Basic Exercise

1. The product formed in the reaction,

$BCl_3 + H_2O \longrightarrow$ Product is –

(1) $H_3BO_3 + HCl$ (2) $B_2O_3 + HOCl$ (3) $B_2H_6 + HCl$ (4) No reaction

Ans. **(1)**

2. The type of hybridization of boron in diborane is -

(1) sp (2) sp^2 (3) sp^3 (4) sp^3d^2

Ans. **(3)**

3. Which of the following is an organo silicon polymer ?

(1) silica (2) silicon (3) silicon carbide (4) silicic acid

Ans. **(2)**

4. Graphite conducts electricity because of the –

(1) Highly polarized nature of π-electrons (2) Highly delocalized nature of π-electrons

(3) Highly localized nature of π-electrons (4) None of these

Ans. **(2)**

Boron & Carbon Family

5. Melting point is higher for –

(1) B (2) Al (3) Ga (4) In

Ans. **(1)**

6. Alane is chemically –

(1) AlH_3 (2) $(AlH_3)_n$ (3) $LiAlH_4$ (4) None

Ans. **(2)**

7. Aluminium is not acted upon by pure water as –

(1) Impurities in water are essential for the reaction to occur

(2) It is light metal

(3) It is protected by a film of aluminium oxide

(4) It is not a reactive metal

Ans. **(3)**

8. The borax bead test is based upon the formation of

(1) Boron oxide (2) Boric acid (3) Meta borates (4) Elemental boron

Ans. **(3)**

9. Boric acid polymerizes due to –

(1) The presence of hydrogen bonds (2) Its acidic nature

(3) Its geometry (4) Its monobasic nature

Ans. **(1)**

10. Alum is found to contain hydrated monovalent cation $[M(H_2O)_6]^+$, trivalent cation $[M'(H_2O)_6]^{+3}$ and SO_4^{2-} in the ratio of:

(1) 1 : 1 : 1 (2) 1 : 1 : 2 (3) 1 : 2 : 2 (4) 1 : 2 : 3

Ans. **(2)**

11. Borax $Na_2B_4O_7 . 10H_2O$ is actually :-

(1) $Na_2[B_4O_5(OH)_4].8H_2O$ (2) $Na_2[B_4O_4(OH)_6].7H_2O$

(3) $Na_2[B_4O_3(OH)_8].6H_2O$ (4) $Na_2[B_4O_2(OH)_{10}].5H_2O$

Ans. **(1)**

12. Which alum is a double salt made up of two salts :

(1) Salt of a (SA + WB) + Salt of a (WA + WB)

(2) Salt of a (SA + SB) + Salt of a (SA + WB)

(3) Salt of a (SA + SB) + Salt of a (WA + WB)

(4) Salt of a (SA + WB) + Salt of a (WA + WB)

Ans. **(2)**

13. Borax on heating with cobalt oxide forms a blue bead of

(1) $Co(BO_2)_2$ (2) $CoBO_2$ (3) $Co_3(Bo_3)_2$ (4) $Na_3Co(BO_3)_2$

Ans. **(1)**

14. The hydrides of group 14 elements are :

(1) Ionic (2) Oxidising (3) Covalent (4) None of these

Ans. **(3)**

15. Which gas is responsible for green house effect :

(1) CO_2 (2) SO_2 (3) CO (4) SO_3

Ans. **(1)**

16. Artificial gem used for cutting glass is :

(1) Graphite (2) Diamond (3) SiC (4) $CaCN_2$

Ans. **(3)**

Analytical Exercise

1. An example of a cyclic silicate is :-

(1) Beryl (2) Zeolite (3) Talc (4) Feldspar

Ans. **(1)**

2. When a solution of sodium hydroxides is added in excess to the solution of potash alum, we obtain

(1) A white precipitate (2) Bluish white precipitate

(3) A clear solution (4) A crystalline mass

Ans. **(3)**

3. Rubies and sapphire are chemically :

(1) Al_2O_3 (2) $Al_2O_3 + Ag_2O$ (3) $Ag_2O + Au_2O_3$ (4) $Al_2O_3 + C$

Ans. **(1)**

4. Which of the following statements is correct ?

(1) BCl_3 and $AlCl_3$ are both Lewis acids and BCl_3 is stronger than $AlCl_3$

(2) BCl_3 and $AlCl_3$ both Lewis acids and $AlCl_3$ is stronger that BCl_3

(3) BCl_3 and $AlCl_3$ are both equally strong Lewis acids

(4) Both BCl_3 and $AlCl_3$ are not Lewis acids.

Ans. **(1)**

5. Which of the following statements about H_3BO_3 is not correct

(1) It is strong tribasic acid

(2) It is prepared by acidifying an aqueous solution of borax

(3) It has a layer structure in which planar BO_3 units are joined by hydrogen bonds

(4) It does not act as proton donor but acts as a Lewis acid by accepting hydroxyl ion

Ans. **(1)**

6. Aluminium vessels should not be washed with material containing washing soda because

(1) washing soda reacts with aluminium to form soluble aluminate

(2) washing soda is expensive

(3) washing soda is easily decomposed

(4) washing soda reacts with aluminium to form insoluble aluminium oxide

Ans. **(1)**

7. When con. H_2SO_4 is added to charcoal :

(1) There is no reaction (2) Water gas is formed

(3) SO_2 and CO_2 are evolved (4) CO and SO_2 are evolved

Ans. **(3)**

8. Iodine is placed between two liquids C_6H_6 and water then :

(1) It dissolves more in C_6H_6 (2) It dissolves more in water

(3) It dissolves equally in both (4) Does not dissolve in both

Ans. **(1)**

9. "Hybridisation of central atom does not always change due to back bonding." This statement is valid for which of the following compounds ?

(i) CCl_3^- (ii) CCl_2 (iii) CF_2 (iv) $N(SiH_3)_3$

(1) (i), (ii) (2) (i), (iii) (3) (ii), (iii) (4) All

Ans. **(3)**

10. According to following reactions,

$$CHF_3 \xrightarrow{K_\alpha} CF_3^- + H^+$$

$$CHCl_3 \xrightarrow{K'_\alpha} CCl_3^- + H^+$$

Correct statement(s) is :

(1) $K_a > K_\alpha'$

(2) CHF_3 act as a stronger bronsted acid than $CHCl_3$

(3) CCl_3^- is more stable than CF_3^-

(4) None of these

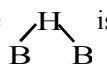
Ans. **(3)**

11. Which of the following statements is incorrect in relation to the structure of diborane

(1) All the terminal B-H bond length are equal

(2) The terminal B–H bond is a 2-centre 3-electron bond

(3) The terminal B–H bond is a 2-centre 2-electron bond

(4) The bridge  is a 3-centre 2-electron bond

Ans. **(2)**

12. In which of the following dimer empty atomic orbital of central atom of monomer does not involve in hybridisation?

(1) Ga_2H_6 (2) Al_2Br_6 (3) Be_2H_4 (4) Cl_2O_6

Ans. **(4)**

13. Silicate having one monovalent corner oxygen atom in each tetrahedron unit is

(1) sheet silicate (2) cyclic silicate (3) single chain silicate (4) double chain silicate

Ans. **(1)**

14. The silicate anion in the mineral kinoite is a chain of three SiO_4^{-4} tetrahedra, that share corners with adjacent tetrahedra. The charge of the silicate anion is

(1) –4 (2) –8 (3) –6 (4) –2

Ans. **(2)**

15. Diborane is a Lewis acid forming addition compound $B_2H_6.2NH_3$ with NH_3, a Lewis base. This

(1) Is ionic and exists as $[BH_2(NH_3)_2]^+$ and $[BH_4]^-$ ions

(2) On heating, is converted into borazine, $B_3N_3H_6$

(3) Both are correct

(4) None is correct

Ans. **(3)**

16. From B_2H_6 all the following can be prepared except :

(1) H_3BO_3 (2) $B_2(CH_3)_4H_2$ (3) $B_2(CH_3)_6$ (4) $NaBH_4$

Ans. **(3)**

Previous Year Questions

1. It is because of inability of ns^2 electrons of the valence shell to participate in bonding that **[NEET- 2017]**

(1) Sn^{2+} is reducing while Pb^{4+} is oxidising

(2) Sn^{2+} is oxidising while Pb^{4+} is oxidising

(3) Sn^{2+} and Pb^{2+} are both oxidising and reducing

(4) Sn^{4+} is reducing while Pb^{4+} is oxidising

Ans. **(1)**

2. AlF_3 is soluble in HF only in presence of KF. It is due to the formation of **[NEET-(Phase-2)-2016]**

(1) $K_3[AlF_3H_3]$ (2) $K_3[AlF_6]$ (3) AlH_3 (4) $K[AlF_3H]$

Ans. **(2)**

3. The product obtained as a result of a reaction of nitrogen with CaC_2 is **[NEET- 2016]**

(1) Ca_2CN (2) $Ca(CN)_2$ (3) CaCN (4) $CaCN_3$

Ans. **(2)**

4. The stability of +1 oxidation state among Al, Ga, In and Tl increases in the sequence **[Re-AIPMT-2015]**

(1) Tl < In < Ga < Al (2) In < Tl < Ga < Al (3) Ga < In < Al < Tl (4) Al < Ga < In < Tl

Ans. **(4)**

5. Which of the following statement is correct about solid state of boric acid. **[AIIMS-2015]**

(1) H–bond is present (2) dissolves in water to yield H^+

(3) shape of B is tetrahedral (4) None of these

Ans. **(1)**

6. Chain growth can be controlled by **[AIIMS-2015]**

(1) R_2SiCl_2 (2) R_3SiCl (3) $RSiCl_3$ (4) $R_4Si/SiCl_4$

Ans. **(2)**

7. Which of the following gives B_2H_6 on reaction with $NaBH_4$ **[AIIMS-2015]**

(1) $LiAlH_4$ (2) NaOH (3) I_2 (4) None

Ans. **(3)**

8. sp^2 carbon is not present in :- **[AIIMS-2014]**

(1) Fullerene (2) Graphite (3) Carbonic acid (4) Dry ice

Ans. **(4)**

9. Which of these is least likely to act as a Lewis base ? **[NEET-2013]**

(1) F^- (2) BF_3 (3) PF_3 (4) CO

Ans. **(2)**

10. Which of the following structure is similar to graphite ? **[NEET-2013]**

(1) B (2) B_4C (3) B_2H_6 (4) BN

Ans. **(4)**

11. Which of these is not a monomer for a high molecular mass silicone polymer ? **[NEET-2013]**

(1) Me_2SiCl_2 (2) Me_3SiCl (3) $PhSiCl_3$ (4) $MeSiCl_3$

Ans. **(2)**

12. The basic structural unit of silicates is **[NEET-2013]**

(1) SiO_4^{4-} (2) SiO_3^{2-} (3) SiO_4^{2-} (4) SiO^-

Ans. **(1)**

13. Which of the following is electron-deficient ? **[NEET-2013]**

(1) $(SiH_3)_2$ (2) $(BH_3)_2$ (3) PH_3 (4) $(CH_3)_2$

Ans. **(2)**

14. Which of the following is least likely to behaves as Lewis base ? **[AIPMT(Prelims) - 2011]**

(1) OH^- (2) H_2O (3) NH_3 (4) BF_3

Ans. **(4)**

15. Name the type of the structure of silicate in which one oxygen atom of $[SiO_4]^{4-}$ is shared ? **[AIPMT(Prelims) - 2011]**

(1) Three dimensional (2) Linear chain silicate (3) sheet silicate (4) Pyrosilicate

Ans. **(4)**

16. Which of the following oxide is amphoteric ? **[AIPMT(Mains) - 2011]**

(1) SiO_2 (2) CO_2 (3) SnO_2 (4) CaO

Ans. **(3)**

17. Which one of the following molecular hydrides acts as a Lewis acid ? **[AIPMT(Prelims) - 2010]**

(1) NH_3 (2) H_2O (3) B_2H_6 (4) CH_4BF_3

Ans. **(3)**

18. The tendency of BF_3, BCl_3 and BBr_3 to behave as Lewis acid decreases in the sequence **[AIPMT(Prelims) - 2010]**

(1) $BCl_3 > BF_3 > BBr_3$ (2) $BBr_3 > BCl_3 > BF_3$ (3) $BBr_3 > BF_3 > BCl_3$ (4) $BF_3 > BCl_3 > BBr_3$

Ans. **(2)**

19. Which of the following molecules acts as a Lewis acid ? **[AIPMT(Prelims) - 2009]**

(1) $(CH_3)_2O$ (2) $(CH_3)_3P$ (3) $(CH_3)_3N$ (4) $(CH_3)_3B$

Ans. **(4)**

20. Which of the following oxidation states are the most characteristic for lead and tin respectively ? **[AIPMT(Prelims) - 2007]**

(1) +2, +2 (2) +4, +2 (3) +2, +4 (4) +4, +4

Ans. **(3)**

21. Which one of the following anions is present in the chain structure of silicates **[AIPMT(Prelims) - 2007]**

(1) SO_4^{4-} (2) $Si_2O_7^{-6}$ (3) $(SiO_3^{2-})_n$ (4) $(Si_2O_5^{2-})_n$

Ans. **(4)**

22. Al_2O_3 can be converted to anhydrous $AlCl_3$ by heating **[AIPMT(Prelims) - 2006]**

(1) Al_2O_3 with HCl gas

(2) Al_2O_3 with NaCl in solid state

(3) A mixture of Al_2O_3 and carbon in dry Cl_2 gas

(4) Al_2O_3 with Cl_2 gas

Ans. **(3)**

23. Which of the following is the electron deficient molecule ? **[AIPMT(Prelims) - 2005]**

(1) B_2H_6 (2) C_2H_6 (3) PH_3 (4) SiH_4

Ans. **(1)**

Question asked prior to Medical Ent. Exams. 2005

24. Which statement is wrong ?

(1) Feldspars are not aluminosilicates

(2) Beryl is an example of cyclic silicate

(3) Mg_2SiO_4 is orthosilicate

(4) Basic structural unit in silicates SiO_4^{-4} is the tetrahedron

Ans. **(1)**

25. Carbon and silicon belong to (IV) group. The maximum coordination number of carbon in commonly occurring compounds is 4, whereas that of silicon is 6. This is due to

(1) Availability of low lying d-orbitals in silicon

(2) Large size of silicon

(3) More electropositive nature of silicon

(4) Both (2) & (3)

Ans. **(1)**

26. Which of the following statements about H_3BO_3 is not correct ?

(1) It has a layer structure in which planar BO_3 units are joined by hydrogen bonds

(2) It does not act as proton donor but acts as a Lewis acid by accepting hydroxyl ion

(3) It is a strong tribasic acid

(4) It is prepared by acidifying an aqueous solution of borax

Ans. **(3)**

27. Aluminium (III) chloride forms a dimer because aluminium

(1) Belongs to 3rd group (2) Can have higher coordination number

(3) Cannot form a trimer (4) Has high ionization energy

Ans. **(2)**

28. Boron compounds behave as Lewis acids, because of their

(1) Ionisation property (2) Electron deficient nature

(3) Acidic nature (4) Covalent bond

Ans. **(2)**

29. In graphite, electrons are

(1) Localised on each C-atom (2) Localised on every third C-atom

(3) Delocalised within the layer (4) Present in anti-bonding orbital

Ans. **(3)**

30. In borax bead test which compound is formed ?

(1) Orthoborate (2) Metaborate (3) Double oxide (4) Tetraborate

Ans. **(2)**

31. Which one of the following statements about the zeolite is false ?

(1) They are used as cation exchangers.

(2) They have open structure which enables them to take up small molecules.

(3) Zeolites are aluminosilicates having three dimensional network

(4) Some of the SiO_4^{4-} units are replaced by AlO_4^{5-} and AlO_6^{9-} ions in zeolites

Ans. **(4)**

32. The straight chain polymer is formed by

(1) Hydrolysis of $(CH_3)_2 SiCl_2$ followed by condensation polymerisation

(2) Hydrolysis of $(CH_3)_3 SiCl$ followed by condensation polymerisation

(3) Hydrolysis of $CH_3 SiCl_3$ followed by condensation polymerisation

(4) Hydrolysis of $(CH_3)_4 Si$ by addition polymerisation

Ans. **(1)**

33. Oxalic acid on heating with conc. H_2SO_4 gives

(1) CO only (2) CO_2 only (3) $CO_2 + H_2O$ (4) $CO + CO_2 + H_2O$

Ans. **(4)**

34. Pb + conc. HNO_3 gives

(1) $Pb(NO_3)_2 + NO_2$ (2) $PbNO_3 + N_2O$ (3) $Pb(NO_3)_2 + N_2O_3$ (4) $Pb(NO_3)_2 + N_2O$

Ans. **(1)**

35. Chemical formula of phosgene is

(1) $COCl_2$ (2) $CaOCl_2$ (3) $CaCO_3$ (4) COCl

Ans. **(1)**

ASSERTION & REASON QUESTIONS

These questions consist of two statements each, printed as *Assertion* and *Reason.* While answering these Questions you are required to choose any one of the following four responses.

A. **If both *Assertion* & *Reason* are True & the *Reason* is a correct explanation of the *Assertion*.**

B. **If both *Assertion* & *Reason* are True but *Reason* is not a correct explanation of the Assertion.**

C. **If *Assertion* is True but the *Reason* is False.**

D. **If both *Assertion* & *Reason* are False.**

1. ***Assertion*** **:** CCl_4 is not hydrolysed by water

Reason **:** Carbon in CCl_4 is sp^3 hybridised

Ans. **(B)**

2. ***Assertion*** **:** Between $SiCl_4$ and CCl_4 only $SiCl_4$ reacts with water.

Reason **:** $SiCl_4$ is ionic and CCl_4 is covalent.

Ans. **(C)**

3. ***Assertion*** **:** PbI_4 is a stable compound.

Reason **:** Iodine stabilizes higher oxidation state.

Ans. **(D)**

4. ***Assertion*** **:** The atoms in a covalent molecule are said to share electrons, yet some covalent molecules are polar.

Reason **:** In polar covalent molecules, the shared electrons spend more time on the average near one of the atoms due to high EN.

Ans. **(A)**

5. ***Assertion*** **:** $SiCl_4$ is more hydrolysed then SiF_4.

Reason **:** I effect of F > Cl

Ans. **(B)**