



CHEMISTRY

FOR IIT JEE ASPIRANTS OF CLASS 11 FOR CHEMISTRY

13TH GROUP ELEMENTS

Introduction

1. The most abundant metal is

- A. AL
- B. Ca
- C. Fe
- D. K

Answer: 1



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2. Which is not a mineral of aluminium?

- A. Anhyfrite
- B. Basuxite
- C. Corundum
- D. Diaspore

Answer: 2

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3. Bauxite is an oxide mineral of

- A. Barium
- B. Boron
- C. Bismuth

D. Aluminium

Answer: 4



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4. The non metallic element present in the mineral cryolite is

A. F

B. Cl

C. Br

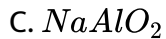
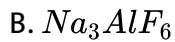
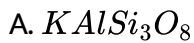
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Answer: 1



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5. The chemical formula of feldspar is



Answer: 1

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6. Kernite is a mineral containing

A. Aluminium

B. Gallium

C. Borron

D. Silicon

Answer: 3

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7. The important source of boron is

- A. Calamine
- B. Carnalite
- C. Calermanite
- D. cryoilite

Answer: 3



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8. Among IIA group elements, the elements with highest and lowest E.N values are

- A. B,tl
- B. B,ln
- C. Al

D. B,Ga

Answer: 3



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9. The most electro positive elements among the following is

A. C

B. B

C. Al

D. Si

Answer: 3



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10. The ionization energies from Ga to Tl do not decrease due to

- A. Shielding effect
- B. Improper shielding effect
- C. Increase in the atomic size
- D. Decrease in the nuclear charge

Answer: 2

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11. The most stable oxidation state of thallium is +1

- A. +1
- B. +3
- C. +4
- D. +6

Answer: 1

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12. The element that exhibits negative oxidation state in IIIA group elements is

A. B

B. Al

C. Ga

D. Tl

Answer: 1



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13. Thallous chloride is more stable than thallic chloride because of

A. More ionic character

B. Larger size of Tl^+ ion

C. High hydration energy of Tl^+ ion

D. Inert pair effect.

Answer: 4



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14. which of the following is the most stable oxidation state of aluminium

(AFMC99)

A. -1

B. $+1$

C. $+2$

D. $+3$

Answer: 4



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15. Which one of the following is summer liquid

A. Al

B. Ga

C. Tl

D. C

Answer: 2



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16. Element with a giant molecular structure

A. B

B. Al

C. Ga

D. Tl

Answer: 1



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17. Boron halides are

- A. Electron deficient compounds
- B. Ionic compounds
- C. Lewis bases
- D. Used as refractory compounds

Answer: A



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18. The comp[ounds of boron are

- A. Mostly ionic

B. mostly covalent

C. Crystalline

D. Both 1&3

Answer: 2

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19. The substance as hard as diamond is

A. $B_3N_3H_6$

B. B_2H_2

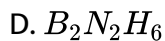
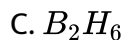
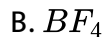
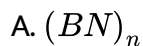
C. $(BN)_n$

D. $Na_2B_4O_7$

Answer: 3

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20. Inorganic graphite is



Answer: 1



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21. Moissan boron is

A. 95-98% pure amorphous boron

B. 75-78% pure amorphous boron

C. 95-98% pure crystalline boron

D. 75-78% pure crystalline boron

Answer: 1

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22. The most that does not give the borax bead test

A. Chromium

B. Nickel

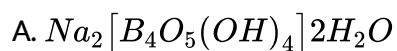
C. Lead

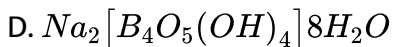
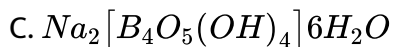
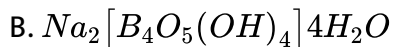
D. Manganese

Answer: 3

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23. which of the foollowing is the correct formulae of borax?



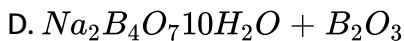
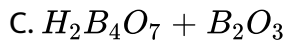
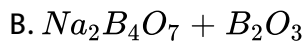
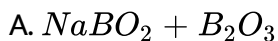


Answer: 4



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24. The glass- like bead , obtained on strong heating of borax is a mixture of



Answer: 1



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25. Borax is the sodium salt of

A. Ortho boric acid

B. B_2O_3

C. Tetra boric acid

D. Pyroboric acid

Answer: 3



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26. $Na_2b_4O_7 \cdot 10H_2O$ is

A. Borax

B. Kernite

C. Glauber salt

D. Colemanite

Answer: 1

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27. Boric acid is prepared from borax by the action of.

A. HCl

B. NaOH

C. CO_2

D. Na_2CO_3

Answer: 1

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28. Borax is known as

A. Sodium borate

B. sodium tetra borate

C. Disodium tetra borate

D. All

Answer: 4

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29. Borax is

A. Miscible in water

B. Immiscible in oil

C. Partially soluble in cold water & fairly soluble in hot water

D. Insoluble in water

Answer: 3

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30. H_3BO_3 is :

- A. Monobasic and weak lewis acid
- B. Monobasic and weak bronsted acid
- C. Monobasic and strong lewis acid
- D. Tribasic and weak bronsted acid

Answer: 1



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31. Borazole is an isoster of

- A. Benzene
- B. propane
- C. Naphthalene
- D. phenol

Answer: 1

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32. Number of terminal hydrogen atoms present in ditorane

A. 2

B. 4

C. 6

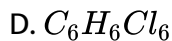
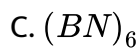
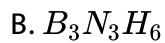
D. 8

Answer: 2

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33. Inorganic benzene is

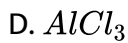
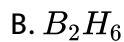
A. $B_3N_3H_{12}$



Answer: 2

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34. Hthree centre two electron bond is present in



Answer: 2

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35. In diborane, the banana bond is formed between

A. 2 electrons, 3 atoms

B. 2 electrons, 1 atom

C. 2 electrons, 2 atoms

D. 1 electron, 2 atoms

Answer: 1

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36. A bond that does not exist in diborane is

A. Cl_2

B. Br_2

C. I_2

D. All

Answer: 3

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37. A bond that does not exist in diborane is

- A. B-H
- B. B-B
- C. B-H-B
- D. H-B-H

Answer: 2

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38. The bond dissociation energy of $B - F$ in BF_3 is 646 kJ mol^{-1} whereas that of $C - F$ in CF_4 is 515 kJ mol^{-1} . The correct reason for

higher $B - F$ bond dissociation energy as compared to that of $C - F$ in CF_4 is

- A. Stronger *sigma* bond between B and F in BF_3 as compared to that between C and F in CF_4
- B. Significant $p\pi = p\pi$ interaction between B and F in BF_3 Whereas there is no possibility of such interaction between C and in CF_4
- C. Lower degree of $p\pi - p\pi$ interaction between B and F BF_3 than that between C and F in CF_4
- D. Smaller size of boron atom as compared to that of carbon atom

Answer: 2



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39. The number of hydrogen atoms bridging the boron atoms in a diborane molecule is

A. 1

B. 2

C. 3

D. 6

Answer: 2

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40. The types of hybridisation of boron in diborane is

A. sp

B. sp^2

C. sp^3

D. sp^3d

Answer: 3

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41. the maximum covalency of aluminum is

- A. 4
- B. 6
- C. 8
- D. 3

Answer: 2



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42. Lithium aluminium hydride $LiAlH_4$, acts as

- A. Oxidising agent
- B. Complex forming agent
- C. Reducing agent

D. Both Oxidant and reductant

Answer: 3



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43. Most covalent halide of aluminium is

A. Aluminium bromide

B. Aluminium fluoride

C. Aluminium iodide

D. Aluminium chloride

Answer: 3



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44. Aluminum is extracted from

A. Magnetite

B. Bauxite

C. Aluminium

D. Haematite

Answer: 2

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45. The chief ore of aluminium is

A. Alunite

B. Bauxite

C. Cryolite

D. Felsper

Answer: 2

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46. Which is not a compound of aluminium

A. Corundum

B. Ruby

C. Diaspore

D. Dolomite

Answer: 4



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47. The chemical formula of diaspore an ore of aluminium is

A. $Al_2O_3 \cdot 3H_2O$

B. $Al_2O_3 \cdot 2H_2O$

C. $Al_2O_3 \cdot H_2O$

D. Al_2O_3

Answer: 3



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48. Which of the following minerals does not contain aluminium ?

A. Mica

B. Cryolite

C. Felspar

D. Fluorspar

Answer: 4



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49. The chief impurity present in bauxite is

A. FeO

B. Fe_2O_3

C. SiO_2

D. AlCl_3

Answer: 3

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50. the common impurities present in bauxite are

A. $\text{Fe}_2\text{O}_3, \text{SiO}_2$

B. $\text{NaCl}, \text{MgCl}_2$

C. $\text{AlCl}_3, \text{MgCl}_2$

D. $\text{CaCl}_2, \text{MgCl}_2$

Answer: 1

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51. B-10 isotopes

- A. Absorbs neutron
- B. Release neutron
- C. Absorbs electron
- D. Release electron

Answer: 1



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52. In the aluminothermic process, aluminium acts as

- A. An oxidising agent
- B. A flux
- C. A reducing agent

D. Asoler

Answer: 3



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53. Blanc fixe used in paints is

A. Fe

B. Sn

C. Ag

D. Al

Answer: 4



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54. magnalium is an alloy of

A. $Al + Mg$

B. $Al + Cu + Mg + Mn$

C. $Al + Zn + Mg + Ni$

D. $Al + Cu$

Answer: 1

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55. Duralumin is an alloy of

A. $Al + Mg$

B. $Al + Cu + Mg + Mn$

C. $Al + Zn + Mg + Ni$

D. $Al + Cu$

Answer: 2

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56. which of the following metal forms a protective oxide layer to prevent corrosion ?

A. Cu

B. Mg

C. Al

D. Mn

Answer: 3



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57. Which of the following is used as control rods in nuclear reactors?

A. Al

B. Ga

C. Tl

D. B

Answer: 4



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58. Al_2O_3 foemation involes evolution of a large quantity of heat ,so we use "Al"

- A. As decoxidiser
- B. In indoor photography
- C. In confectionary
- D. In themite welding

Answer: 4



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59. Boron carbide is used :

- A. Deoxydiser
- B. In making bullet -proof vest
- C. Boron -10 to ac=bsorb neutrons
- D. All the above

Answer: 4



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60. Al and Ga have the same covalent radius because of

- A. Greater shielding of s- electrons of Ga atoms
- B. Poor shielding of s-eletrons of Ga atoms
- C. Poor shiedling of d-electrons of Ga atoms
- D. Greater shieldinfg of d-electrons Ga atoms

Answer: 3

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61. Which one of the following elements can have both positive and negative oxidation state?

A. B

B. Al

C. Ga

D. Tl

Answer: 1

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62. Which of the following statements is incorrect ?

- A. The hydroxide of aluminum is more acidic than that of boron
- B. The hydroxide of boron is basic whereas that of aluminium is amphoteric
- C. The hydroxide of boron is acidic whereas that of aluminum is amphoteric
- D. The hydroxides of both boron and aluminium are amphoteric

Answer: 3



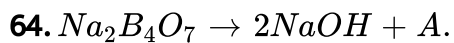
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63. Aqueous solution of borax is

- A. Neutral
- B. Acidic
- C. alkaline
- D. None

Answer: 3

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The compound A is

- A. Ortho boric acid
- B. Metaboric Acid
- C. Tetra Boric Acid
- D. Pyroboric acid

Answer: 1

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65. Borax is used as buffer since :

- A. Divalent metals
- B. Heavy metals
- C. Light metal
- D. Metals which form coloured metaborrates

Answer: 4

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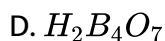
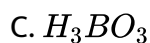
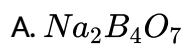
66. Borax is used as

- A. Preservative
- B. Pyrex 0
- C. Flux
- D. All

Answer: 4

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67. $Ca_2B_6O_{11} + 2Na_2CO_3 \rightarrow X + 2CaCO_3 + 2NaBO_2$ The compound X in the above reaction is



Answer: 1



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68. Borax is treated with hot conc .HCl to get NaCl and compound A .The oxidation state of B in compound A is

A. +1

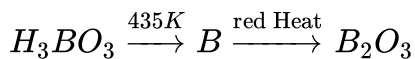
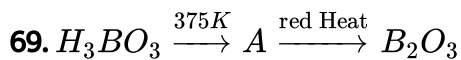
B. +2

C. +3

D. -3

Answer: 3

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The compounds A & B are

A. Orthobaric acid , Metaboric acid

B. Metaboric acid ,Tetra boric acid

C. Tetra boric acid ,Metaboric acid

D. Tetra boric acid , Orthobaoric acid

Answer: 2

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70. Borazole contains the following bonds

A. 9σ , 6π

B. 6σ , 9π

C. 12σ , 3π

D. 15σ , 0π

Answer: 3



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71. The maximum number of atoms which lie in the same plane in B_2H_6 molecule is :

A. 2

B. 4

C. 6

D. 3

Answer: 3



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72. The valencies of nitrogen and boron in barazole re

A. 3,3

B. 4,4

C. 3,4

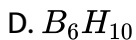
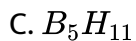
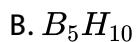
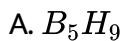
D. 4,3

Answer: 2



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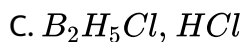
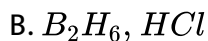
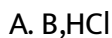
73. Which one is not a borane ?



Answer: 2

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74. The mixture of BCl_3 vapour and hydrogen gas is subjected to electric discharge. The chief products are



Answer: 2

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75. Assertion (A) : Aluminum is passive towards conc HNO_3

Reason (R) : Due to formation of layer of nitrate on aluminium

A. AlN

B. Al_2S_3

C. Al_4C_3

D. Al_2O_3

Answer: 4

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76. In aluminate ion , coordination number of aluminium is

A. 2

B. 4

C. 6

D. 1

Answer: 3

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77. Aqueous ammonia is used as a precipitating reagent for Al^{3+} ions as $Al(OH)_3$ rather than aqueous $NaOH$, because:

A. NH_4^+ is weak base

B. $NaOH$ is a strong base

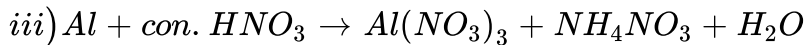
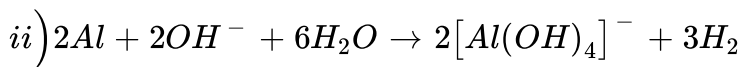
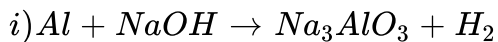
C. $NaOH$ forms $[Al(OH)_4]^-$ ions

D. $NaOH$ forms $[Al(OH)_2]^+$ ions

Answer: 3

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78. Consider the following reactions



- A. i and ii are true
- B. I and iii are true
- C. Only I is true
- D. All are true

Answer: 1



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79. Which of the following reacts with nitrogen when heated in air

Anomalous properties

- A. Al

B. C

C. Na

D. K

Answer: 1



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80. Aluminium forms $[AlF_6]^{3-}$ ion but boron does not form $[BF_6]^{3-}$ ion. Explain.

A. The atomic size of B is small

B. Of absence of d-orbital in B atom

C. Of high I.P B-atom

D. B is non-metal

Answer: 2



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81. Boron resembles silicon in properties, This resemblance is mainly due to equal values of

A. Ionisation enthalpies of boron and silicon

B. Atomic volumes of Boron and silicon

C. Densities of boron and silicon

D. Polarising powers of B^{3+} and Si^{4+}

Answer: 4

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82. The reducing character of Al, Ga, In, Tl increases in which of the following order .

A. $Tl < Al < Ga < In$

B. $Ga < Al < Tl < In$

C. $Tl < In < Ga < Al$

D. $Al < Ga < In < Tl$

Answer: 3

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83. The element which cannot form a cation is

A. Al

B. B

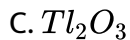
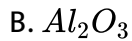
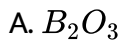
C. Cs

D. Bi

Answer: 2

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84. Which amongst the following is also called as a sesqui oxide



D. All

Answer: 4



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85. Which of the following does not liberate hydrogen on reacting with acids

Boron and its compounds

A. Al

B. In

C. Tl

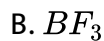
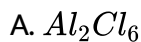
D. B

Answer: 4

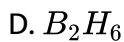


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86. Dative bonds are not present in :



C. Borrazole

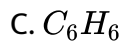
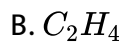
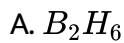


Answer: 4



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87. The non planar molecule among the following is



Answer: 1

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88. The geometry of BH_4^- unit is

A. Square planar

B. Tetrahedral

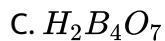
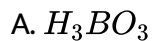
C. Octahedral

D. Trigonal pyramidal

Answer: 2

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89. Solid oxy acids of boron are



D. All

Answer: 4



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90. Boric acid is polymeric due to :

A. Its acidic nature

B. The presence of hydrogen bonds

C. Its monobasic nature

D. Its geometry

Answer: 2

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91. Boric acid (H_3BO_3) has

Aluminium and its compounds

A. Trigonal structure

B. Tetrahedral structure

C. Layer structure, in which BO_3^{-3} units are linked by oxygen

D. layer structure, in which planar BO_2^{-3} units are linked by hydrogen bonding.

Answer: 4

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92. Anhydrous $AlCl_3$ is

- A. Covalent
- B. Ionic
- C. Covalent and basic
- D. Covalent and neutral

Answer: 1



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93. $AlCl_3$ on hydrolysis gives

- A. $AlCl_3 \cdot H_2O$
- B. $Al(OH)_3$
- C. Al_2O_3
- D. $AlCl_3 \cdot 6H_2O$

Answer: 2

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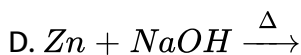
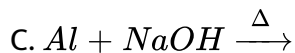
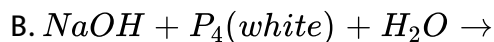
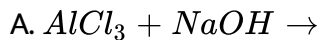
94. Aluminium vessels should not be washed with materials containing washing soda because:

- A. Washing soda is expensive
- B. Washing soda is easily decomposed
- C. Washing soda reacts with aluminium to form soluble aluminate
- D. Washing soda reacts with aluminium to form insoluble aluminium oxide

Answer: 3

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95. Which one of the following reactions does not form gaseous product ?



Answer: 1



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96. Consider the reaction, $LiH + AlH_3 \rightarrow \dots\dots\dots$

The incorrect statement about this reaction is

A. The product is a good reducing agent

B. AlH_3 acts as a Lewis acids

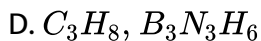
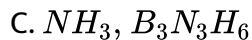
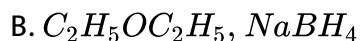
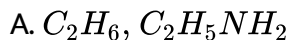
C. Decrease of oxidation number of aluminum occurs

D. LiH donates H^- to AlH_3

Answer: 3

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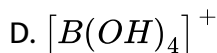
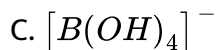
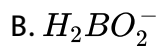
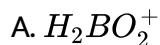
97. An alkali metal hydride (NaH) reacts with diborane in Y to give a tetrahedral compound Z, which is extensively used as reducing agent in organic synthesis. The Y and Z in the above reaction are



Answer: 2

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98. Orthoboric acid behaves as weak monobasic acid giving H_3O^+ and

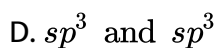
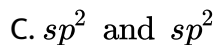
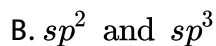
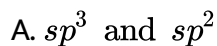


Answer: 3



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99. The states of hybridisation of boron and oxygen atoms in boric acid (H_3BO_3) are respectively :



Answer: 2

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100. BCl_3 does not exist as dimer but BH_3 exist as dimer (B_2H_6) because :-

A. Cl is more electropositive than H

B. There is $p\pi - p\pi$ back bonding in BCl_3 but BH_3 does not contain such multiple bonding

C. Small sized chlorine atoms do not fit in between small sized boron atoms where as small sized hydrogen atoms get fitted in between boron atoms

D. There is $p\pi - d\pi$ back bonding in BCl_3 but BH_3 does not contain such multiple bonding

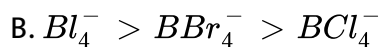
Answer: 2





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101. With a given anion the correct stability order of tetra haloborates is :



Answer: 1



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102. Some statements about the structure of diborane are given below .

NMR and RAMAN spectral studies have confirmed that four hydrogens of diborane are one type and remaining two are of another type

B) Electron diffraction studies have shown that diborane contains two coplanar BH_2 groups

c) Diborane is a planar molecule

D) Boron of diborane undergoes sp^2 hybridisation .

the correct statements are

A. Only A and B

B. Only A,B,C

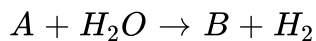
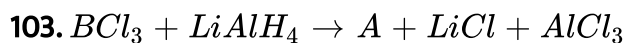
C. Only B,C,D

D. All are correct

Answer: 1



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$B \xrightarrow{\text{Red heat}} C$. In this reaction sequence A, B and C compounds respectively are :

A. B_2H_6 , B_2O_3 , B

B. B_2H_6 , B_2O_3 , B_2O_3

C. B_2H_6 , $H(3)BO_3$, B

D. HBF_4 , H_3BO_3 , B_2O_3

Answer: 2

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104. Mark the incorrect statement describing the structural features of Borax

A. It has two tetrahedral and two trigonal units

B. All the boron atoms are not in the same hybrid state

C. Each boron atom of a pair is tetravalent

D. One Boron atom has a lone pair of electrons

Answer: 4

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105. Which is true for an element R present in III A group of the periodic table

- A. it forms halide of type RX_3
- B. It has oxidation state of +3
- C. It forms Oxide of type R_2O_3
- D. All the above

Answer: 4



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106. Which is not correct in case of Be and Al ?

- A. Both are rendered passive by conc, HNO_3
- B. Carbides of both give methane on hydrolysis
- C. Both give hydroxides which are basic
- D. Both give covalent chlorides

Answer: 3

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107. A metal 'X' Produces an oxide and nitride on burning in air , but do not liberate hydrogen with alkali ,Another metal 'y' produces an oxide and niotride on buring in air ,but liberate hydrogen with alkalies ,then ,X' and 'Y' arae

A. Na,Mg

B. Mg,Al

C. Al,Na

D. Na,Ca

Answer: 2

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108. which of the following statement is not correct .

A. $B(OH)_3$ is acidic

B. Potash alum is used to stop bleeding .

C. The decreasing Order of Lewis acidic character of BBR_3 ,

BCl_3 and $B_2Br_3 > BCl_3 > BF_3$

D. B_2H_6 contains B-B covalent bonds.

Answer: 4

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109. Which of the statement about aluminium is not correct

A. It liberates hydrogen from acids as well as alkalis

B. It liberates hydrogen from acids but not from alkalis

C. It liberates hydrogen from hot alkali solution

D. It liberates hydrogen from boiling water.

Answer: 2

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110. Which of the following statement is incorrect ?

A. Anhydrous aluminium chloride cannot be prepared by heating

$AlCl_3 \cdot 6H_2O$ because of hydrolysis of $AlCl_3$

B. Anhydrous $AlCl_3$ is high melting solid whereas AlF_3 is a low melting volatile solid .

C. Aluminium forms $[AlF_6]^{3-}$ ion but boron does not form $[BF_6]^{3-}$

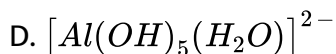
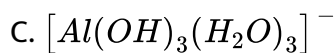
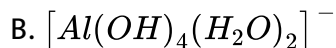
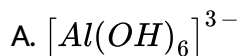
D. All the three B-F Bond lengths are equal (1.30 \AA) in BF_3 and each of them is shorter than the sum of the covalent radii of Boron (0.8 \AA) and fluorine (0.72 \AA)

Answer: 2



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111. Aluminate ion in aqueous solution actually exists as

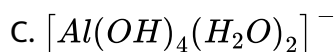
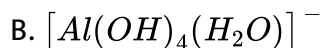
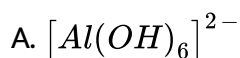


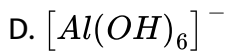
Answer: 1



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112. AlO_2^- ion in aqueous solution exists as





Answer: 3

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113. which of the following statement regarding borax is correct

- A. It is used in the manufacture of optical glass
- B. It is widely used as a flux.
- C. It is used in leather industry
- D. All are correct.

Answer: 4

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114. Wich fo the following is correct is correct ?

- A. The members of B_nH_{n+6} are less stable than B_nH_{n+4} series
- B. Diborane is colourless and unstable at room temperature
- C. The reaction of diborane with oxygen is endothermic
- D. All of the above.

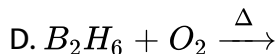
Answer: 1

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115. In which of the following, a salt of the type KMO_2 is obtained ?



C. Both 1 & 2



Answer: 3

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116. Borax is used as a cleaning agent because on dissolving in water, it gives

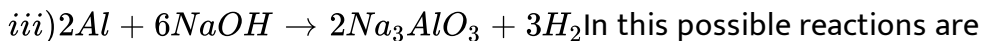
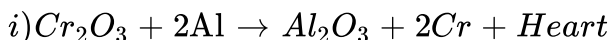
- A. Alkaline Solution
- B. Acidic solution
- C. Bleaching solution
- D. Neutral solution

Answer: 1



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117. Consider the following reactions



A. I &iii

B. ii&iii

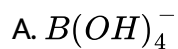
C. i&ii

D. I,ii&iii

Answer: 1

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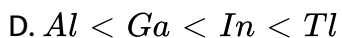
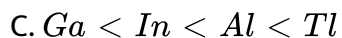
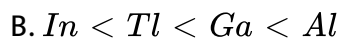
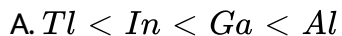
118. Boron cannot form which one of the following anions?



Answer: 3

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119. The stability of +1 oxidation state increases in the sequence :

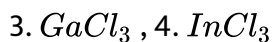
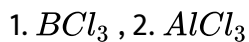


Answer: 4

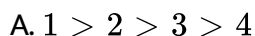


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120. Amongst the halides



The order of decreasing Lewis acid character is



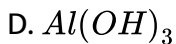
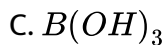
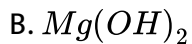
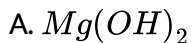
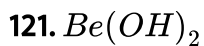
B. $4 > 3 > 1 > 2$

C. $3 > 4 > 2 > 1$

D. $2 > 3 > 4 > 1$

Answer: 1

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Answer: 3

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122. Alum is used in dyeing industry as

- A. For fire proofing fabrics
- B. As first -aid for cuts
- C. For softening hard water
- D. As mordant

Answer: 4



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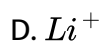
123. Alum helps in purifying water by

- A. Forming Si complex with clay particles
- B. Sulphate part which combines with the dirt and removes it
- C. Aluminum ion which coagulates the mud particles
- D. Kills bacteria making the mud, water soluble

Answer: 3

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124. Which of the following does not form alums?



Answer: 4

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125. Select coloured alum

A. Potash alum

B. Ammon alum

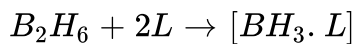
C. Chrome alum

D. All of these

Answer: 3

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126. Which of the following cannot be used in the following reaction as L ?



A. PF_3

B. NH_3

C. CO

D. $(CH_3)_3N$

Answer: 2

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127. In dihorane total number of bonding electrons are

A. 12

B. 18

C. 24

D. 20

Answer: 1



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128. The liquified metal expanding on solidification is :

A. Ga

B. Al

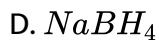
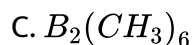
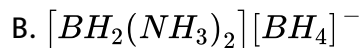
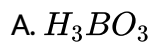
C. Zn

D. Cu

Answer: 1

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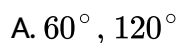
129. From B_2H_6 , all the following can be prepared except



Answer: 3

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130. In diborane, the two $H - B - H$ angles are nearly



B. 97° , 120°

C. 95° , 150°

D. 120° , 180°

Answer: 2



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131. Which one of the following compound is a gas (at $0^\circ C$)

A. BF_3

B. BCl_3

C. BBr_3

D. BI_3

Answer: 1



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132. 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

A. 1:1:1

B. 1:2:3

C. 1:3:2

D. 1:12

Answer: 4



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133. The element which exists in liquid state for a wide range of temperature and can be used for measuring high temperature is

A. B

B. Al

C. Ga

D. In

Answer: 3

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134. Which of the following is a Lewis acid ?

A. anhydrous $AlCl_3$

B. $MgCl_2$

C. $CaCl_2$

D. $BaCl_2$

Answer: 1

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135. The geometry of a complex species can be understood from the knowledge of type of hybridisation of orbitals of central atom. The hybridisation of orbitals of central atom in $[B(OH_4)]^-$ and the geometry of the complex are respectively.

A. sp^3 , tetrahedral

B. sp^3 , square planar

C. sp^3d^2 , octahedral

D. dsp^2 , square planar

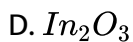
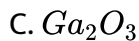
Answer: 1

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136. Which of the following oxides is acidic in nature ?

A. B_2O_3

B. Al_2O_3



Answer: 1

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137. The exhibition of highest co-ordination number depends on the availability of vacant orbitals in the central atom. Which of the following elements is not likely to act as central atom in MF_6^{3-} ?

A. B

B. Al

C. Ga

D. In

Answer: 1

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138. Boric acid is an acid because its molecule

- A. contains replaceable H^+ ion
- B. gives up a porton
- C. accepts OH^- from relesing proton
- D. combines with proton form water molecule

Answer: 3



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139. Ionisation enthalpy ($\Delta_i H$ kJ mol⁻¹) for the elements of group 13 follows the order.

- A. $B > Al > Ga > In > TI$
- B. $B > Al > Ga > In > TI$
- C. $B > Al > Ga > In > TIA$

D. $B > Al > Ga > In > TI$

Answer: 4

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140. In the structure of diborane

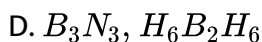
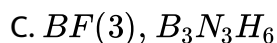
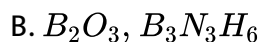
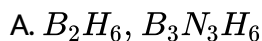
- A. All hydrogen atoms lie in one plane and boron atoms lie in a plane perpendicular to this plane
- B. 2 boron atoms and 4 terminal hydrogen atoms lie in the same plane and 2 bridging hydrogen atoms lie in the perpendicular plane
- C. 4 bridging hydrogen atoms and boron atoms lie in one plane and two terminal hydrogen atoms lie in a plane perpendicular to this plane
- D. All the atoms are in the same plane

Answer: 2



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141. A compound X, of boron reacts with NH_3 on heating to give another compound Y which is called inorganic benzene. The compound X can be prepared by treating and Y are represented by the formula.



Answer: 1



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142. The reason for small radius of Ga compared to Al is

A. poor screening effect of d orbitals

B. decrease in nuclear charge

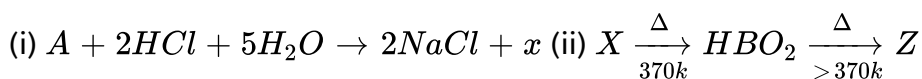
C. presence of higher orbitals

D. higher atomic number

Answer: 1

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143. Identify the compound A, X and Z in the following reactions:



A. B_2H_6 , H_3BO_3 , B_2O_3

B. $B(OH)_3$, B_2O_3 , Borax

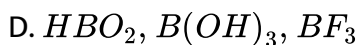
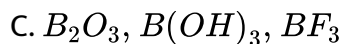
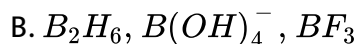
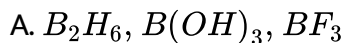
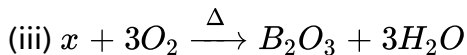
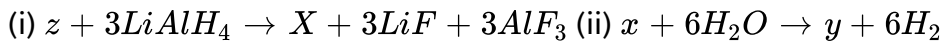
C. $B(OH)_3$, $H_2B_4O_7$, Borax

D. B or \otimes , $B(OH)_3$, B_2H_6

Answer: 2

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144. Complete the following chemical equations:

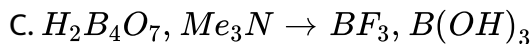
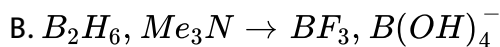
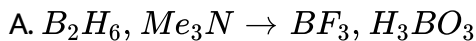


Answer: 1



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145. A compound (A) of boron reacts with Nme_3 to give an adduct (B) which on hydrolysis gives a compound (C) and hydrogen gas. Compound (C) is an acid. Identify the compounds A,B and C. give the reactions involved.



Answer: 1

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146. Identify the correct statement (s) based on the following standard electrode potential (E^0 value:

$$E^0_{(Al^{3+})/Al} = -1.66V, E^0_{(TI^{3+})/TI} = +1.26V$$

I. Aluminium has least tendency to make Al^{3+} (aq) ions

II TI^+ is unstable in solution and is a powerful oxidizing agent

III TI^+ is more stable in solution than TI^{3+}

IV TI is more electropositive than Al

A. I and IV only

B. II only

C. II and III only

D. I and III only

Answer: 3



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147. Which one of the following statements is/are correct?

A. Gallium has higher ionisation enthalpy than aluminium

B. Boron does not exist as B^{3+} ion

C. Aluminium forms $[AlF_6]^{3-}$ ion but boron does not form $[BF_6]^{3-}$ ion

D. $Tl(NO_3)_3$ acts as an oxidising agent.

Answer: 1234



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148. Identify the correct statements?

- A. BF_3 is stronger Lewis acid than BCl_3
- B. BCl_3 exist as monomer whereas $AlCl_3$ is dimerised through halogen bridging.
- C. Boron fluoride exists BF_3 , but boron hydride doesn't exist as BH_3
- D. When aqueous solution of borax is acidified with HCl, a white crystalline solid is formed which is soapy to touch.

Answer: 234



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149. Which of the following statements is/are correct?

- A. AlF_3 is insoluble in anhydrous HF but dissolves in the presence of KF
- B. If BF_3 gas is passed through Na_3AlF_6 aluminium trifluoride is precipitate
- C. $B - F$ bond length in BF_3 is less than in BF_4^-
- D. A mixture of dilute NaOH and aluminium pieces is used to open drain.

Answer: 1234



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150. To maintain the aluminium vessels for long life which of the following precautions must be taken?

- A. Aluminium vessels should not be stored with ordinary water for overnight

- B. Aluminium vessels should not be washed with washing powders
- C. Aluminium vessels should be coated with oxide layer by anodic oxidation
- D. They should be dipped in conc HNO_3 .

Answer: 1234

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151. Match the species given column I with properties given in column II



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Level I H W

1. Which of the following represents the variation of electronegativity with atomic number Z of f group 13th elements ?

Boron and its compounds

A. 

B. 

C. 

D. All are correct

Answer: B



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The hybridisation of central atom in compound A is

A. sp

B. sp^2

C. sp^3

D. sp^3d

Answer: B



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3. The aqueous solution of borax turns red litmus to

A. Blue

B. No Change

C. Red

D. White

Answer: A



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4. Borax bead test is used to identify the

A. Anion in coloured salt

B. Cation in coloured salt

C. Anion in white salt

D. Cation in white salt

Answer: B



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5. Orthoboric acid contains

A. Triangular BO_3^{3-} units

B. Linear BO_3^{3-} units

C. T-shaped BO_3^{3-} units

D. Pyramidal BO_3^{3-} units

Answer: A



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6. PCl_3 on hydrolysis gives

- A. B_2O_3 and HCl
- B. B_2H_6 , HCl and O_2
- C. H_3BO_3 and HCl
- D. B_2O_3 , H_2 and Cl_2

Answer: C



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7. Reactivity of borazole is greater than that of benzene because

- A. Borazole contains polar bonds
- B. Borazole contains non polar bonds
- C. Borazole is an electron rich compound
- D. Both B and N are in sp^3 hybridised states.

Answer: A

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8. Total number of electron shared between two B-H-B atoms in B_2H_6

Aluminium and its compounds

A. 2

B. 3

C. 4

D. 6

Answer: C

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9. Which of the following has more number of water of crystallisation

A. Corundum

B. Gibbsite

C. Bauxite

D. Diaspore

Answer: B



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10. Al reacts with conc. H_2SO_4 and forms

Uses of B & Al and their compounds

A. SO_3

B. SO_2

C. H_2

D. $S(vap)$

Answer: B

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11. Borax is used in

- A. Qualitative analysis
- B. Welding
- C. Pyrex glass
- D. All

Answer: D

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12. Conc. HNO_3 can be stored in a container made of

- A. Cu
- B. Al
- C. Zn

D. Sn

Answer: B



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Level II H W

1. Which of the following forms M_2O type of oxide

A. Al

B. B

C. *Tl*

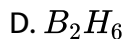
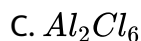
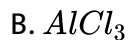
D. *Ca*

Answer: C



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2. Which one of following is not an electron deficient compound



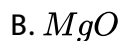
Answer: C



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3. Which of the following oxides dissolves in both hydrochloric acid and sodium hydroxide solution

Boron and its compounds



D. Al_2O_3

Answer: D

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4. When borax is dissolved in water:

A. Only $B(OH)_3$ is formed.

B. Only $B(OH)_4^-$ is formed.

C. Both $B(OH)_3$ and $B(OH)_4^-$ are formed.

D. Both $B(OH)_3$ and B_2O_3 are formed.

Answer: C

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5. All the products formed in the oxidation of $NaBH_4$ by I_2 are

A. B_2H_6 and NaI

B. B_2H_6 , H_2 and NaI

C. BI_3 and NaH

D. $NaBI_4$ and HI

Answer: B

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6. Which is used to separate Al_2O_3 and Fe_2O_3

A. NaOH

B. dil.HCl

C. H_2SO_4

D. Any acid

Answer: A

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7. Aluminium is more reactive than iron. But aluminium is less easily corroded than iron because.

- A. Aluminium is a noble metal
- B. Oxygen forms a protective oxide layer
- C. Iron undergoes reaction easily with water
- D. Iron undergoes reaction easily with water

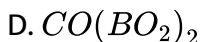
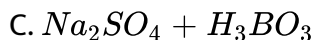
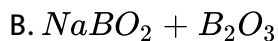
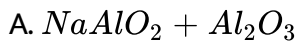
Answer: B



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8. A white precipitate (X) is formed when a mineral of Boron (W) is boiled with Na_2CO_3 solution. The precipitate is filtered and the filtered contains two compounds (Y) and (Z). The compound (Y) is removed by crystallization. By passing CO_2 through (Z) changes to (Y).

The compound (Y) on strong heating gives



Answer: B

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9. Boron form many compound like boric acid, borax inorganic graphite etc. Orthoboric acid contain triangular BO_3^{2-} units. In the solid the $B(OH)_3$ units are hydrogen bonded together into 2 – D sheets with almost hexagonal symmetry. Borax is used in borax bead test.

The number of the H-atoms replaced from boric acid when it is dissolved in water is

A. 2

B. 1

C. 3

D. Zero

Answer: D



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10. Boron form many compound like boric acid, borax inorganic graphite etc. Orthoboric acid contain triangular BO_3^{2-} units. In the solid the $B(OH)_3$ units are hydrogen bonded together into 2 – D sheets with almost hexagonal symmetry. Borax is used in borax bead test.

Boric acid can behave as a strong acid in presence of

A. Anhydrous H_2SO_4

B. Glycerol

C. Mannitol

D. All of these

Answer: D



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11. Boron form many compound like boric acid, borax inorganic graphite etc. Orthoboric acid contain triangular BO_3^{2-} units. In the solid the $B(OH)_3$ units are hydrogen bonded together into 2 – D sheets with almost hexagonal symmetry. Borax is used in borax bead test.

Borax bead test can be used to detect

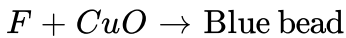
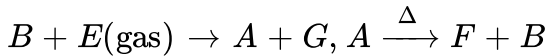
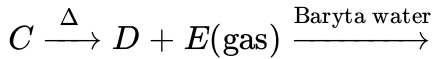
- A. Vitamin A
- B. Vitamin C
- C. Vitamin B_{12}
- D. None of these

Answer: C



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12. Colemanite + G (compound) rarr A + B + C



When 1 mole of 'C' and 2 moles of 'G' are heated the number of moles of 'E' formed is/are 'x'. The number of hybrid or orbitals in 'E' is/are 'y'. then $x + y =$

A. 1

B. 2

C. 3

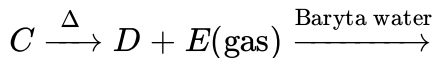
D. 4

Answer: C

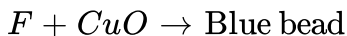
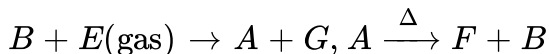


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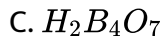
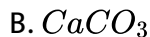
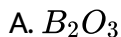
13. Colemanite + G (compound) rarr A + B + C



milky $\xrightarrow{E + H_2O}$ milkyness disappears



F with 3 moles of water gives 2 moles of compound 'H'. 'H' on heating to $100^\circ C$ gives 'I'. 'I' is :

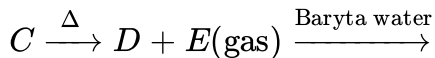


Answer: D

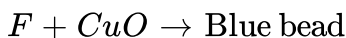
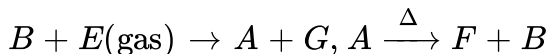


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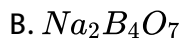
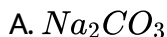
14. Colemanite + G (compound) rarr A + B + C



milky $\xrightarrow{E + H_2O}$ milky ness disappears



Compound 'A' is :



Answer: B



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15. Group 13 element reacts with halogen and forms a compound P shows the following properties:

- (i) It is white solid and exist as dimer, gives fumes of Q with moist air
- (ii) It sublimes on 180°C and forms monomer if heated to 400°C
- (iii) Its aq solution turns blue litmus to red
- (iv) Addition of NH_4OH and NaOH separately to a solution of P gives white precipitate which is however soluble in excess of NaOH solution to form a solution R

What is compound P

- A. B_2Cl_6
- B. N_2O_3
- C. $(\text{TlCl}_3)_2$
- D. Al_2Cl_6

Answer: D

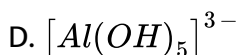
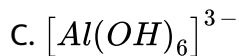
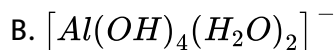
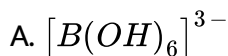


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16. Group 13 element reacts with halogen and forms a compound P shows the following properties:

- (i) It is white solid and exist as dimer, gives fumes of Q with moist air
- (ii) It sublimes on $180^{\circ}C$ and forms monomer if heated to $400^{\circ}C$
- (iii) Its aq solution turns blue litmus to red
- (iv) Addition of NH_4OH and $NaOH$ separately to a solution of P gives white precipitate which is however soluble in excess of $NaOH$ solution to form a solution R

Anionic formula of solution R is :



Answer: B



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17. Orthoboric acid, $B(OH)_3$, is the normal end product of hydrolysis of most boron compounds. It forms flaky, white, transparent crystals in

which a planar array of BO_3 units is joined by unsymmetrical H -bonds. In contrast to the short $O-H\cdots O$ distance of 272 pm within the plane, the distance between consecutive layer in the crystal is 318 pm, thus accounting for the pronounced basal cleavage of the waxy, plate-like crystals and their low density (1.84 g cm^{-3})

Which of the following reaction product boric acid?

I) Hydrolysis of BCl_3 .

II) Reaction of H_2SO_4 with aqueous solution of borax

III) Reaction of water with B_2H_6 .

A. I, II, III

B. I, II

C. I, III

D. II, III

Answer: A



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18. Orthoboric acid, $B(OH)_3$, is the normal end product of hydrolysis of most boron compounds. It forms flaky, white, transparent crystals in which a planar array of BO_3 units is joined by unsymmetrical H -bonds. In contrast to the short O-H...O distance of 272 pm within the plane, the distance between consecutive layer in the crystal is 318 pm, thus accounting for the pronounced basal cleavage of the waxy, plate-like crystals and their low density (1.84 g cm^{-3})

Select incorrect statement.

- A. Boric acid acts as hydroxyl donor in water rather than proton donor
- B. Its acidity is considerably enhanced by cis 1, 2 – diols
- C. H_3BO_3 on heating at high temperature produce B_2O_3 .
- D. H_3BO_3 when reacts with aqueous $NaOH$, produce $Na[B(OH)_4]$

Answer: A



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19. Orthoboric acid, $B(OH)_3$, is the normal end product of hydrolysis of most boron compounds. It forms flaky, white, transparent crystals in which a planar array of BO_3 units is joined by unsymmetrical H -bonds. In contrast to the short O-H—O distance of 272 pm within the plane, the distance between consecutive layer in the crystal is 318 pm, thus accounting for the pronounced basal cleavage of the waxy, plate-like crystals and their low density (1.84 g cm^{-3})

H_3BO_3 is slippery nature due to

- A. Boric acid crystals are readily cleaved along interlayer planes
- B. It acts as a monobasic acid
- C. The presence of banana bonds within a layer make it planar like graphite
- D. The presence of hydrogen bonds between the layers

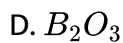
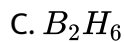
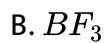
Answer: A



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20. 

The compound Y is



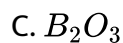
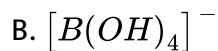
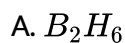
Answer: C

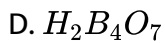


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21. 

The compound X is





Answer: C

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Level V H W

1. TlI_3 is an ionic compound which furnishes

A. Tl^+ & I_3^- ions

B. Tl^{3+} & I_3^- ions

C. Tl^{3+} & I^- ions

D. Tl^+ & I^- ions

Answer: A

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2. Which of the following is incorrect about borax?

- A. Produce alkaline solution in water
- B. Produce buffer solution in water
- C. Produce blue bead on heating with $CaSO_4$
- D. used as a flux

Answer: C



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3. Which of the following salt act as strong oxidizing agent?

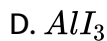
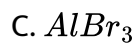
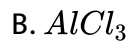
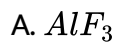
- A. Tl^{+3}
- B. Tl^{+1}
- C. Ga^{+3}
- D. In^{+3}

Answer: A



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4. Covalent character is maximum for



Answer: D



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5. What is the oxidation state of Ga in $GaCl_2$?



B. +1 and +3

C. 0

D. -2

Answer: B



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6. BF_3 and $B(OH)_3$ are isoelectronic, but the former is a gas, whereas the later is a solid because

A. BF_3 is a Lewis acid whereas $B(OH)_3$ is not

B. In BF_3 , F^- is smaller in size than OH^- in $B(OH)_3$

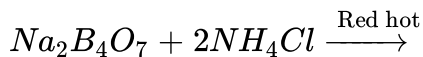
C. Molecular association is not possible in BF_3 Whereas it is possible in $B(OH)_3$

D. They have different polarities.

Answer: C

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7. Which of the following is not formed as product in the reaction ?



A. BN

B. B_2O_3

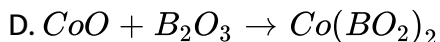
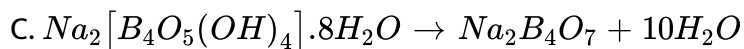
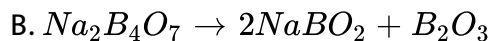
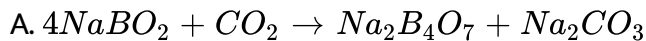
C. $NaCl$

D. $B_3N_3H_6$

Answer: D

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8. A coloured salt of cobalt is subjected to borax bead test. The transparent borax bead turns blue. From the given reaction, identify the one which does not take place during the process



Answer: A

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9. In which of the following the central atom is not in the sp^3 hybridised state?

A. Boron in solid layered boric acid

B. Boron in diboreane

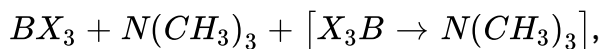
C. Boron in the product formed by the reaction of sodium hydride with diborane

D. Boron in the product formed by the addition of $(CH_3)_3N$ to diborane.

Answer: A

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10. In the adduct formation of trimethyl and amine with boron halide



the enthalpy change is more negative in the case of

A. BF_3

B. BCl_3

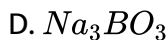
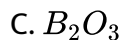
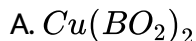
C. BBr_3

D. All are equal

Answer: C

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11. Which of the following is not produced when mixture of borax and $CuSO_4$ is heated at high temperature ?



Answer: D



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12. Which of the following statement is incorrect regarding the structure of borax?

A. Number of B - B bonds are zero

B. Hybridisation of each boron atom is sp^2

C. Number of $B - O - B$ bonds are five

D. Two of the boron atoms are triangular planar and rest two are having tetrahedral geometry

Answer: B

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13. Boric acid on heating at $150^{\circ}C$ gives

A. B_2O_3 and HCl

B. $H_2B_4O_7$

C. HBO_2

D. H_2BO_3

Answer: B

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14. The correct statement is :

- A. Hydroxide of aluminium is more acidic than the hydroxide of boron
- B. Hydroxide of boron is basic while the hydroxide of aluminium is amphoteric.
- C. Hydroxide of aluminium is amphoteric since $Al - O$ and $O - H$ bonds have nearly same ionic character
- D. Hydroxide of boron is acidic since it ionizes in water to BO_3^{3-} and H^+ ions.

Answer: C



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15. Select the name of mineral which is used for the production of boric acid

- A. Chromite
- B. Colemanite
- C. Chalcopyrite
- D. Calamine

Answer: B

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16. When boric acid reacts with aq $NaOH$, it produces

- A. Na_3BO_3
- B. $Na[B(OH)_4]$
- C. Na_3B
- D. Boron

Answer: B

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17. A mixture of ethyl alcohol and boric acid burn with green edged flame.

The green edged flame contains

A. Triethyl borate

B. ethyl boride

C. Acetaldehyde

D. diborane

Answer: A



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18. Boric acid is a very weak acid but in presence of certain organic compounds, it acts as a strong acid. Which one of the following organic compounds can affect such change?

A. Glycerol

B. Acetic acid

C. Ethyl alcohol

D. Ethylene

Answer: A

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19. When $H_3BO_3(s)$ added in fused $NaOH$, it produces

A. Na_3BO_3

B. $Na[B(OH)_4]$

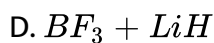
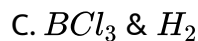
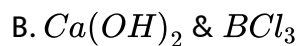
C. Na_3B

D. Boron

Answer: A

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20. Which of the following combinations is not suitable for the preparation of Diborane



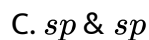
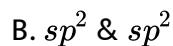
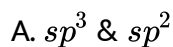
Answer: B



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21. B_2H_6 on reaction with tri methyl amine from a compound X.

Hybridisation of B and N in that compound X is



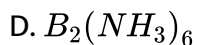
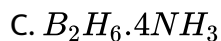
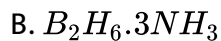
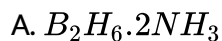
D. sp^3 & sp^3

Answer: D



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22. B_2H_6 reacts with excess of NH_3 at low temperature to form an addition product. The product is

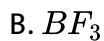
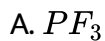


Answer: A



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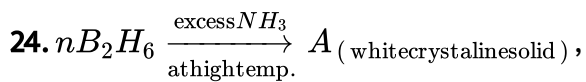
23. Diborane forms adduct with



Answer: A



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A is isostructural with

A. Benzene

B. Borazole

C. Boron Nitrate

D. Graphite

Answer: D



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25. When B_2H_6 reacts with excess ammonia at low temperature, select correct about product.

- A. Both boron are bonded with nitrogen
- B. One of the boron is bonded with nitrogen
- C. None of the boron is bonded with nitrogen
- D. B_2H_6 do not react with ammonia at low temperature

Answer: B



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26. Diborane forms ionic compound by the addition of which of the following substance ?

A. CO

B. $(CH_3)_3N$

C. CH_3NH_2

D. $(CH_3)_2O$

Answer: C

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27. B_2O_3 can be converted to BCl_3 by heating

A. B_2O_3 with Cl_2 gas in the presence of SiO_2

B. B_2O_3 with HCl gas

C. B_2O_3 with $NaCl$ in solid state

D. A mixture of B_2O_3 and Carbon in dry Cl_2 gas

Answer: B

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28. Which of the following statement about $B_3N_3H_6$ is correct?

A. Like C_6H_6 , $B_3N_3H_6$ is planar.

B. Like C_6H_6 , the bonds in borazole are non-polar

C. In borazole the hybridization of boron is sp^2 and nitrogen is sp^3 hybridised.

D. In borazole the hybridization of boron is sp^3 and nitrogen is sp^2

Answer: A

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29. $B_3N_3H_6$ + solution of hydrochloric acid \rightarrow ?

Select correct about above equation

A. No reaction

B. $B_3N_3H_6$ show substitution reaction and produce $B_3N_3Cl_6$

C. $B_3N_3H_6$ show addition reaction and produce $B_3N_3H_9Cl_3$ in about

which Cl is bonded to boron

D. $B_3N_3H_6$ show addition reaction and produce $B_3N_3H_9Cl_3$ in which

Cl is bonded to nitrogen

Answer: C

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30. The incorrect statement among the following is :

A. Crystalline boron is obtained by the reduction of boric anhydride

with Al powder

B. Amorphous boron is obtained by the reduction of boric anhydride

by fusion with Na , K or Mg .

C. Amorphous boron is chemically inert in nature.

D. Crystalline boron is black and chemically inert.

Answer: C



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31. Which compound does not contain sp^3 hybridised boron ?

- A. Product of the reaction of H_3BO_3 and aqueous solution of sodium hydroxide
- B. Borax
- C. 1 : 1 adduct of BF_3 and NH_3 .
- D. Boric acid

Answer: D



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32. Aluminium is more reactive than iron. But aluminium is less easily corroded than iron because.

- A. Aluminium is noble metal
- B. Oxygen forms a protective oxide layer
- C. Iron undergoes reaction easily with water
- D. Iron forms both mono and divalent ions

Answer: B

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33. $Al_2O_3 + C + Cl_2 \xrightarrow{1273K} X \uparrow + Y \uparrow$. Correct statements regarding

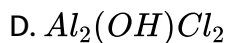
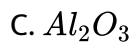
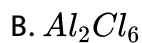
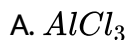
X & Y

- A. Both X and Y contain dative bonds in one of their forms
- B. Both contains Ionic bond
- C. Both contains Oxygen
- D. Both contains chlorine

Answer: A

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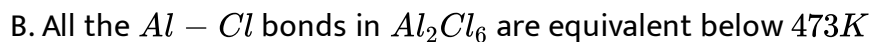
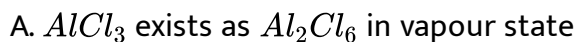
34. Heating an aqueous solution of aluminium chloride to dryness will give



Answer: C

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35. The incorrect statement among the following are



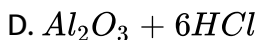
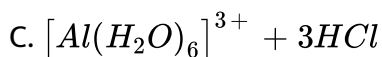
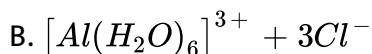
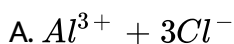
C. Borax when strongly heated with NH_4Cl forms Boron nitride as one of the product

D. AlF_3 has a higher melting point while $AlCl_3$ has lower melting point

Answer: B

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36. Aluminium chloride exists as a dimer, Al_2Cl_6 in solid state as well as in solution of non-polar solvents such as benzene. When dissolved in water, it gives :



Answer: B



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37. Which of the following reactions will not give the anhydrous $AlCl_3$?

- A. Heating a mixture of alumina and coke in a current of dry Cl_2
- B. Passing dry Cl_2 over heated aluminium powder
- C. Passing dry HCl over heated aluminium powder
- D. Heating of $AlCl_3 \cdot 6H_2O$

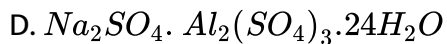
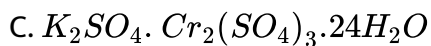
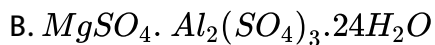
Answer: D



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38. Which among the following is a Pseudoalum

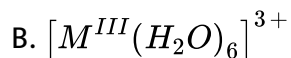
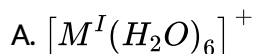
- A. $(NH_4)_2SO_4 \cdot Fe_2(SO_4)_3 \cdot 24H_2O$



Answer: B

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39. Which of the following must be present in alums

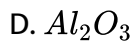
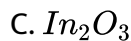
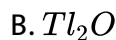
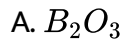


D. All of these

Answer: D

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1. Which of the following oxides are basic?



Answer: B::C



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2. Which of the following statements is/are correct?

A. The bond energy of B-X is more in BX_3 than in $[BX_3 \text{ Pyridine}]$ adduct.

B. When BF_3 is added to Na_3AlF_6 , $NaBF_4$ is formed

C. Borazole contains polar bonds.

D. Inorganic benzene is more reactive than benzene

Answer: A::B::C::D

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3. Pickup the correct statements

A. Borazone a crystalline form of BN is even harder than diamond

B. Borazine is inorganic benzene

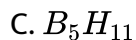
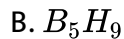
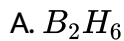
C. Borazine on heating with a silent electric discharge gives inorganic naphthalene

D. Borazole contains 3 boron atoms and 3 Nitrogen atoms only

Answer: A::B::C

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4. Pickup the nido boranes



Answer: A::B::D



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5. Which of the following statements regarding B_2H_6 are correct?

A. there are four axial H-atoms

B. there are two axial H-atoms

C. there are four equatorial H-atoms

D. The axial H-atoms are more reactive than equatorial H-atoms

Answer: B::C

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6. Reactivity of borazole is greater than that of benzene because

- A. Bonds in Borazole are non-polar
- B. Bonds in Borazole are polar
- C. Borazole is aromatic compound
- D. Electrons are localized in it

Answer: B

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7. Identify the correct statement regarding structure of diborane

- A. There are two bridging Hydrogen atoms

- B. Each boron atom forms four electron pair bonds
- C. The terminal Hydrogen atoms are not in the same plane of boron atoms
- D. Each boron atom is sp^3 hybridized

Answer: A::D

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8. Which of the following are true about diborane ?

- A. It has two bridging hydrogen and four terminal hydrogens
- B. When methylated, the product is $Me_4B_2H_2$
- C. The bridging hydrogen are in a plane perpendicular to the rest
- D. All the six B-H bond distances are equal

Answer: A::B::C

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9. The following liberate H_2 gas when treated with B_2H_6 .

A. HCl in the presence of anhydrous $AlCl_3$

B. Aq. KOH

C. H_2O

D. NH_3 at $200^{\circ}C$

Answer: A::B::C::D



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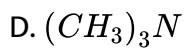
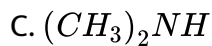
10. In the reaction



The reagents (s) 'x' is (are):

A. NH_3

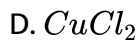
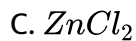
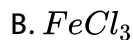
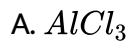
B. CH_3NH_2



Answer: A::B::C

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11. Which of the following does not respond to borax bead test?



Answer: A::C

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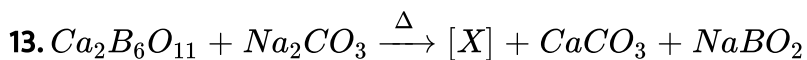
12. Select correct statement/s about borax

- A. It is prepared from colemanite ore
- B. All boron atoms are in same hybridisation state
- C. It produces alkaline solution when dissolved in water
- D. It produces B_2O_3 , $NaBO_2$ and O_2 on strong heating

Answer: A::C



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(unbalanced equation)

Correct choice (s) for [X] is/are :

- A. X with $NaOH(aq)$, gives a compound which on reaction with H_2O_2 in alkaline medium yield a compound used as a brightner in soaps.

- B. Structure of anion of crystalline $[X]$ has one boron atom sp^3 hybridised and other three boron atoms sp^2 hybridised.
- C. Hydrolysis of $[X]$ with HCl or H_2SO_4 yields a compound on reaction with HF gives fluoroboric acid.
- D. $[X]$ on heating with chromium salts in oxidising flame green coloured bead.

Answer: A::C::D



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14. Borazine is called 'inorganic benzene' in view of its ring structure with alternate BH and NH groups. Which of the following statements is correct about borazine?

- A. Each B and N atoms is sp^2 hybridized
- B. Borazine contains 6π electrons
- C. Borazine does not give addition product with HCl

D. Borazine contains dative $p\pi - p\pi$ bond

Answer: A::B::D

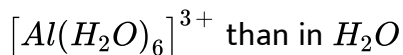
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15. Why is a solution of aluminium chloride acidic?

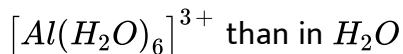
A. Chloride ions react with water to form hydrochloric acid

B. Aluminium ions have a large charge/surface area ratio

C. The $H - O$ bonds are weaker in



D. The H-O bonds are stronger in



Answer: B::C

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16. Aluminium chloride exists as a dimer when

- A. Dissolved in water
- B. Dissolved in benzene
- C. Heated above $747^{\circ}C$
- D. In vapour state below $400^{\circ}C$

Answer: B::D

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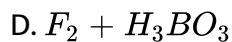
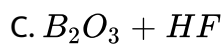
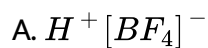
17. Aluminium becomes passive in

- A. Conc. HNO_3
- B. H_2CrO_4
- C. $HClO_4$
- D. Conc. HCl

Answer: A::B::C

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18. BF_3 on hydrolysis(partial) forms.



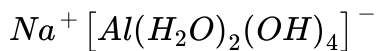
Answer: A

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19. Correct statements are



B. Sodium meta aluminate is



C. Crystalline form of Al has no reaction with air

D. Aluminium is the most abundant element in the earth crust

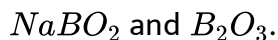
Answer: A::B::C

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20. $Na[B_4O_5(OH)_4] \cdot 8H_2O$ is called borax.

Select correct for borax

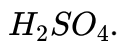
A. On heating glassy solid is obtained which is a composition of



B. All borons use sp^3 orbital's for bonding.

C. Its aqueous solution is alkaline in nature

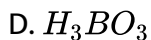
D. Its aqueous solution produce boric acid when treated with conc.



Answer: A::C::D

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21. Which of the following exist as polymer in solid state?



Answer: A::B::D

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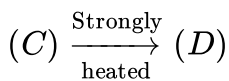
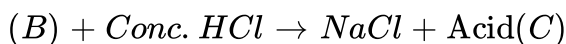
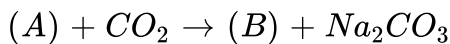
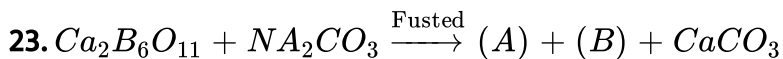
22. Incorrect statement about Alum

- A. In alum each metal ion is surrounded by six water molecule.
- B. Aqueous solutions of alums are acidic in nature.
- C. Aqueous solutions of alums shows the properties of M^{+2} , M^{+3} and SO_3^{-2} .
- D. Alums are not used as styptic agent.

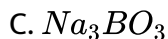
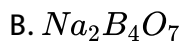
Answer: C::D



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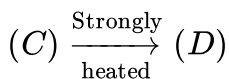
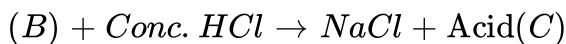
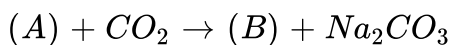
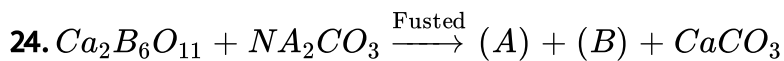


Compound (B) is:



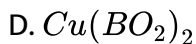
Answer: B

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Compound (E) is:





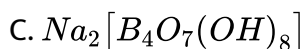
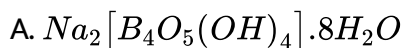
Answer: B



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25. White crystalline compound (X) reacts with water to produce an alkaline solution. On heating it produce a transparent bead which on heating with $CuSO_4$ form a blue colour bead Y. Compound X on heating with ethanol and H_2SO_4 give green edged flame. Compound X dissolved in $NaOH$ but when conc. H_2SO_4 is added white crystals of an acid (Z) separate out.

The compound X is



D. H_3BO_3

Answer: A

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26. White crystalline compound (X) reacts with water to produce an alkaline solution. On heating it produce a transparent bead which on heating with $CuSO_4$ form a blue colour bead Y. Compound X on heating with ethanol and H_2SO_4 give green edged flame. Compound X dissolved in $NaOH$ but when conc. H_2SO_4 is added white crystals of an acid (Z) separate out.

The green edged flame is because of

- A. vapours of ethanol
- B. vapours of sulphuric acid
- C. vapour of triethyl borate
- D. vapours of boron trisulphate

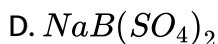
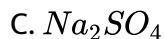
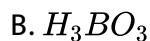
Answer: C



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27. White crystalline compound (X) reacts with water to produce an alkaline solution. On heating it produce a transparent bead which on heating with $CuSO_4$ form a blue colour bead Y. Compound X on heating with ethanol and H_2SO_4 give green edged flame. Compound X dissolved in $NaOH$ but when conc. H_2SO_4 is added white crystals of an acid (Z) separate out.

The compound Z is



Answer: B





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28. An inorganic compound (A) is white solid and exist as dimer.

(A) get sublimes on $180^{\circ}C$

(A) gives fumes (B) with wet air

(A) gives white ppt with NH_4OH .However

(A) is soluble in excess of $NaOH$ to give soluble compound(C)

The inorganic compound 'A' is

A. Al_2O_3

B. $AlBr_3$

C. $AlCl_3$

D. $BeCl_2$

Answer: C



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29. An inorganic compound (A) is white solid and exist as dimer.

(A) get sublimes on $180^{\circ}C$

(A) gives fumes (B) with wet air

(A) gives white ppt with NH_4OH .However

(A) is soluble in excess of $NaOH$ to give soluble compound(c)

'B' would be

A. NH_4Cl

B. HCl

C. H_2S

D. NO_2

Answer: B



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30. An inorganic compound (A) is white solid and exist as dimer.

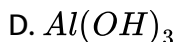
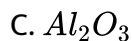
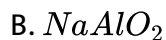
(A) get sublimes on $180^{\circ}C$

(A) gives fumes (B) with wet air

(A) gives white ppt with NH_4OH . However

(A) is soluble in excess of $NaOH$ to give soluble compound (C)

The soluble compound (C)



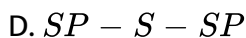
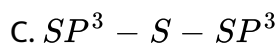
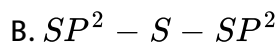
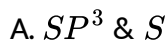
Answer: B



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31. Boron forms a number of hydrides having general formulae B_nH_{n+4} and B_nH_{n+6} . These hydrides called boranes. The simplest hydride of boron is diborane. Boranes contains special types of bonds known as multi centre bonds. Boranes have high heat of combustion

In diborane, B_2H_6 type of overlapping of orbitals involved in banana bond formation



Answer: C

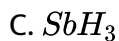
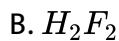


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32. Boron forms a number of hydrides having general formulae B_nH_{n+4} and B_nH_{n+6} . These hydrides called boranes. The simplest hydride of boron is diborane. Boranes contains special types of bonds known as multi centre bonds. Boranes have high heat of combustion

Which hydride does not exist





Answer: A



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33. Boron forms a number of hydrides having general formulae B_nH_{n+4} and B_nH_{n+6} . These hydrides called boranes. The simplest hydride of boron is diborane. Boranes contains special types of bonds known as multi centre bonds. Boranes have high heat of combustion
Diborane liberates H_2 gas when it is treated with

A. HCl in the presence of anhydrous $AlCl_3$

B. H_2O

C. KOH_{aq}

D. All are correct

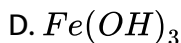
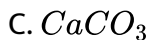
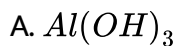
Answer: D



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34. A white precipitate (X) is formed when a mineral of Boron (W) is boiled with Na_2CO_3 solution. The precipitate is filtered and the filtered contains two compounds (Y) and (Z). The compound (Y) is removed by crystallization. By passing CO_2 through (Z) changes to (Y).

'X' is



Answer: C



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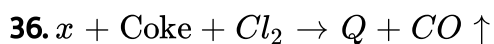
35. A white precipitate (X) is formed when a mineral of Boron (W) is boiled with Na_2CO_3 solution. The precipitate is filtered and the filtered contains two compounds (Y) and (Z). The compound (Y) is removed by crystallization. By passing CO_2 through (Z) changes to (Y).

'W' is

- A. Colemanite
- B. Borax
- C. Cobalt tetra borate
- D. Kernite

Answer: A

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If Y is a hydride which on hydrolysis under appropriate conditions produces a weak monobasic acid M, then choose the correct statement(s) based on above sequence of reactions:

A. X is acidic oxide

B. Q is a Lewis acid

C. Equivalent weight of M in its reaction with a base under suitable condition is 62

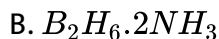
D. M can also be obtained by hydrolysis of BN under appropriate conditions.

Answer: A::B::C::D

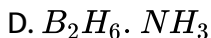
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37. Which of the following products may be formed by the reaction of diborane with ammonia/

A. $(BN)_x$



C. $B_3N_3H_6$ show addition reaction and produce $B_3N_3H_9Cl_3$ in about
which Cl is bonded to boron



Answer: A::B::C

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38. Identify the correct statement about Ortho boric acid

A. It has layer structure in which planar BO_3^{3-} units are joined by
hydrogen bonds

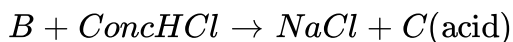
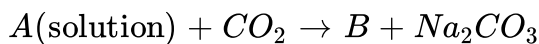
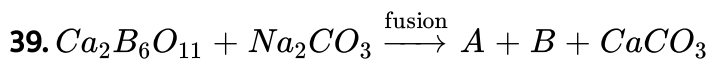
B. Ortho boric acid is a weak monobasic Lewis acid

C. On heating Ortho-boric forms meta boric acid and on further
heating to red hot, boric anhydride

D. It is obtained by reacting borax with HCl .

Answer: A::B::C::D

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The correct statement(s) among the following is/are :

A. Compound A is $NaBO_2$

B. 1 mole of solution of B requires 2 moles of HCl for its complete reaction

C. Compound C is $H_2B_4O_7$,

D. pH of aq solution of B is equal to pKa of acid C when equimolar solutions of B and C are considered.

Answer: A::B::C

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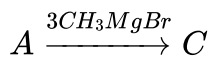
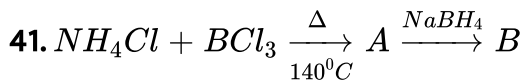
40. Select the correct statement about the compound $NO[BF_4]$

- A. It has 5σ and 2π bonds
- B. Nitrogen - oxygen bond length is higher than Nitric oxide
- C. B-F bond energy in this compound is more than in BF_3
- D. It is a diamagnetic substance

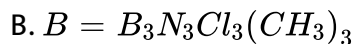
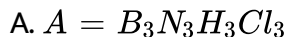
Answer: A::D

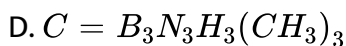
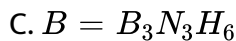


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Identify A, B, C





Answer: A::C::D



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42. Identify the correct statements regarding the structure of $Al(BH_4)_3$.

1. Al is sp^3d^2 and B is sp^3 hybridized

2. It has 6 $3c - 2e^-$ bonds

3. It has 6 Al - H - B bonds

4. It has 6 $2c - 2e^-$ bonds.

A. 'A' is sp^3d^2 and 'B' is sp^3 hybridized

B. It has six $3C - 2e^-$ bonds

C. It has six $Al - H - B$ bonds

D. It has six $2C - 2e^-$ bonds

Answer: A::B::C::D



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43. Select the correct statement(s) regarding structure of $Al_2(CH_3)_6$:

- A. all carbon atoms of $-CH_3$ groups do not lie in the same plane
- B. one vacant orbital of each Al-atom is involved in sp^3 hybridisation
- C. there are only $8sp^3$ hybridised atoms are present
- D. there are total 48 bonding electrons are available

Answer: A::B::C::D

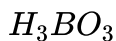


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44. Which of the following statements are correct?

- A. Boron trioxide with P_4O_{10} forms BPO_4
- B. Aq solution of borax is basic in nature due to anionic hydrolysis

C. Aq solution of borax forms acidic buffer with $NaB(OH)_4$ and



D. Orthoboric acid is weak monobasic Lewis acid.

Answer: A::B::C::D



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45. Which of the following statements are correct?

A. Boron has icosahedral structure and acts as bad conductor of electricity

B. Aluminium salts does not show any colour in boarx bead test.

C. Gallium is a pyrometric liquid but posses low melting point

D. Tl^{3+} salts are good oxidising agents

Answer: A::B::C::D



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46. Select the correct statement(s) :

A. Borax is made up of two triangular BO_3 units and two tetrahedral

BO_4 units

B. $Sn(OH)_2$, $Al(OH)_3$, $Pb(OH)_2$ are all insoluble in $NaOH$

C. Borazole is reactive than benzene

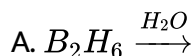
D. Anhydrous $AlCl_3$ is obtained by heating a mixture of alumina and coke in a current of dry chlorine.

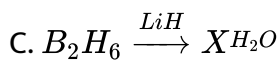
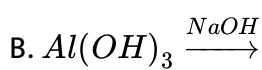
Answer: A::C::D



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47. Which of the following reactions lead to the formation of H_2 ?





Answer: A::C::D

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48. Select the correct statements:

A. B_2H_6 is stronger lewis acid than BF_3

B. BF_3 is weaker lewis acid than BCl_3

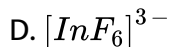
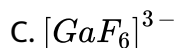
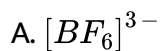
C. B_2H_6 is not a lewis acid

D. In B_2H_6 all 'H' atoms are not in the same plane

Answer: B::D

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49. Which of the following species exists:



Answer: B::C::D



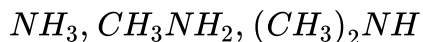
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50. Which of following are correct

A. B_2H_6 is non planar

B. B_2H_6 undergo symmetrical cleavage with PF_3 , CO and $(C_2H_5)_3N$

C. B_2H_6 undergo unsymmetrical cleavage with



D. Ga_2Me_6 , Al_2Me_6 have two type of bonds

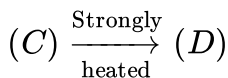
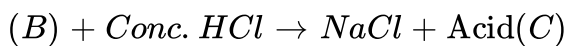
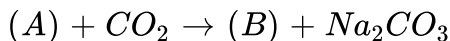
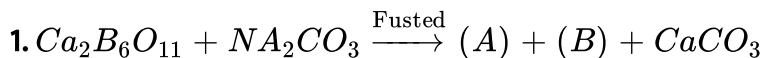
($2C - 2e$ bonds as well as $3C - 3e$ bond)

Answer: A::B::C::D

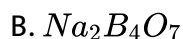


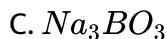
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Comprehensive Type Question



Compound (A) is :

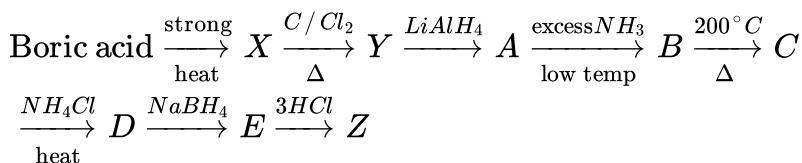




Answer: A

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2. Observe the following reaction sequence carefully and answer the question that follows.



Identify the incorrect statement from the followings about Boric acid

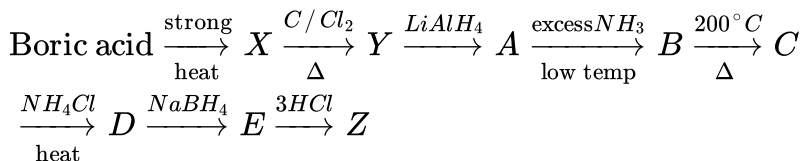
- A. Boric acid crystallizes in a layer structure in which H_3BO_3 units are bonded together by Vander Waals forces.
- B. It can't be titrated with $NaOH$ by using Phenolphthalein indicator satisfactorily
- C. H_3BO_3 is a weak Lewis acid

D. It can be titrated with $NaOH$ by adding catechol

Answer: B

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3. Observe the following reaction sequence carefully and answer the question that follows.



Which of the following statement with respect to the paragraph is incorrect?

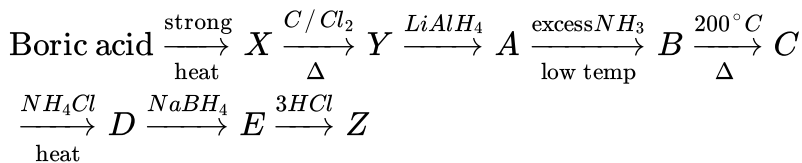
- A. X on reaction with metal oxide, gives metal metaborates
- B. The compounds C and E are identical
- C. The hybridization of Boron in E and Z are SP^2 and SP^3 respectively
- D. Compound A on methylation forms hexa methyl derivative

Answer: D



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4. Observe the following reaction sequence carefully and answer the question that follows.



Pick out the incorrect statement from the following with respect to the above paragraph ?

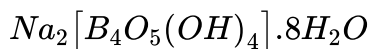
- A. Conversion of E to Z is an example of addition reaction
- B. In Z chlorine atoms are bonded to Boron
- C. Z has planar structure
- D. The reactivity of E is more than that of Benzene.

Answer: C



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5. Borax is actually made of two tetrahedral and tetrahedral and two triangular units joined together and should be written as



Consider following statements about borax:

- (1) Each boron atom has four $B - O$ bonds
- (2) Each boron atom has three $B - O$ bonds
- (3) Two boron atoms have four $B - O$ bonds while other two have three $B - O$ bonds
- (4) Each boron atom has one $-OH$ group

Select correct statement(s) :

A. 1, 2

B. 2, 3

C. 3, 4

D. 1, 3

Answer: C



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6. Borax is actually made of two tetrahedral and tetrahedral and two triangular units joined together and should be written as $Na_2[B_4O_5(OH)_4] \cdot 8H_2O$

Select incorrect statement:

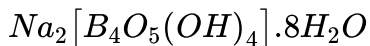
- A. Borax is used as a buffer
- B. 1M borax solution reacts with equal volumes of 2M HCl solution
- C. Titration of borax can be made using methyl orange as the indicator
- D. In borax all boron atoms are sp^3 hybridised

Answer: D



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7. Borax is actually made of two tetrahedral and tetrahedral and two triangular units joined together and should be written as



Aqueous solution containing 1 mol of borax reacts with 2 mol of acids.

This is because of

- A. formation of 2 mol of $B(OH)_3$ only
- B. formation of 2 mol of $[B(OH)_4]^-$ only
- C. formation of 1mol each of $B(OH)_3$ and $[B(OH)_4]^-$
- D. formation of 2mol each of $[B(OH)_4]^-$ and $B(OH)_3$, of which only $[B(OH)_4]^-$ reacts with acid

Answer: D



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8. Borax is formulated as

$Na_2[B_4O_5(OH)_4] \cdot 8H_2O$. On the basis of its structure answer the following questions

Total number of $-OH$ groups attached to Boron atoms in Borax

A. 4

B. 6

C. 3

D. 2

Answer: A



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9. Borax is formulated as

$Na_2[B_4O_5(OH)_4] \cdot 8H_2O$. On the basis of its structure answer the following questions

Number of $B - O - B$ bonds in the structure

A. 4

B. 5

C. 6

D. 3

Answer: B

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10. Borax is formulated as

$Na_2[B_4O_5(OH)_4] \cdot 8H_2O$. On the basis of its structure answer the following questions

Hybridisation of Boron atoms

A. sp^3 & sp^3

B. sp^3 & sp^2

C. sp^2 & sp^2

D. sp^2 & sp

Answer: B

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11. Diborane (B_2H_6) on heating with NH_3 at $450K$ produce a compound called Borazole (or) Borazine. It is called inorganic benzene (or) triborane triamine. It is colourless liquid. It has cyclic structure.

Number of $SP^2 - SP^2$ overlaps in Borazine

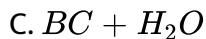
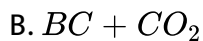
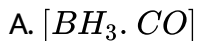
- A. 4
- B. 3
- C. 6
- D. 8

Answer: C

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12. Diborane (B_2H_6) on heating with NH_3 at $450K$ produce a compound called Borazole (or) Borazine. It is called inorganic benzene (or) triborane triamine. It is colourless liquid. It has cyclic structure.

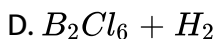
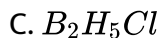
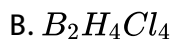
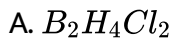
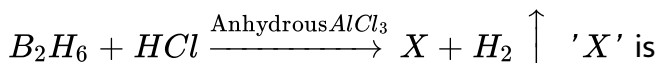
B_2H_6 on reaction with CO forms



Answer: A

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13. Diborane (B_2H_6) on heating with NH_3 at $450K$ produce a compound called Borazole (or) Borazine. It is called inorganic benzene (or) triborane triamine. It is colourless liquid. It has cyclic structure.

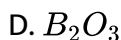
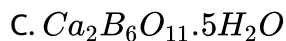
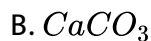
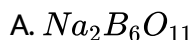


Answer: C

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14. A white precipitate (X) is formed when a mineral (A) is boiled with Na_2CO_3 solution. The precipitate is filtered and filtrate contains two compound (Y) and (Z). The compound (Y) is removed by crystallization and when CO_2 is passed through the filtrate obtained after crystallization, then (Z) changed to (Y). When compound (Y) is heated, it gives two compounds (Z) and (T). Compound (T) on heating with cobalt oxide produces blue coloured substance (S)

The mineral (A) is

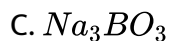
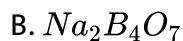


Answer: A

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15. A white precipitate (X) is formed when a mineral (A) is boiled with Na_2CO_3 solution. The precipitate is filtered and filtrate contains two compound (Y) and (Z). The compound (Y) is removed by crystallization and when CO_2 is passed through the filtrate obtained after crystallization, then (Z) changed to (Y). When compound (Y) is heated, it gives two compounds (Z) and (T). Compound (T) on heating with cobalt oxide produces blue coloured substance (S)

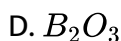
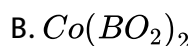
The compound (Y) in the filtrate when (A) is boiled with Na_2CO_3 is



Answer: B

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16. A white precipitate (X) is formed when a mineral (A) is boiled with Na_2CO_3 solution. The precipitate is filtered and filtrate contains two compound (Y) and (Z). The compound (Y) is removed by crystallization and when CO_2 is passed through the filtrate obtained after crystallization, then (Z) changed to (Y). When compound (Y) is heated, it gives two compounds (Z) and (T). Compound (T) on heating with cobalt oxide produces blue coloured substance (S). When cobalt oxide is heated with (Y), then a bead (S) is formed which is blue in colour. The bead (S) is



Answer: C



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17. Alums having the general formula $M_2SO_4 \cdot M_2^1(SO_4)_3 \cdot 24H_2O$ where M is monovalent basic radical while M is trivalent basic radical. Alums are generally obtained when hot solutions of equimolar quantities of their constituent sulphates are mixed and the resulting solution is subjected to crystallization. Alums are fairly soluble in hot water but less soluble in cold water

The aqueous solution of potash alum is

- A. Acidic
- B. Basic
- C. Neutral
- D. Can not be predicted

Answer: A





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18. Alums having the general formula $M_2SO_4 \cdot M_2^1(SO_4)_3 \cdot 24H_2O$ where M is monovalent basic radical while M is trivalent basic radical. Alums are generally obtained when hot solutions of equimolar quantities of their constituent sulphates are mixed and the resulting solution is subjected to crystallization. Alums are fairly soluble in hot water but less soluble in cold water

Which of the following cation can not form alum



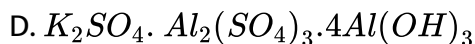
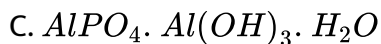
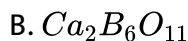
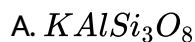
Answer: C



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19. Alums having the general formula $M_2SO_4 \cdot M_2^1(SO_4)_3 \cdot 24H_2O$ where M is monovalent basic radical while M is trivalent basic radical. Alums are generally obtained when hot solutions of equimolar quantities of their constituent sulphates are mixed and the resulting solution is subjected to crystallization. Alums are fairly soluble in hot water but less soluble in cold water

The chemical formula of feldspar is



Answer: A



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20. 

(All products from P to related to Boron.)

The by products are not included)

The compound X is

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21. 

(All products from P to related to Boron.

The by products are not included)

The ionic structure

$[BH_2(NH_3)_2]^+ [BH_4]^-$ corresponds to

A. Z

B. Y

C. X

D. S

Answer: B

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22. 

(All products from P to related to Boron.

The by products are not included)

The following is called inorganic benzene

A. P

B. X

C. Y

D. Z

Answer: D



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Match The Column

1. 



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2. 

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3. 

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4. 

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5. 

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6. 

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7. 

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8. 

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Integer Type Question

1. In borax number of sp^2 hybridised atoms are _____.

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2. The total number of tetrahedral and trigonal planar units in borax is.....

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3. In Borax, no of water molecules in the hydrated state are

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4. Total number of moles of HCl reacts with one mole of borax to convert all borons to boric acid?

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5. In borax molecule $Na_2[B_4O_5(OH)_x]yH_2O$ what will be the value of x, if x molecules are part of its structural composition?

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6. How many moles of H_3O^+ ions are required to completely hydrolyse one mole of borax into orthoboric acid?

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7. The number of water molecules required to hydrolyse 1 mole of borax is :

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8. In borax the number of water molecules present outside the coordination sphere is x and inside the coordination sphere is y , then $x - y =$

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9. How much nitrogen is evolved when one gram of ammonium chloride is heated with borax strongly?



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10. In the tetranuclear unit of borax,

$[B_4O_5(OH)_4]^{2-}$, the number of $B - O - B$

bridges formed between sp^3 borons and

sp^2 borons is x and the number of $B - O - B$

bridges formed between sp^3 borons and

sp^3 borons is y , then $(x - y) =$



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11. In the compound $Na_2[B_4O_5(OH)_4] \cdot 8H_2O$, it the

(i) number of $B - O - B$ bonds is x

(ii) number of $B - B$ bonds is y

(iii) number of sp^2 hybridised B atoms is z calculate the value of

$x + y + z$.



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12. In crystalline form boron exists as Icosahedron that has x faces and y atoms linked in this unit. The value of $(x - y) =$

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13. Number of moles of H_2 formed in the hydrolysis of a mole of borazole is :

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14. Among H_3BO_3 , $AlCl_3$, BF_3 , B_2H_6 ,

$Li[BH_4]$, AlF_6^{3-} , $[BH_4]^-$, the number of Lewis acids are :

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15. Number of compounds which is/are only acidic:

$Be(OH)_2$, $Mg(OH)_2$, $Al(OH)_3$, $B(OH)_3$, $Tl(OH)_3$, $Ga(OH)_3$

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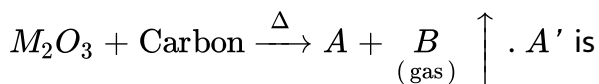
16. The number of B-O bonds in peroxoborate is

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17. The number of isomers possible for disubstituted borazine with similar substituents is

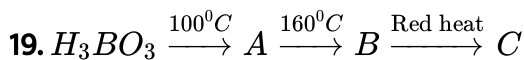
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18. Metal M belonging to group 13,



an ionic compound, which gives Methane on hydrolysis by H_2O . The total number of atoms in a molecule of 'A' is-

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The sum of the number of Boron atoms present in both the A & B molecules is _.



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20. $3B_2H_6 + 6NH_3 \rightarrow 3X \xrightarrow{\text{heat}} 2Y + 12H_2$. In the anionic part of the intermediate X the covalency of the central atom is _.



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21. Among $[BeCl_2]_n$, $[BeH_2]_n$, B_2H_6 ,

$Al_2(CH_3)_6$, Al_2Cl_6 , $Be(BH_4)_2$,

$Al(BH_4)_3$, the number of compounds having $3c - 2e$ bonds are :



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22. In $K[B_5O_6(OH)_4]$, the number of tetrahedral units is /are,



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23. Consider the structure of Al_2Me_6 compound and find the value of $\frac{x}{y}$
Where, $x =$ total number of atoms that are sp^3 hybridised and $y =$
total number of $3c2e$ bonds.



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24. How many of the following compounds cleave diborane symmetrically?

CH_3NH_2 , $(CH_3)_2NH$, $(CH_3)_3N$, $CO(CH_3)_2O$, NH_3



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25. The number of electron deficient bonds in Al_2Cl_6 is :



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26. Reduction of 117.5g BCl_3 by H_2 in silent electric discharge produces HCl , which required 500mL of $x\text{M NaOH}$ for neutralization. Report x .

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27. The coordination number of Al in the crystalline state of AlCl_3 is

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28. Tri alkyl aluminium molecules exist as dimers which contains $3c - 2e$ bonds. The coordination number of bridged carbon is

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29. Number of $3c - 2e$ bonds (hydrogen bridges) in $\text{Be}(\text{BH}_4)_2$ is

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30. The number of hydrogen bonds that can be formed by each boric acid molecule is

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31. Number of hexagonal rings in boron

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32. In the icosahedron of B_{12} unit each boron atom is bonded to how many boron atoms.

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33. The number of water molecules coordinated to each monovalent cation in alum is

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34. The number of moles of hydrocarbon formed in the hydrolysis of one mole of aluminium carbide is

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35. Number of tetrahedral boron atoms in colemanite is

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36. Boron nitride which is isoelectronic and isostructural with graphite is made of fused hexagonal rings made of boron and nitrogen atoms alternatively. The number of π bonds in each hexagonal ring is

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37. Borax and kernite are complex borates to sodium. What is the difference in the number of water molecules of crystallization according

to their structural formulae

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Single Answer Type Questions

1. False statement among the following is:

A. Anhydrous $AlCl_3$ is covalent

B. Hydrated $AlCl_3 \cdot 6H_2O$ is ionic

C. In solid anhydrous $AlCl_3$ each aluminium ion is surrounded by 4 chlorine atoms

D. Solid anhydrous $AlCl_3$ has layered lattice structure.

Answer: C

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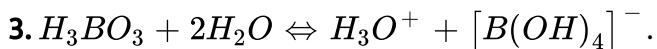
2. BF_3 exist monomer but not dimer because:

- A. Boron cannot coordinate with four fluorine atoms to form dimer
- B. Dimerisation of BF_3 leads to the rehybridiation bond character
- C. BF_3 is ionic compound
- D. of steric hinderence

Answer: A



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The additon of which of the following compounds will make the above equilibrium shift towards right by interacting with tetrahydroxoborate ion?

- A. An adehyde
- B. A ketone

C. An ester

D. A cis-1, 2-diol

Answer: D

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4. H_3BO_3 dissolves in liquid HF due to formation of compound X. The hybridisation of central atom in compound X is ,

A. sp^3

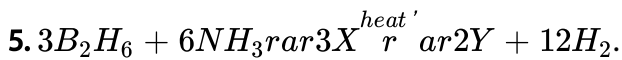
B. sp^2

C. sp & sp

D. sp^3d

Answer: A

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Number of ammonia molecules present in cationic part of X

A. 4

B. 2

C. 6

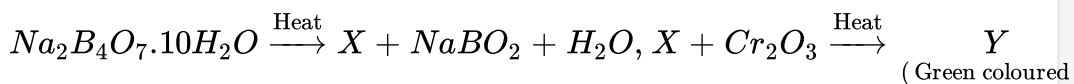
D. 8

Answer: B



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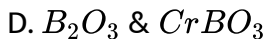
6.



X and Y are :

A. Na_3BO_3 & $Cr(BO_2)_3$

B. $Na_2B_4O_7$ & $Cr(BO_2)_3$

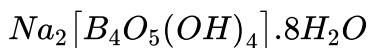


Answer: C



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7. Borax is actually made of two tetrahedral and tetrahedral and two triangular units joined together and should be written as



Consider following statements about borax:

- (1) Each boron atom has four $B - O$ bonds
- (2) Each boron atom has three $B - O$ bonds
- (3) Two boron atoms have four $B - O$ bonds while other two have three $B - O$ bonds
- (4) Each boron atom has one $-OH$ group

Select correct statement(s) :

A. *i, ii*

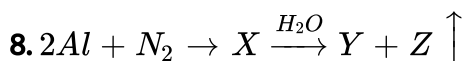
B. *ii, iii*

C. *i, iii*

D. *iii, iv*

Answer: D

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Correct statement regarding Y

A. Y is soluble in H_2O

B. Y is insoluble in H_2O

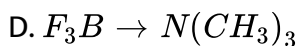
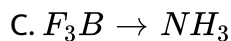
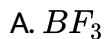
C. Y is only basic and does not show acidic behaviour

D. *M. W. of 'Y'* is 17

Answer: B

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9. In which of the following compounds B-F bond length is shortest?



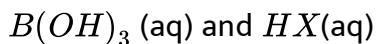
Answer: A



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10. Which of the following is correct regarding the hydrolysis of BX_3 (X-hylogen)?

A. All BX_3 undergo hydrolysis to produce



B. BF_3 does not undergo complete hydrolysis due to formation of



C. BBr_3 does not undergo hydrolysis due to formation of



D. All the above are correct

Answer: B



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11. Correct statement about $Al(BH_4)_3$ is :

A. Each BH_4 unit forms two hydrogen bridges

B. Two of the tBH_4 units forms one hydrogen bridges and one BH_4 unit forms one hydrogen bridge

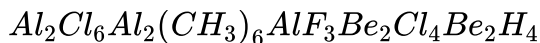
C. One BH_4 unit forms two hydrogen bridges and two BH_4 units form one hydrogen bridges.

D. Boron form only $2e - 2e$ bonds.

Answer: A

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12. In which of compounds octet is complete and incomplete for all atoms:(C for complete octet and IC for incomplete octet)



A. IC IC IC C C

B. C IC IC C C

C. C IC C IC IC

D. IC C IC IC IC

Answer: C

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13. '*H*', '*M*' and '*Q*' are the aq chlorides of the element '*X*', '*Y*' and '*Z*' respectively.

'*X*', '*Y*' and '*Z*' are in the same period of the periodic table.

'*Q*' gives a white ppt with *NaOH* but this white ppt dissolves as more *NaOH* is added.

When *NaOH* is added to '*M*' a white ppt forms which does not dissolve when base is added.

H does not give a ppt with *NaOH*.

Which of the following statements are correct?

- I. The three elements are metals
- II. The electronegativity values decrease from '*X*' to '*Y*' to '*Z*'
- III. '*X*', '*Y*' and '*Z*' could be *Na*, *Mg* and *Al*
- IV. The first ionisation energy increases from '*X*' to '*Y*' to '*Z*'.

A. I, II, III

B. only I and III

C. only II and IV

D. only III and IV

Answer: B

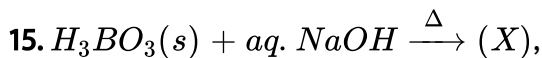
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14. Borax is used as buffer since :

- A. Its aqueous solution contains both the weak acid and its salt
- B. Its aqueous solution contains H_3BO_3 , which is a weak acid
- C. Its aqueous solution contains equal amount of strong acid and its salt
- D. statement that borax is a buffer is wrong

Answer: A

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Compound (X) & (Y) are respectively,

- A. Na_3BO_3, Na_3B
- B. $Na_3BO_3, NaBO_2$
- C. $Na[B(OH)_4], Na_3BO_3$
- D. $Na_3BO_3, Na[B(OH)_4]$

Answer: C



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16. Amphoteric oxide (X) + $3C + Cl_2 \rightarrow$

Poisonous gas + anhydrous chloride (Y)

Element forming 'Y' other than 'Cl' reacts with concentrated HCl but leads to passivation with conce. HNO_3 . Select the correct option

- A. $X = Z$ and Y on reacting with LiH forms strong oxidising agent
- B. $X = Z$ and Y on reacting with LiH forms strong reducing agent
- C. $X \neq Z$ and Y is used as a catalyst in Friedel crafts reaction

D. $X \neq Z$ and Y on reacting with LiH form strong oxidising agent

Answer: B

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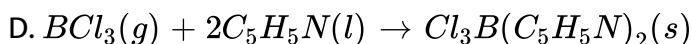
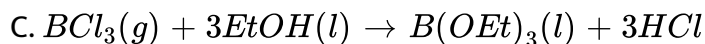
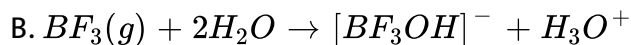
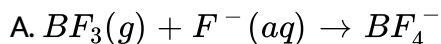
17. Which of a solution of sodium hydroxide is added in excess to the solution of potash alum, we obtain

- A. a white precipitate
- B. bluish white precipitate
- C. A clear solution
- D. a crystalline mass

Answer: C

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18. Which of the following reaction is incorrect?



Answer: D



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19. Select the incorrect statement about the boron

A. Pure form of the elements are obtained by the reduction of BCl_3

with zine at $900^\circ C$

B. Crystalline boron is attacked only by hot concentrated oxidising agents

C. Amorphous boron and ammonia at white heat gives $(BN)_x$, a slippery white solid with a layer structure resembling that of graphite

D. Boron does form B^{3+} cation easily

Answer: B

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20. Aqueous solution of borax reacts with two mol of acids. This is because of :

A. formation of 2 mole of $B(OH)_3$ only

B. formation of 2 mole of $[B(OH)_4]^-$ only

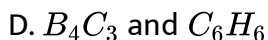
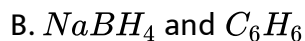
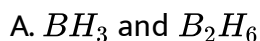
C. formation of 1 mole each of $B(OH)_3$ and $[B(OH)_4]^-$

D. formation of 2 mol each of $[B(OH)_4]^-$ and $B(OH)_3$, of which only $[B(OH)_4]^-$ reacts with acid

Answer: D

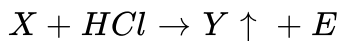
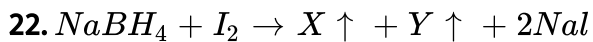
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21. A compound of boron X reacts at 200°C temperature with NH_3 to give another compound Y which is called as inorganic benzene. The compound Y is a colourless liquid and is highly light sensitive. Its melting point is -57°C . The compound X with excess of NH_3 and at a still higher temperature gives boron nitride $(\text{BN})_n$. The compounds X and Y are respectively:



Answer: C

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D gives following colour with flame

A. Red

B. Green

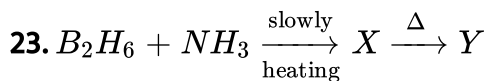
C. Blue

D. No colour

Answer: B



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Which of the following statement is incorrect?

A. X is ionic in nature, Hybridisation state of B in both cationic and anionic part is same

B. X is ionic in nature, hybridisation state B in cationic and anionic part are different

C. Y is covalent and hybridisation state of ball B is not same

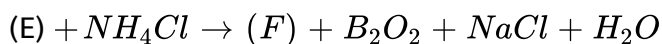
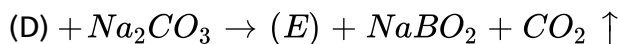
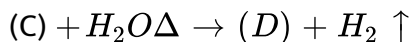
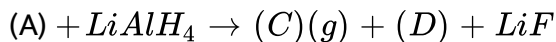
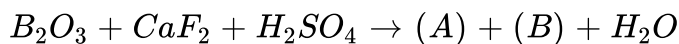
D. Y is ionic and hybridisation state of all B are same

Answer: A



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24. Consider the following sequence of reactions:



The empirical formula mass of compound (F)

A. 25

B. 15

C. 50

D. 117.5

Answer: A



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