is vitreous silica?

Ans: When crystalline silica is heated it melts and viscous liquid having a random structure is formed. When this liquid is cooled, it does not crystallize readily, but it undercools and without having undergone orientation into a regular crystal pattern. This highly undercooled rigid liquid is called vitreous silica or silica glass.

59. What is talc or soapstone? Give its uses?

BWP -2014

Ans: **Definition:**

The magnesium silicate $\text{Mg}_3\text{H}_2(\text{SiO}_3)_4$ is commonly known as talc or soapstone which is greasy to touch.

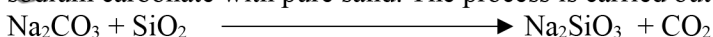
Uses of soapstone:

- (i) Soapstone is used in making cosmetics.
- (ii) It is used in making household articles.

60. What is water glass? OR What is sodium silicate? How is can be prepared?

BWP – 2009

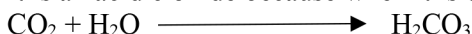
Ans: Sodium salt of meta silicic acid H_2SiO_3 . It is known as water glass or soluble glass. It is prepared by fusing sodium carbonate with pure sand. The process is carried out in a furnace called **reverberatory furnace**.



61. Why CO_2 is acidic in character?

FBD-2008, BWP-2008, RWP-2015, DGK-2016

Ans: It is an acidic oxide because when it is dissolved in water it form carbonic acid as shown below.



62. What is the formula of red lead? Give its principle uses.

MTN-2018

Ans: Formula of red lead is Pb_2O_4 . Its principle uses.

- (i) In the manufacturing of storage batteries.
- (ii) As a pigment in paints which are applied in steel and iron to retard corrosion.
- (iii) As an ingredient in manufacturing flint glass, matches and ceramic glazes.

63. Write any two points of importance of oxides of lead in paints.

BWP-2018

- Ans:
- (i) PbO (Litharge) is used in preparing oils and varnishes.
 - (ii) Pb_3O_4 (Red Lead) is used as pigment in paints for steel and iron to prevent corrosion.

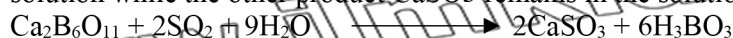
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64. How will you prepare borax from (a) Colemanite (b) Boric Acid

DGK-2014-GRW-2008, RWP-2014, FBD-2015

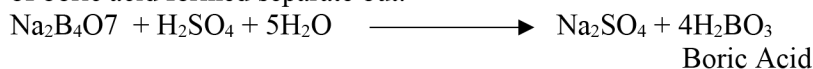
Ans: **From colemanite:**

On commercial scale boric acid is prepared from a natural calcium borate called colemanite ($\text{Ca}_2\text{B}_6\text{O}_{11} \cdot 5\text{H}_2\text{O}$) by suspending it in boiling water while sulphur dioxide is passed through it. Boric acid crystallizes out from the solution while the other product CaSO_3 remains in the solution.



From Borax:

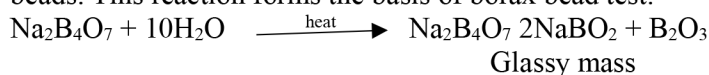
A hot concentrated solution of borax is treated with a calculated quantity of conc. H_2SO_4 . On cooling, crystals of boric acid formed separate out.



65. What is effect of heat on borax?

LHR-SGD-2008, LHR-2009, GRW-2014, BWP-2015, MTN-2015

Ans: When borax is heated, it loses water and swells up into a white porous mass due to the expulsion of water. On further heating it melts into a clear transparent glass, which dissolves many metallic oxides forming coloured beads. This reaction forms the basis of borax bead test.



66. What is chemistry of borax bead test?

GRW-2008, SWL-2015, RWP-2005, 2010

Ans: Chemistry of Borax bead test:

Borax, when fused, is decomposed into sodium meta borate and boric anhydride.



The metallic oxide formed from the substance, under examination, combines with B_2O_3 giving the coloured metallic borates. With cupric oxide, the beads are coloured blue in the oxidizing flame because cupric borates are blue in colour.



67. How orthoboric acid is prepared from:

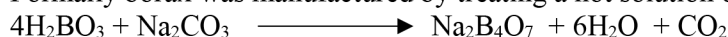
GRW-2005, DGK-2008, FBD-2015

(a) Borax

(b) Colemanite

Ans: **From orthoboric acid:**

Formerly borax was manufactured by treating a hot solution of boric acid with the proper amount of soda ash.

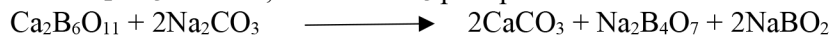


Boric acid

Borax

From colemanite:

Now –a–days borax is almost exclusively obtained from calcium borate. Finely powdered colemanite is boiled with Na_2CO_3 solution, when CaCO_3 precipitates out and a mixture of borax and sodium meta borate is formed.

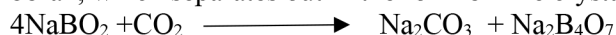


Colemanite

Borax

Sodium metaborate

The clear solution from the top is taken off and is then allowed to crystallize, when crystals of borax separate out. To get more borax CO_2 is blown through the mother-liquor, the sodium meta borate is decomposed into borax, which separates out in the form of fine crystals.



Sodium metaborate

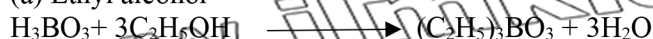
Borax

68. How does orthoboric acid react with?

(a) Ethyl alcohol

(b) Sodium carbonate

Ans: (a) Ethyl alcohol



(b) Sodium carbonate



69. Give two peculiar behavior of boron from elements of group III- A.

Ans: Boron is the first member of the Group III –A , it shows many dissimilarities with the members of its own group. The difference in the properties of boron and those of the other member of the series is mainly due to the large difference in their sizes and ionization energies.

1. Boron is the only element in Group III A which is non-metallic in behavior.
2. It is the only element with less than four electrons in the outermost shell which is not a metal.

70. How aluminium metal is used to remove air bubbles form molten metals.

LHR-2008, GRW-2010

Ans: Because of its ability to combine with both oxygen and nitrogen, the metal is often used to remove air bubbles from molten metals.

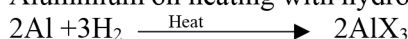
Salt solutions corrode aluminium badly so aluminum and aluminum alloys are not suitable for marine use.

71. Write down the reaction of aluminium with (i) Halogens (ii) Acids (iii) NaOH (iv) H₂SO₄

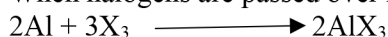
MTN-2009, MTN-2009, DGK-2014, SGD-2014, GRW-2014, BWP-2015

Ans: **Reaction with non-metal (Halogens).**

(i) Aluminium on heating with hydrogen forms aluminium hydride.



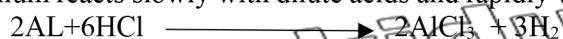
(ii) When halogens are passed over heated aluminium, powdered aluminum halides are produced.



Reaction with Acids:

(i) Aluminium does not react with nitric acid at any concentration. It is passive due to the formation of a protective layer of Al₂O₃. Nitric acid is said to render the aluminum passive. Nitric acid is, therefore frequently transported in aluminium containers.

(ii) Aluminium reacts slowly with dilute acids and rapidly with concentrated HCl giving out hydrogen gas.



(iii) Aluminium does not react with dilute sulphuric acid. However it reacts with concentrated acid and SO₂ gas is evolved.



Reaction with Alkalies:

Aluminium dissolves in both sodium and potassium hydroxides to form a soluble aluminate, with the evolution of hydrogen gas.



72. Why Aluminium does not react with nitric acid.

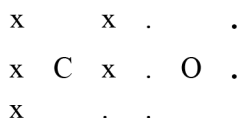
GRW-2006

Ans: Aluminium does not react with nitric acid at any concentration. It is passive due to the formation of a protective layer of Al₂O₃. Nitric acid is said to render the aluminum passive. Nitric acid, therefore frequently transported in aluminium containers.

73. CO is polar in nature. Give reasons.

BWP-2009, 2015, LHR-2009, GRW-2011, SGD- 2015

Ans: Carbon monoxide is diatomic molecule having triple bond between the two atoms. It is slightly polar. The electronic structure of carbon monoxide can be represented as.



It is usually written as $\overset{\times}{\underset{\times}{\text{C}}} \equiv \overset{\cdot}{\underset{\cdot}{\text{O}}}$.

It might appear from the above structure that the molecule should have a large dipole moment, but in fact, the molecule has a small dipole moment.

74. What is effect of temperature upon viscosity of silicones?

BWP – 2009

Ans: Very small change in viscosity takes place by changing the temperature of silicones. In this respect silicones are better lubricant than mobile oils.
If the temperature is dropped for 100 °C to 0 °C, the viscosity of petroleum oil may increase about one hundred folds, whereas that of silicones oil will increase less than four folds.

75. Give formula of white lead. Give its uses.

LHR-2008, DGK-2009

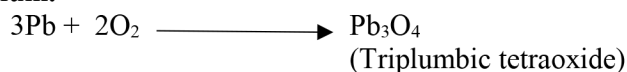
Ans: White Lead ($2\text{PbCO}_3 \cdot \text{Pb(OH)}_2$).

- Basic lead carbonate $2\text{PbCO}_3 \cdot \text{Pb(OH)}_2$ is an amorphous white pigment.
- It mixes readily with linseed oil and has good covering power.
- If improperly prepared, it becomes crystalline and its covering power is reduced.

76. What happen when lead is heated in air at 340 °C? Give two uses of red lead?

LHR – 2008

Ans: When lead is heated in air at about 340 °C, it absorbs oxygen and forms a bright scarlet crystalline powder of red lead or **minium**.



It decomposes at 470 °C.

Uses:

1. It is used for manufacture of lead storage batteries.
2. It is used as red pigment in paints.
3. Mixture of linseed oil and red lead is applied to steel and iron to prevent corrosion.
4. It is an important ingredient for the manufacture of flint glass, matches and ceramic glazes.

77. What is structure of CO and CO₂?

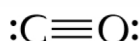
EHR - 2015

Ans: **Structure of carbon monoxide (CO):**

Carbon monoxide is diatomic molecule having triple bond between the two atoms. It is slightly polar. The electronic structure of carbon monoxide can be represented as:

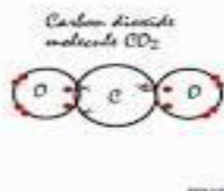


It is usually written as :



Structure of carbon dioxide (CO₂):

Carbon dioxide exists in the gaseous state as linear molecules. The observed C-O bond distance is 115 pm and is in agreement with the following structure.



78. Give equation to represent the chemical equation.

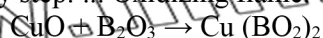
LHR – 2015

(i) Borax is heated with CuO

(ii) Al₂O₃ is heated with NaOH solution.

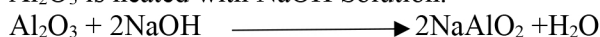
Ans: **(i) Borax is heated with CuO.**

The borax bead test is based on the creation of a glassy bead that can variously ... Then it's loaded with borax or phosphorus salt and heating in the flame you get a clear, ... Let's see what are the reactions involved step by step: ... Oxidizing flame:



cupric metaborate green (hot), blue-green (cold).

(ii) Al₂O₃ is heated with NaOH Solution:



79. Define Metalloids. Give reaction of a metalloid of group III- A with oxygen.

LHR - 2014

Ans: A **metalloid** is a chemical element that exhibits some properties of metals and some of nonmetals.

Definition for metalloids: elements with properties intermediate between metals and nonmetals. Boron, silicon, germanium, arsenic, antimony, tellurium, and polonium are **metalloids**

Metalloid: The **metalloid** silicon **reacts** with **oxygen** to form only one stable compound, SiO_2 , which dissolves slightly in water and is weakly acidic. The three **metals** in this **group** have many different oxide compounds due to their extended octets. ... Lead: PbO , PbO_2 , Pb_3O_4 .

80. Under the conditions aluminium corrodes?

Ans: When aluminium sheet is exposed to moist air it acquires a thin, continuous coating of aluminium oxide, which is product of aluminium corrosion.

..... THE END

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