

## CHEMISTRY

### BOOKS - CHHAYA CHEMISTRY (BENGALI ENGLISH)

#### SOME p-BLOCK ELEMENTS

#### Warm Up Exercise

1. Which is the most abundant metal in the earth's crust?



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2. Name the principle ore of aluminium. How is the metal extracted from this ore ?



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3. Atomic radius of Ga is somewhat less than that of Al-why?



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4. The first ionisation enthalpies ( $\Delta_i H_1$ ) of group-13 elements are lower than those of elements of group

2-Explain.



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5. The stability of + 1 oxidation state follows the order:  $\text{Al} < \text{Ga} < \text{In} < \text{Tl}$  -Explain.



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6. Why is boron unable to form  $B^{3+}$  ion?



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7.  $Tl^{3+}$  salts act as strong oxidising agents-why?



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8. Which of the group-13 elements is used in thermometers for recording high temperatures and why?



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9. Boron is a non-metal and a bad conductor of electricity while aluminium is a metal and a good conductor of electricity. Explain.



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**10.** Why does density increase on moving from B to Tl?



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**11.** Explain why the elements of group-13 are expected to form covalent bonds in +3 oxidation state.



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**12.** Which elements out of five members of boron family react with dinitrogen to form nitride?



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**13.** What is 'inorganic graphite'? Describe its structure.



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**14.** The basic character of the hydroxides of group-13 elements increases on moving down the group- why?



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15. How would you establish that aluminium oxide ( $Al_2O_3$ ) is amphoteric in nature?



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16. Give reactions to justify the amphoteric nature of Ga .



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17. Explain why aluminium vessels can be used to store cone. nitric acid ( $HNO_3$ )



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18. Give an example of a complex hydride of aluminium and mention its use.



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19. What is corundum? Mention its use.



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20. Explain why the trihalides of boron act as Lewis acid.



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21. Which one of  $BF_3$  and  $BI_3$  acts as a stronger Lewis acid and why?



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22. Unlike aluminium chloride, boron trichloride does not exist as a dimer-why?



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23. Why does  $BF_3$  forms an adduct with ammonia?





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**24.** Boron is distinctly non-metallic-why?



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**25.** Boron is an extremely hard solid-why?



**Watch Video Solution**

**26.** Give the names of 3 crystalline allotropic forms of boron.



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27. Using chemical reactions show that boron acts as an oxidising agent as well as a reducing agent.



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28. How can boron carbide be prepared? Mention its use.



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29. Metal borides having  $^{10}\text{B}$  are used in nuclear reactors why?



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30. What is the building unit of various allotropic forms of B?



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31. Write the reaction of amorphous boron with strong alkali.



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32. Aqueous solution of  $BCl_3$  is acidic in nature- why?



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33. Why is boron used in steel industry?



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34. The formula of borax should be written as

$Na_2[B_4O_5(OH)_4] \cdot 8H_2O$  instead of

$Na_2B_4O_7 \cdot 10H_2O$  - explain this fact.



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**35.** What happens when borax is heated in a platinum loop strongly?



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**36.** Explain why an aqueous solution of borax is alkaline?



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**37.** When phenolphthalein is added to an aqueous solution of borax, the solution becomes pink in colour. However, when glycerol is added to that

solution, it becomes colourless again. Explain these observations.



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**38.** What is goldsmith's suhaga?



**Watch Video Solution**

**39.** How can you identify a salt which contain cobalt by borax bead test?



**Watch Video Solution**

40. State with chemical reaction how can boric acid be identified?



**Watch Video Solution**

41. Boric acid is a monobasic acid-explain.



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42. When boric acid is allowed to react with ammonium bifluoride, no residue is obtained-Explain.



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43. Aqueous solutions of two acidic compounds are reacted to give alkaline solution. Give example.



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44.  $BO_3^{3-}$  has trigonal planar structure-why?



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45. Although boric acid  $[B(OH)_3]$  contains three -OH groups, yet it is sparingly soluble in water-why?



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**46.** What is inorganic benzene? Why it is called so?



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**47.** Explain why diborane ( $B_2H_6$ ) is electron deficient but ethane ( $C_2H_6$ ) is not.



**Watch Video Solution**

**48.** Explain the structure of diborane ( $B_2H_6$ ) on the basis of hybridisation.



**Watch Video Solution**

**49.** State with equation what happens when diborane is treated with ammonia & then heated at 473 K.



**Watch Video Solution**

**50.** From which ore Al can be extracted profitably?



**Watch Video Solution**

**51.** Which Al alloys are used for constructing aircrafts?



**Watch Video Solution**

**52.** What is ammonal? Mention its use.



**Watch Video Solution**

**53.** What happens when aluminium reacts with hot and conc. NaOH solution?



**Watch Video Solution**

**54.** Why metallic lustre of aluminium disappears when kept in air?



**Watch Video Solution**

55. Which element among the following does form  $p\pi - p\pi$  multiple bonds ?



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56. Account for the anomalous behaviour of carbon from other group-14 elements.



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57. Explain the following order of first ionisation enthalpies ( $\Delta_i H_1$ ) of group-14 elements:  $C > Si > Ge > Sn < Pb$



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58. What do you mean by radio-carbon dating?



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59.  $(SiH_3)_3N$  is a weaker Lewis base than  $(CH_3)_3N$ .  
Explain.



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60. The shape of  $(SiH_3)_3P$  is pyramidal. Comment.



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**61.** Which element among the group-14 elements is a metalloid?



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**62.** The compounds in which the elements of group-14 show an oxidation state of +4 are expected to be covalent, whereas the compound in which they show an oxidation state of +2 are expected to be ionic-explain with reason.



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63. Explain why the Sn (II) salts are used as reducing agents while Pb (IV) salts are used as oxidising agents.



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64. Explain why  $PbI_4$  does not exist.



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65.  $CCl_4$  does not undergo hydrolysis, while  $SiCl_4$  hydrolyses readily-why?



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66. Which compound of lead is used as "Sindoor"?



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67. Among the dioxides of group-14 elements,  $PbO_2$  is the strongest oxidising agent- explain.



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68. Give the Lewis acidity order:

$SiF_4$ ,  $SiCl_4$ ,  $SiBr_4$ ,  $SiI_4$



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**69.** What do you mean by allotropes and allotropy?



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**70.** What are the crystalline and amorphous allotropic forms of carbon?



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**71.** Diamond is effectively an electrical insulator while graphite is a good conductor-why?



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[Watch Video Solution](#)

**72.** Although diamond is a covalent substance, its melting point is very high-explain.



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**73.** Explain why graphite possesses lubricating properties.



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74. How can you distinguish between diamond and glass?



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75. Which of the allotropic forms of carbon conducts heat better than any other material?



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76. How many five- membered and six-membered rings are present in  $C_{60}$  fullerene?



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77. Which allotrope of carbon is used as a moderator in the nuclear reactor?



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78. What is the state of hybridisation of carbon in fullerene?



**Watch Video Solution**

79. Fullerenes act as wonderful lubricants-why?



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80. How can you decolourise a sample of slightly brown coloured impure sugar?



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81. What do we obtain if cone.  $H_2SO_4$  is dropped on sugar?



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**82.** Give two differences between diamond and graphite.



**Watch Video Solution**

**83.** Why is CO toxic?



**Watch Video Solution**

**84.** CO is a combustible gas but  $CO_2$  is not-why?



**Watch Video Solution**

**85.** Explain how carbon dioxide acts as a fire extinguisher.



**Watch Video Solution**

**86.** A burning magnesium ribbon cannot be extinguished by carbon dioxide-why?



**Watch Video Solution**

**87.** CO has both oxidising and reducing property-explain.



**Watch Video Solution**



88.  $CO_2$  act as oxidising agent but not reducing agent-why?



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89. CO forms addition compound but  $CO_2$  does not-why?



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90. Unlike  $CO_2$ , CO is used as a fuel-why?



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**91.** Explain why blue flame is seen in coal oven.



**Watch Video Solution**

**92.** How will you separate CO and  $CO_2$  from a mixture?



**Watch Video Solution**

**93.** What do you mean by baking powder? Why is it used in the preparation of bread?



**Watch Video Solution**

94. How will you confirm that a gas is  $CO_2$  but not  $SO_2$  ?



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95. In preparing  $CO_2$  from marble, which one of the two acids  $HCl$  and  $H_2SO_4$  should be used and why?



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96. Give example of a reaction in which  $CO_2$  acts as an oxidising agent.



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97. Explain why  $CO_2$  is a non-polar molecule.



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98. Why is solid carbon dioxide called dry ice ?



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99. Mention one use of super critical  $CO_2$ .



Watch Video Solution

**100.** Write formula of white asbestos. What type of silicate is it?



**Watch Video Solution**

**101.** How can ultrapure silicon be prepared from impure silicon?



**Watch Video Solution**

**102.** Which anions are present in orthosilicates & pyrosilicates?



**Watch Video Solution**

**103.** What are silicates? How are they classified?



**Watch Video Solution**

**104.** Explain why silicones are water repelling in nature .



**Watch Video Solution**

**105.** How can silica gel be prepared from  $SiCl_4$  ? Give two uses.



**Watch Video Solution**

**106.** Write the structure of the anion present in pyrosilicate .



**Watch Video Solution**

**107.** What are zeolites? Give two important uses of zeolites.



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**Question Answer Zone For Board Examination Very Short Answer Type**

1. Name one ore of boron and give its formula.



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2. What are the two isotopes present in natural boron ?



**Watch Video Solution**

3. Which element of group-13 has the most stable +1 oxidation state ?



**Watch Video Solution**



4. Which elements of Gr-13 form amphoteric hydroxide ?



**Watch Video Solution**

5. Which elements of group- 13 forms only covalent compounds and why ?



**Watch Video Solution**

6. Give the general valence shell electronic configuration of group-13 elements. What is their common oxidation state?



**Watch Video Solution**

7. which one among group-13 elements has the highest value of ionisation enthalpy?



**Watch Video Solution**

8. Which element of Gr- 13 is the most abundant one ?



**Watch Video Solution**

9. Write one physical characteristic of boron in which it differs from the other members of group-13.



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10. Why boron compounds such as  $BF_3$  are called electron deficient compounds?



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11. Which of the Gr- 13 elements forms acidic oxide ?



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12. Arrange the following compounds in order of decreasing strength as Lewis acid :  $BCl_3$ ,  $BBr_3$ ,  $BF_3$



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13. Which compound is responsible for the green - edged flame in a test for borate ion ?



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14. Name the compound which on warming produces pure  $BF_3$ .



Watch Video Solution

15. Explain why  $BF_6^{3-}$  has no existence.



Watch Video Solution

16. What type of cations are identified by borax bead test ?



Watch Video Solution

17. What happens when borax solution is acidified ?



Watch Video Solution

18. How are the  $BO_3^{3-}$  units in boric acid linked to give layered structure ?



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19. What is the shape of  $BO_3^{3-}$  ion?



Watch Video Solution

20. Which compounds are formed on heating boric acid ?



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21. Using balanced chemical equation show how  $B(OH)_3$  behaves as a monobasic acid in water.



**Watch Video Solution**

**22.** What are the forces involved between the layers of two-dimensional sheets of  $H_3BO_3$  ?



**Watch Video Solution**

**23.** What is the composition of the transparent glassy bead obtained on heating borax ?



**Watch Video Solution**

24. What is the structural unit present in all allotropic forms of boron ?



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25. What type of bonds are present in  $B_2H_6$  molecule ?



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26. Explain why boron cannot form  $B^{3+}$  ions.



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27. Mention the states of hybridisation of boron in  $B_2H_6$  and in  $BF_3$ .



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28. Crystalline boron is an extremely hard solid - why ?



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29. What are boranes ?



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**30.** Boron shows anomalous behaviour and differs from the rest the members of its family - why ?



**Watch Video Solution**

**31.** Which two out of five members of carbon family are distinctly metals ?



**Watch Video Solution**

**32.** Which one out of catechol, resorcinol and quinol can be used to titrate boric acid against sodium hydroxide using methyl orange as the indicator?



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**33.** Carbon forms covalent compounds but lead forms ionic compounds-Why?



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**34.** Which element of carbon family has no d-orbital in its valence shell?



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**35.** Among the group-14 elements which is the most electronegative one?



**Watch Video Solution**

**36.** Which member of carbon family has the lowest melting point?



**Watch Video Solution**

**37.** Which is the more stable oxidation state of Pb ?



**Watch Video Solution**

**38.** Out of diamond & graphite which is a good conductor of electricity and which is a good conductor of heat?



**Watch Video Solution**

**39.** Which member of carbon family has the highest value of first ionisation enthalpy?



**Watch Video Solution**

**40.** Which member of carbon family has the maximum tendency to exhibit catenation property?



Watch Video Solution

41. What are the structural units of ice and dry ice?



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42. Among the group-14 elements which one exhibits  $p\pi - p\pi$  multiple bond?



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43. Give reasons for which carbon differs from the rest of the members of its family.



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44. What is the basic building unit of all silicates?



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45. What happens when cone.  $H_2SO_4$  is dropped on sugar?



Watch Video Solution

46. What is buckminsterfullerene ?



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47. What is the state of hybridisation of carbon in  $CO_3^{2-}$  ?



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48. What is the state of hybridisation of carbon in  $HCO_3^-$  ?



Watch Video Solution



**49.** What is the state of hybridisation of carbon in  $CO_2$  ?



**Watch Video Solution**

**50.** Which allotrope of C is used as moderator in atomic reactors and as solid lubricant for heavy machinery?



**Watch Video Solution**

**51.** Mention the oxides of C which are the anhydrides of carbonic acid and formic acid respectively.



**Watch Video Solution**

**52.** Name the gases which are present in producer gas.



**Watch Video Solution**

**53.** Out of CO and  $CO_2$  which acts as a ligand and can form a coordinate bond with certain metals and why?



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**54.** What is the state of hybridisation of carbon in each of the following diamond.



**Watch Video Solution**

**55.** What is the state of hybridisation of carbon in each of the following graphite



**Watch Video Solution**

**56.** What is the state of hybridisation of carbon in each of the following fullerene.



**Watch Video Solution**

57. What is carborundum ?



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58. Give an example of a reaction where  $CO_2$  acts as an oxidising agent.



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59. What are zeolites ?



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**60.** Write the name of the compound used as a fire extinguisher under the name pyrene.



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**61.** Name the hardest compound of boron.



**Watch Video Solution**

**62.** What is alane?



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## Question Answer Zone For Board Examination Short Answer Type

1. Explain why the B - X bond distance in  $BX_3$  is shorter than the theoretically expected value.



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2. Boric acid can be titrated against NaOH solution using phenolphthalein indicator only in presence of polyhydroxy compounds. Explain.



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3. Although aluminium lies above hydrogen in the electrochemical series, it is quite stable in water and air. Why ?



**Watch Video Solution**

4. Using chemical reactions show that aluminum is amphoteric in nature.



**Watch Video Solution**

5. Mention 3 similarities in the nature of B and Si.



**Watch Video Solution**

6. "Graphite acts as a better lubricant on the moon compared to that on earth" - Justify the validity of the statement.



**Watch Video Solution**

7. Explain why  $PbCl_4$  is a good oxidising agent.



**Watch Video Solution**

8. Why do nitrogen and carbon monoxide show similarities in their physical properties?



**Watch Video Solution**



**9. Give reasons**

Graphite is used as lubricant.



**Watch Video Solution**

**10. Unlike diamond, graphite is a good conductor of electricity-explain.**



**Watch Video Solution**

**11. Diamond is extremely hard but graphite is soft and slippery -explain with reason.**



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12. Diamond is a bad conductor of electricity but a very good conductor of heat-explain.



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13. In spite of being a covalent substance, the melting point of diamond is very high-why?



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14. CO is an inflammable gas while  $CO_2$  is not-why?



[Watch Video Solution](#)

**15.** How does carbon dioxide function as a fire extinguisher ? Burning magnesium cannot be extinguished by carbon dioxide -why ?



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**16.** Carbon monoxide possesses both oxidising and reducing properties - why ?



[Watch Video Solution](#)

17. How will you convert a mixture of CO and  $CO_2$  completely into  $CO_2$  ?



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18. How will you convert a mixture of CO and  $CO_2$  completely into CO ?



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19.  $[SiF_6]^{2-}$  is known to exist whereas  $[CF_6]^{2-}$  does not exist. Explain.



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**20.** Aqueous solution of sodium hydroxide is added drop wise to solution of gallium chloride in water. A precipitate is initially formed. The precipitate dissolves on further addition of NaOH solution. Explain the observation using suitable chemical reactions.



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**21.** Define buckyball. How is it made ?



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22. CO is readily absorbed by ammoniacal cuprous chloride solution but  $CO_2$  is not. Explain.



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23. Why is orthoboric acid used in talcum powders?



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24. Why, molten  $AlBr_3$  is a poor conductor of electricity?



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**25.** What is the chemical composition of borax bead?



**Watch Video Solution**

**26.** Which glass has the highest percentage of lead?

Mention its use.



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**27.** Silicon in elemental form does not form a graphite-like structure. Explain.



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## Question Answer Zone For Board Examination Long Answer Type

1. When boron trichloride reacts with water, it only forms  $[B(OH)_4]^-$ , whereas aluminium trichloride forms  $[Al(H_2O)_6]^{3+}$  in acidified aqueous solution. State the hybridisation of boron and aluminium in these species and explain your answer.



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2. Diamond tipped tools are used for drilling and cutting purposes.



**Watch Video Solution**



3. Graphite is used as lubricant.



Watch Video Solution

4. Silicones are water repelling in nature.



Watch Video Solution

5. CO gets absorbed by ammoniacal cuprous chloride to form a complex but  $CO_2$  does not.



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6. A mixture of sand and sodium carbonate is melted on heating.



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7. At  $200^{\circ}C$  and under high pressure, carbon monoxide is passed through caustic soda solution and the product is heated to  $300^{\circ}C$ .



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8. At high temperature, metallic calcium is made to react with carbon and the product obtained is

treated with water.



**Watch Video Solution**

9. Potassium ferrocyaoides is heated in the presence of concentrated  $H_2SO_4$  and the gas thus obtained is passed over finely divided nickel powder at  $50^\circ C$ .



**Watch Video Solution**

10. Silicon is heated with methyl chloride at high temperature in the presence of copper.



**Watch Video Solution**

11.  $\text{SiO}_2$  is treated with HF.



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12. Starting from boric acid how can you prepare boric anhydride.



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13. Starting from boric acid how can you prepare boron trichloride.



Watch Video Solution

14. Starting from boric acid how can you prepare boron trifluoride.



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15. Starting from boric acid how can you prepare meta and tetraboric acid.



**Watch Video Solution**

16. Starting from boric acid how can you prepare boron hydride.



**Watch Video Solution**

17. Starting from boric acid how can you prepare ethyl borate.



**Watch Video Solution**

**Solved Wbchse Scanner**

1. What is producer gas? Write down the reactions for the production of this gas.



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2. How can you separate CO from a mixture of  $CO$  and  $CO_2$ ?



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3. Write the formula of following ore: bauxite



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4. Mention the use of Borax.



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5. Anhydrous aluminium chloride cannot be prepared by heating hydrated aluminium chloride. Why?



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6. A white precipitate is formed when small amount of a gas is passed through lime water. The precipitate dissolves when excess of the gas is passed. What can be the possible gases? How would you identify the gases?



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7. Name the chemicals required for preparation of CO in the laboratory. Give equation(s) for the reaction(s) involved.



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8. Write the chemical equation for the manufacture of urea.



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9. Write the balanced equation(s) for the reaction when excess  $CO_2$  is passed through brine saturated

with  $NH_3$ .



**Watch Video Solution**

**10. What is dry ice?**



**Watch Video Solution**

**11. How is producer gas manufactured?**



**Watch Video Solution**

**12. What is active charcoal? Mention one of its uses.**



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13. Which one is the hardest allotrope of carbon?

Answer with reason.



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14. Why  $PbO_2$  is oxidising?



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15. Explain why  $TlCl$  is known but  $AlCl$  is not known.



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16. Which of the following is thermodynamically most stable form of carbon? Coke, diamond, graphite, fullerenes.



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17.  $PbCl_4$  is less stable than  $SnCl_4$  while  $PbCl_2$  is more stable than  $SnCl_2$ . Justify or contradict.



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18. Explain why  $CCl_4$  is not hydrolysed while  $SiCl_4$  is hydrolysed.



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19. What happens when borax is heated strongly?



Watch Video Solution

20. Why are the dihalides of carbon unstable but the dihalides of tin and lead are stable?



Watch Video Solution

21. Why is the aqueous solution of borax alkaline?



Watch Video Solution

22. What happens when at first lesser amount and then excess amount of NaOH solution is added to  $Al_2(SO_4)_3$  solution?



Watch Video Solution

23. Explain with reason:  $SnCl_2$  is a solid ionic compound whereas  $SnCl_4$  is a covalent liquid.



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**24.** Explain the phenomenon: When phenolphthaleine is added to aqueous solution of borax the colour of the solution turns pink which is again turn colourless if glycerol is added to it.



**Watch Video Solution**

**25.** What is inorganic benzene? How does it prepare? State with conditions and equation.



**Watch Video Solution**

26. Why graphite is a conductor of electricity but diamond is not?



**Watch Video Solution**

27. Which of the following has a bridge bond-

A. water

B. inorganic benzene

C. phenol

D. diborane

**Answer:**





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28.  $\text{SiCl}_4$  undergoes hydrolysis, but  $\text{CCl}_4$  does not-explain.



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29. What happens when boric acid is mixed with potassium bifluoride solution? Give equation.



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30. Draw one canonical structure of  $\text{CO}_2$ .



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31. Explain why  $SiCl_4$  undergoes hydrolysis easily.



Watch Video Solution

32. Why aqueous solution of borax alkaline?



Watch Video Solution

33. Why is carbon monoxide toxic?



Watch Video Solution

**34.** Write the balanced chemical equation what happens when aluminium is heated with concentrated aqueous solution of caustic potash.



**Watch Video Solution**

**35.** Write one use of each of Silicones and Zeolite.



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**Solved Ncert Exercise**

1. Discuss the pattern of variation in the oxidation states of B to Tl.



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2. Discuss the pattern of variation in the oxidation states of C to Pb.



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3. How can you explain higher stability of  $BCl_3$  as compared to  $TlCl_3$  ?



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4. Why does boron trifluoride behave as a Lewis acid?



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5. Consider the compounds,  $BCl_3$  and  $CCl_4$ . How will they behave with water? Justify.



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6. Is boric acid a protic acid? Explain.



Watch Video Solution

7. Explain what happens when boric acid is heated.



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8. Describe the shapes of  $BF_3$  and  $BH_4^-$ . Assign the hybridisation of boron in these species.



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9. Write reactions to justify amphoteric nature of Al.



Watch Video Solution

10. What are electron deficient compounds? Are  $BCl_3$  and  $SiCl_4$  electron deficient species? Explain.



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11. Write the resonance structures of  $CO_3^{2-}$  and  $HCO_3^-$ .



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12. What is the state of hybridisation of carbon in  $CO_3^{2-}$ ?



Watch Video Solution

**13.** What is the state of hybridisation of carbon in diamond ?



**Watch Video Solution**

**14.** What is the state of hybridisation of carbon in graphite?



**Watch Video Solution**

**15.** Explain the difference in properties of diamond and graphite on the basis of their structures.



**Watch Video Solution**



16. Rationalise the statement and give reaction :

Lead (II) chloride reacts with  $Cl_2$  to give  $PbCl_4$ .



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17. Rationalise the statement and give reaction :

Lead (IV) chloride is highly unstable towards heat.



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18. Rationalise the statement and give reaction :

Lead is known not to form an iodide,  $PbI_4$ .



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19. Suggest reasons why the B-F bond lengths in  $BF_3$  (130 pm) and  $BF_4^-$  (143 pm) differ.



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20. If B-Cl bond has a dipole moment, explain why  $BCl_3$  molecule has zero dipole moment.



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**21.** Aluminium trifluoride is insoluble in anhydrous HF but dissolves on addition of NaF. Aluminium trifluoride precipitates out of the resulting solution when gaseous  $BF_3$  is bubbled through. Give reasons.



**Watch Video Solution**

**22.** Suggest a reason as to why CO is poisonous.



**Watch Video Solution**

**23.** How does the increase in the amount of  $CO_2$  in the atmosphere lead to global warming ?



**Watch Video Solution**

**24.** Explain structures of diboroane and boric acid.



**Watch Video Solution**

**25.** What happen when  
Borax is heated strongly.



**Watch Video Solution**

**26.** What happens when  
Boric acid is added to water.



Watch Video Solution

27. What happens when

Aluminium is treated with dilute NaOH.



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28.  $BF_3$  is reacted with ammonia?



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29. Explain the following reaction Silicon is heated with methyl chloride at high temperature in the

presence of copper.



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**30.** Explain the following reaction : Silicon dioxide is treated with hydrogen fluoride.



**Watch Video Solution**

**31.** Explain the following reaction : CO is heated with ZnO.



**Watch Video Solution**

**32.** Explain the following reaction : Hydrated alumina is treated with aqueous NaOH.



**Watch Video Solution**

**33.** Give reasons

Conc.  $HNO_3$  can be transported in aluminium container.



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**34.** Give reasons

A mixture of dilute NaOH and aluminium pieces is

used to open drain.



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**35. Give reasons**

Graphite is used as lubricant.



**Watch Video Solution**

**36. Give reasons**

Diamond is used as an abrasive.



**Watch Video Solution**



### 37. Give reasons

Aluminium alloys are used to make aircraft body.



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### 38. Give reasons

Aluminium utensils should not be kept in water overnight.



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### 39. Give reasons

Aluminium wire is used to make transmission cables.





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**40.** Explain why is there a phenomenal decrease in ionisation enthalpy for carbon to silicon ?



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**41.** How would you explain the lower atomic radius of Ga as compared to Al ?



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**42.** What are allotropes ? Sketch the structure of two allotropes of carbon of structure on physical properties of two allotropes ?



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**43.** Classify following oxides as neutral, acidic, basic or amphoteric :

$CO$ ,  $B_2O_3$ ,  $SiO_2$ ,  $CO_2$ ,  $Al_2O_3$ ,  $PbO_2$ ,  $Tl_2O_3$ .



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**44.** Write suitable chemical equations to show their natural.



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**45.** In some reactions thallium resembles aluminium, whereas in others it resembles with group - I metals. Support this statement by giving some evidences.



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**46.** When metal X is treated with sodium hydroxide, a white precipitate (A) is obtained, which is solubel in

excess of  $\text{NaOH}$  to give soluble complex (B). Compound (A) is soluble in dilute  $\text{HCl}$  to form compound (C). The compound (A) when heated strongly gives (D), which is used to extract metal. Identify (X), (A), (B), (C) and (D). Write suitable equations to support their identities.



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**47.** What do you understand by inert pair effect ?



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**48.** What do you understand by allotropy ?



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**49.** What do you understand by catenation ?



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**50.** A certain salt X, gives the following result.

Its aqueous solution is alkaline to litmus.



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**51.** A certain salt X, gives the following result.

It swells up to a glassy material Y on strong heating.



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**52.** A certain salt X, gives the following result.

When conc.  $H_2SO_4$  is added to a hot solution of X, white crystal of an acid Z separates out. Write equation for all the above reactions and identify X, Y and Z.



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**53.** Write balanced equations for,  $BF_3 + LiH \rightarrow$



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54. Write balanced equations for,  $B_2H_6 + H_2O \rightarrow$



Watch Video Solution

55. Write balanced equations for,  $NaH + B_2H_6 \rightarrow$



Watch Video Solution

56. Write balanced equations for,  $H_3BO_3 \xrightarrow{\Delta}$



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57. Write balanced equations for,  $Al + NaOH \rightarrow$



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58. Write balanced equations for,  $B_2H_6 + NH_3 \rightarrow$



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59. Give one method for industrial preparation and one for laboratory preparation of CO and  $CO_2$  each.



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**60.** An aqueous solution of borax is-

- A. neutral
- B. amphoteric
- C. basic
- D. acidic

**Answer: C**



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**61.** Boric acid is polymeric due to-

- A. its acidic nature

B. the presence of hydrogen bonds

C. its monobasic nature

D. its geometry

**Answer: B**



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**62.** The type of hybridisation of boron in diborane is -

A.  $sp$

B.  $sp^2$

C.  $sp^3$

D.  $dsp^2$

**Answer: C**



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**63.** Thermodynamically the most stable form of carbon is

- A. diamond
- B. graphite
- C. fullerenes
- D. coal

**Answer: B**



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**64.** Elements of Gr-14

- A. exhibit oxidation state of +4 only
- B. exhibit oxidation state of +2 and +4
- C. form  $M^{2-}$  and  $M^{4+}$  ions
- D. form  $M^{2+}$  and  $M^{4+}$  ions

**Answer: C**



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65. If the starting material for the manufacture of silicones is  $RSiCl_3$ , write the structure of the product.



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### Higher Order Thinking Skill Hots Questions

1. Anhydrous aluminium chloride is used as a catalyst and fumes in moist air. Explain these observations.



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2. Out of anhydrous  $AlCl_3$  and hydrated  $AlCl_3 \cdot 6H_2O$ , which one is more soluble in diethyl ether and why?



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3. When lead nitrate solution is added to an aqueous solution of  $H_2S$ , a black precipitate is obtained. However, when lead nitrate solution is added to the filtrate obtained by passing the solution of  $H_2S$  through activated charcoal, no black precipitate is obtained. Explain these observations.



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4. CO is a poisonous gas while  $CO_2$  is not-why?



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5. What is foarnite mixture? How can it extinguish fire?



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6.  $AlF_3$  does not dissolve in anhydrous HF but dissolves in KF. When  $BF_3$  is added to the above solution containing KF, aluminium trifluoride is precipitated. Explain.







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7. Explain why carbon dioxide is a gas at room temperature but silicon dioxide is a solid substance.



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8. Why does Ga (+1) undergo disproportionation reaction?



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9. Unlike  $In^+$ ,  $Tl^+$  does not undergo disproportionation reaction-Explain.



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10. Discuss the pattern of variation in the oxidation states of B to Tl.



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11. Aluminium chloride exists as a dimer, but boron trichloride does not. Explain.



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12.  $AlCl_3$  is covalent but ionises in water-why?



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13.  $BF_3$  is a weaker Lewis acid than  $BCl_3$ , even though F is more electronegative than Cl. Explain.



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14. Sn(II) is a reducing agent but Pb(II) is not-why?



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15. CO is stable but SiO is not-why?



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16.  $[SiF_6]^{2-}$  is known but  $[SiCl_6]^{2-}$  is not. Why?



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17. Explain why  $CCl_4$  is resistant to hydrolysis but  $SiCl_4$  undergo ready hydrolysis.



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18. Discuss the pattern of variation in the oxidation states of C to Pb.



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19. What are aquadag and oildag? Mention their uses.



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20. Which out of dil.  $H_2SO_4$ , HCl and  $HNO_3$  can be used in the preparation of carbon dioxide from  $PbCO_3$ ?



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**21.** Which properties are responsible for the extensive use of aluminium in different industries? Write some applications of aluminium.



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**22.** No visible reaction is observed when Al metal is left in contact with concentrated  $HNO_3$ . Explain.



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**23.** Thermite reaction cannot be stopped by pouring water. Explain.



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24. Why was lead sheets used on the floors in the Hanging Gardens of Babylon?



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25. Explain why HF is not stored in glass containers.



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26. Explain why  $BF_3$  exists whereas  $BH_3$  does not.



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## Entrance Question Bank

1. Which of the following metals has the largest abundance in the earth crust -

A. aluminium

B. calcium

C. magnesium

D. sodium

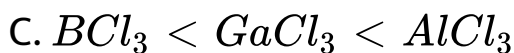
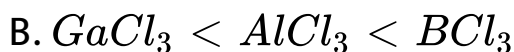
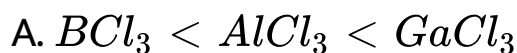
**Answer: A**



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2. For  $BCl_3$ ,  $AlCl_3$  and  $GaCl_3$  the increasing order of ionic character is -



**Answer: C**



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3. In borax, the number of B -O -B link and B -OH bonds present are respectively-

- A. five and four
- B. four and five
- C. three and four
- D. five and five

**Answer: A**



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4. In diborane, the number of electrons that account for  $\pi$  bonding in the bridges is-

A. six

B. two

C. eight

D. four

**Answer: D**



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5. The main reason that  $\text{SiCl}_4$  is easily hydrolysed as compared to  $\text{CCl}_4$  is that -

A. Si-Cl bond is weaker than C-Cl bond

B.  $\text{SiCl}_4$  can form hydrogen bonds

C.  $\text{SiCl}_4$  is covalent

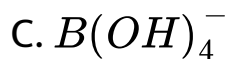
D. Si can extend its coordination number beyond four

**Answer: D**



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6. Which of the following ions cannot be formed by boron-



**Answer: C**



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7. Which of the following exists as covalent crystals in the solid state-

A. phosphorus

B. iodine

C. silicon

D. sulphur

**Answer: B**



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8. Which of the following are Lewis acids-

A.  $PH_3$  and  $SiCl_4$

B.  $BCl_3$  and  $AlCl_3$

C.  $PH_3$  and  $BCl_3$

D.  $AlCl_3$  and  $SiCl_4$

**Answer: A**



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**9. Which of the following oxide is amphoteric -**

A.  $SnO_2$

B.  $CaO$

C.  $SiO_2$

D.  $CO_2$

**Answer: C**



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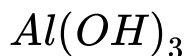
**10.** Which of the following statements is incorrect-

A. pure sodium dissolves in liquid ammonia to give blue solution

B. NaOH reacts with glass to give sodium silicate



C. aluminium reacts with excess Na OH to give



D.  $NaHCO_3$  on heating gives  $Na_2CO_3$

**Answer: C**



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**11.** Name the two types of the structure of silicate in which one oxygen atom of  $[SiO_4]^{4-}$  is shared -

A. linear chain silicate

B. sheet silicate

C. pyrosilicate

D. three-dimensional

**Answer: A**



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**12.** Which of these is least likely to act as a Lewis base

A.  $BF_3$

B.  $PF_3$

C.  $CO$

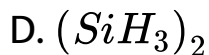
D.  $F^-$

**Answer: B**



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**13.** Which of the following is electron deficient-



**Answer: D**



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**14.** Number of carbon atoms per unit cell of diamond unit cell is -

A. 1

B. 4

C. 8

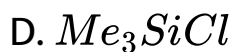
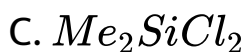
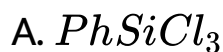
D. 6

**Answer: B**



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15. Which of these is not a monomer for a high molecular mass silicone polymer -

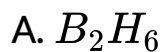


**Answer: D**



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16. Which of the following structure is similar to graphite -



**Answer: A**



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17. The basic structural unit of silicate is -



**Answer: C**



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**18.** The stability of +I oxidation state among Al, Ga, In and Tl increase in the sequence-



B. Al It Ga It In It Tl

C. TlIt InIt Galt Al

D. In It Tl It Ga It Al

**Answer: B**



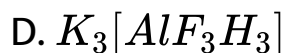
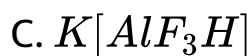
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**19.**  $AlF_3$  is soluble in HF only in presence of KF. It is due to the formation of-

A.  $K_3[AlF_6]$

B.  $AlH_3$





**Answer: A**



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**20.** Boric acid is an acid because its molecule

A. gives up a proton

B. accepts  $\overset{\ominus}{OH}$  from water its molecule

C. combines with proton from water molecule

D. contains replaceable H -ion

Answer: B



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21. It is because of inability of  $n^2$  electrons of the valence shell to participate in bonding that-

A.  $Sn^{2+}$  is oxidising while  $Pb^{4+}$  is reducing

B.  $Sn^{2+}$  and  $Pb^{4+}$  are both oxidising and reducing

C.  $Sn^{4+}$  is reducing while  $Pb^{4+}$  is oxidising

D.  $Sn^{2+}$  is reducing while  $Pb^{4+}$  is oxidising

**Answer: D**



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**22.** Which one of the following elements is unable to form  $MF_6^{3-}$  ion-

A. In

B. Ga

C. B

D. Al

**Answer: C**



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**23.** The correct order of atomic radii in group-13 elements is-

A. B < Ga < Al < In < Tl

B. B < Al < In < Ga < Tl

C. B < Ga < Al < Tl < In

D. B < Al < Ga < In < Tl

**Answer: A**



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24. The wrong statement about fullerene is-

A. it has 5-membered carbon ring

B. it has 6-membered carbon ring

C. it has  $s^2$  hybridisation

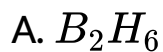
D. it has 5-membered rings more than 6-membered rings

**Answer: D**



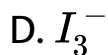
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25. Iodine oxidises sodium borohydride to give-



B. sodium hydride

C. HI



**Answer: A**



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**26.** Which material is used as a neutron moderator-

A. graphite

B. cadmium

C. boron

D. uranium

**Answer: A**



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**27. For silicone which is not correct -**

A. it is a type of silicate

B. it is thermally unstable

C. it is hydrophilic

D. repeating unit is  $R_2SiO$

**Answer: A::B::C**



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**28.** Which of the following is not  $sp^2$  -hybridised

A. graphite

B. graphene

C. fullerene

D. dryice

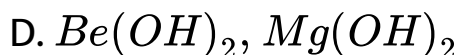
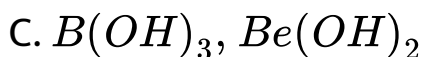
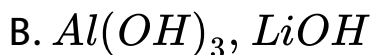
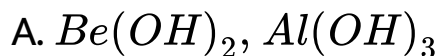
**Answer: D**



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29. The pair of amphoteric hydroxides is -

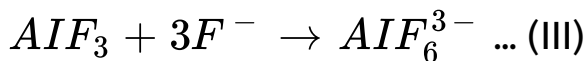
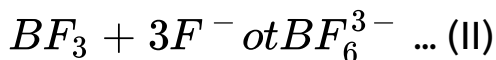
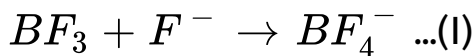


**Answer: A**



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30. Which of the following reactions does not take place-



A. Only (I)

B. Only (II)

C. Only (III)

D. Only (I) and (III)

**Answer: B**



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**31.** Select the correct options from the following

- A. graphene is an atomic layer of graphite
- B. graphene is an atomic layer composed of  $sp^2$  - hybridised carbon.
- C. chemical bonds in graphite are similar in strength to that of diamond.
- D. all of these.

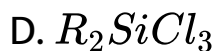
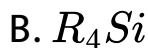
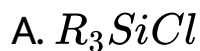
**Answer: D**



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**32.** Among the following substituted silanes, the one which will give rise to cross-linked silicone polymer on

hydrolysis is-



**Answer: C**



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**33.** Hydride of boron occurs as  $B_2H_6$  but  $B_2Cl_6$  does not exist. This is because-

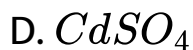
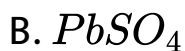
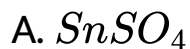
- A.  $p\pi - d\pi$  back bonding is possible in  $B_2H_6$  but not in  $B_2Cl_6$
- B. boron and hydrogen have almost equal values of electronegativity
- C. boron and chlorine have almost equal atomic sizes
- D. small hydrogen atoms can easily fit in between boron atoms but large chlorine atoms do not.

**Answer: A**



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34. Which of the given compounds does not react with dilute , HCl at high temperature-



**Answer: B**



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**Mcq Hotspot Single Correct Type**

1. Boric acid is basically a weak acid, but in presence of which of the following compound, it behaves as a stronger acid-

A. glycerol

B. acetic acid

C. ethanol

D. ethylene

**Answer: A**



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2. The structure of diborane ( $B_2H_6$ ) contains-

- A. four 2c-2e bonds and four 3c-2e bonds
- B. two 2c-2e bonds and two 3c-3e bonds
- C. two 2c-2e bonds and four 3c-2e bonds
- D. four 2c-2e bonds and two 3c-2e bonds

**Answer: D**



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3. Which of the following element is used in temperature thermometry-



A. Al

B. Ga

C. Hg

D. In

**Answer: B**



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**4. An important ingredient of pyrex glass is-**

A. Zn

B. Pb

C. B

D. Fe

**Answer: C**



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5. Which of the following is the purest allotrope of carbon-

A. Diamond

B. Fullerene

C. Graphite

D. Charcoal

**Answer: B**



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6. Number of isomers possible for disubstituted borazine,  $B_3N_3H_4X_2$  is -

A. 3

B. 4

C. 5

D. 6

**Answer: B**



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7. Pentaborane-9 ( $B_5H_9$ ) is an example of-

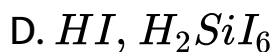
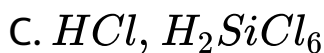
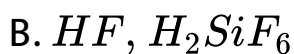
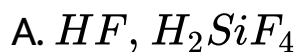
- A. nido-borane
- B. arachno-borane
- C. closo-borane
- D. pseudo-borane

**Answer: A**



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8. Si when reacts with A forms B . A & B respectively are -



**Answer: B**



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9. Boric acid is a-

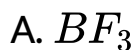
- A. monobasic and weak Lewis acid
- B. monobasic and weak Bronsted acid
- C. monobasic and strong Lewis acid
- D. tribasic and weak Bronsted acid

**Answer: A**



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**10.** Which of the following does not exist in free state-





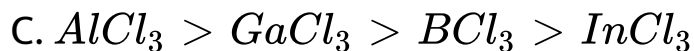
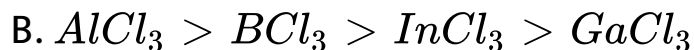
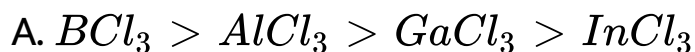
**Answer: D**

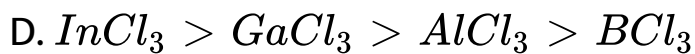


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**11. Correct order of decreasing Lewis acid character is**

-



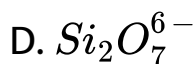
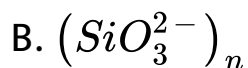
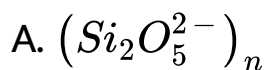


**Answer: A**



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**12.** Which of the following is present in the chain structure of silicate-





Answer: B



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13. A metal, M forms chlorides in +2 and +4 oxidation states. Which of the following statements about these chlorides is correct-

A.  $MCl_2$  is more volatile than  $MCl_4$

B.  $MCl_2$  is more ionic than  $MCl_4$

C.  $MCl_2$  is more soluble in anhy. ethanol than  $MCl_4$

D.  $MCl_2$  is more easily hydrolysed than  $MCl_4$

**Answer: B**



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**14.** The number of O-atoms that are shared per  $SiO_4$  tetrahedra in silicate anion of beryl is-

A. 4

B. 3

C. 2

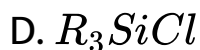
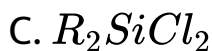
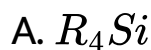
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**Answer: C**



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15. Which of the following on hydrolysis produces cross-linked silicone polymer-



**Answer: B**



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16. The antidote of poisoning caused by CO is-

A. carborundum

B. carbogen

C. carbonic acid

D. pure oxygen

**Answer: B**



**Watch Video Solution**

17. Carbon suboxide on reaction with water produces-

A. oxalic acid

B. formic acid

C. lactic acid

D. malonic acid

**Answer: D**



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**18.** Volume of which liquid metal increases on solidification-

A. Ga

B. Al

C. Zn

D. Cu

**Answer: A**



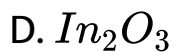
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**19.** Which of the following reacts only with alkali-

A.  $B_2O_3$

B.  $Al_2O_3$

C.  $Ga_2O_3$

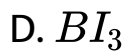
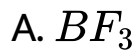


**Answer: A**



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**20.** Which is the strongest Lewis acid-



**Answer: D**



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21. Atomic radius of Ga is slightly less than that of Al.

The reason is-

- A. weaker shielding effect of s -electrons of Ga
- B. stronger shielding effect of s -electrons of Ga
- C. weaker shielding effect of d -electrons of Ga
- D. stronger shielding effect of d -electrons of Ga

**Answer: C**



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22. Carbon does not form complexes, because-

- A. vacant d -orbitals are absent in it
- B. it is not a metal
- C. its atomic radius is small
- D. it is neutral

**Answer: A**



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23. Super critical  $CO_2$  is used as-

- A. dry ice

B. fire extinguisher

C. a solvent for the extraction of organic compounds from natural sources

D. inert solvent in various reactions

**Answer: C**



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**24.** Stability of + 1 oxidation state increases in the sequence-

A.  $\text{Al} < \text{Ga} < \text{In} < \text{Tl}$

B.  $\text{Tl} < \text{In} < \text{Ga} \& \text{It Al}$

C.  $\text{In} < \text{Tl} < \text{Ga} < \text{Al}$

D.  $\text{Ga} < \text{In} < \text{Al} < \text{Tl}$

**Answer: A**



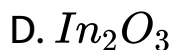
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**25.** Which of the following is acidic in nature-

A.  $\text{B}_2\text{O}_3$

B.  $\text{Al}_2\text{O}_3$

C.  $\text{Ga}_2\text{O}_3$



**Answer: A**



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**26.** Correct order of first ionisation enthalpy for Gr-13 elements is-

A. B gt Algt Ga gt In gt Tl

B. B lt Al lt Ga lt In lt Tl

C. B lt Al gt Ga lt In gt Tl

D. B gt Al lt Ga gt In lt Tl

**Answer: D**



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**27.** Which of the following elements is not likely to be the central atom in  $MF_6^{3-}$  -

A. B

B. Al

C. Ga

D. In

**Answer: A**



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**28.** Tendency of catenation in Gr-14 elements follows the order-

A.  $C > Si > Ge > Sn$

B.  $C > Si > Ge \approx Sn$

C.  $Si > C > Sn > Ge$

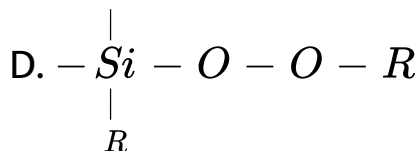
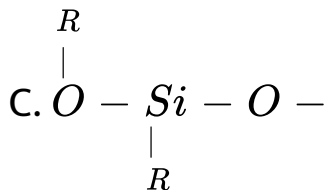
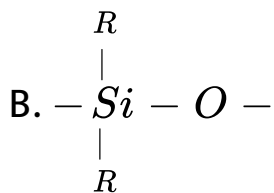
D.  $Ge > Sn > Si > C$

**Answer: B**



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29. The repeating structural unit in silicone is-



Answer: B



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**30.** Which of the following allotropic forms of carbon is isomorphous with crystalline silicon-

A. Graphite

B. Coal

C. Coke

D. Diamond

**Answer: D**



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**31.** The shape and hybridisation of B-atom of  $BH_4^-$  is-



A. pyramidal,  $sp^3$

B. octahedral,  $sp^3d^2$

C. tetrahedral,  $sp^3$

D. None of these

**Answer: C**



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**32.** Germanium is transparent in-

A. visible light

B. infrared region

C. ultraviolet region

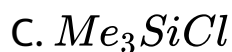
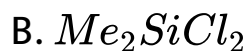
D. infraviolet region

**Answer: B**



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**33.** The chain length of silicone polymer can be controlled by adding-



D.  $Me_4Si$

Answer: C



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34. Higher B-F (in  $BF_3$ ) bond dissociation energy as compared to that of C-F (in  $CF_4$ ) is due to-

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 F in  $CF_4$

C. lower degree of  $p\pi - p\pi$  interaction between B

and F in  $BF_3$  than that between C and F in  $CF_4$

D. smaller size of B -atom as compared to that of C  
-atom

**Answer: B**



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**35.** Reaction of diborane with ammonia initially gives-

A.  $B_2H_6 \cdot NH_3$

B. Borazole

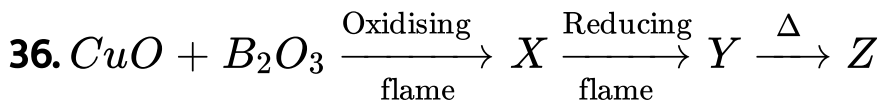
C.  $B_2H_{6.3}NH_3$

D.  $[BH_2(NH_3)_2]^+ [BH_4]^-$

**Answer: D**



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X, Y, Z and their respective colours are-

A.  $X = Cu(BO_2)_2$  (blue),  $Y = Cu_2(BO_2)_2$

(colourless),  $Z = Cu$  (red)

B.  $X = Cu_2(BO_2)_2$  (blue),  $Y = Cu(BO_2)_2$   
(colourless),  $Z = Cu$  (Black)

C.  $X = Cu(BO_2)_2$  (red),  $Y = Cu_2(BO_2)_2$  (blue),  $Z$   
= (red)

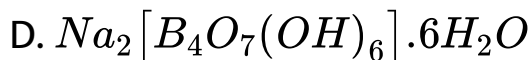
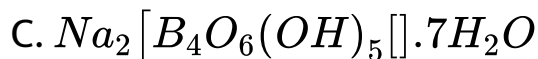
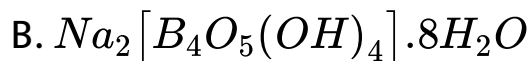
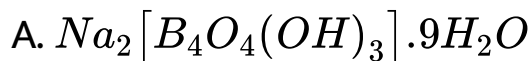
D.  $X = Cu$  (red),  $Y = Cu(BO_2)_2$  (blue),  $Z =$   
 $Cu_2(BO_2)_2$  (colourless)

**Answer: A**



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**37.** Correct formula of borax is-



**Answer: B**



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**38.** Which of the following statements is correct-

A. Sn (II) and Pb (IV) salts are used as oxidants

B. Sn (II) and Pb (IV) salts are used as reductants

C. Sn (II) salts are used as oxidants and Pb (IV)

salts are used as reductants

D. Sn (II) salts are used as reductants and Pb (IV)

salts are used as oxidants

**Answer: D**



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**39.**  $SiCl_4$  gets readily hydrolysed but  $CCl_4$  does not, because-

A. Si can expand its octet but C does not



B. ionisation enthalpy of C is greater than that of Si

C. C forms both double and triple bonds

D. electronegativity of C is greater than that of Si

**Answer: A**



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40.  $PbCl_4$  exists but  $PbBr_4$  and  $PbI_4$  do not, because-

A. chlorine is most electronegative element

B. bromine and iodine are larger in size

C. bromine and iodine cannot oxidise  $Pb^{2+}$  to  $Pb^{4+}$

D. bromine & iodine are stronger oxidants than chlorine

**Answer: C**



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**41.** Which of the following resembles CO in terms of physical properties-

A.  $O_2$

B.  $Cl_2$

C.  $N_2$

D.  $F_2$

**Answer: C**



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**42.** Which of the following statements is incorrect

A. most of the silicones are water repellents

B. silicones get dissociated at high temperature

C. silicones do not get oxidised in air at high temperature

D. silicones are good thermal and electrical insulator

**Answer: B**



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**43.** Wollastonite is a-

A. chain silicate

B. three dimensional silicate

C. sheet silicate

D. cyclic silicate

**Answer: D**



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**44.**



,

The above reaction be made to proceed in forward direction by-

A. addition of diol

B. addition of borax

C. addition of  $KHF_2$

D. addition of  $Na_2HPO_4$

**Answer: A**



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**45.** Which of the following is correct-

A.  $Al(OH)_3$  is more acidic than  $B(OH)_3$

B.  $B(OH)_3$  is basic but  $Al(OH)_3$  is amphoteric in nature

C.  $B(OH)_3$  is acidic but  $Al(OH)_3$  is amphoteric  
in nature

D. Both  $B(OH)_3$  and  $Al(OH)_3$  are amphoteric

**Answer: C**



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**46.** Which of the following is correct-

A.  $B_2H_6 \cdot 2NH_3$  is known as inorganic benzene

B. boric acid is a protonic acid

C. Be exhibits coordination number= 6

D.  $BeCl_2$  and  $AlCl_3$  have bridged chlorine structures in solid phase

**Answer: D**



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47. B cannot form  $B^{3+}$  ion, because-

A. formation of  $B^{3+}$  ion requires a greater amount of energy and this cannot be obtained from lattice energy or hydration energy

B. B is a non-metal



C. B do not possess any vacant d -orbitals

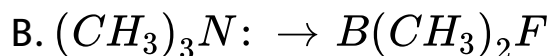
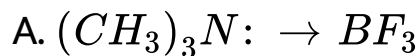
D. B possess highest melting point among its group members

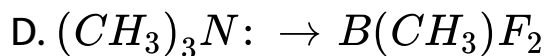
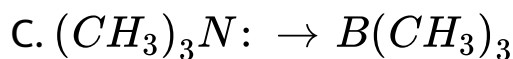
**Answer: A**



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**48.** Which of the following has the minimum heat of dissociation-





**Answer: C**



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**49.** The correct statement with respect to CO is-

A. it combines with  $H_2O$  to give carbonic acid

B. it reacts with haemoglobin

C. it acts only as a reducing agent

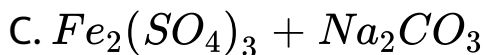
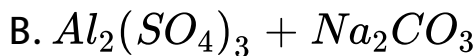
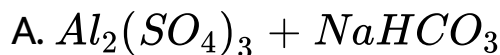
D. it cannot form adducts

**Answer: B**



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**50.** Foamite mixture consists of-

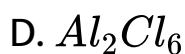
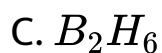
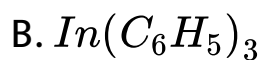
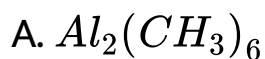


**Answer: A**



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51. In which of the following compounds, 3c-2e bond is present-



**Answer: A::C**



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52. Which of the following oxides do not get reduced by CO -

A.  $\text{ZnO}$

B.  $\text{Fe}_2\text{O}_3$

C.  $\text{CaO}$

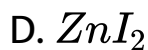
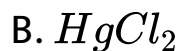
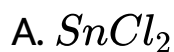
D.  $\text{Na}_2\text{O}$

**Answer: A::B**



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53. Which of the following are not isostructural with  $CO_2$  -



**Answer: B::D**



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54.  $C(OH_4)$  is unstable but  $Si(OH)_4$  is stable.

Possible reasons are-

- A. C - O bond energy is low
- B. C - O bond energy is high
- C. Si - O bond energy is low
- D. Si - O bond energy is high

**Answer: A:D**



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55. Which of the following statements are correct-

- A. fullerenes have dangling bonds
- B. fullerenes are cage-like molecules
- C. graphite is thermodynamically the most stable allotrope of carbon
- D. graphite is the purest allotrope of carbon

**Answer: B::C**



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**56. Boron trifluoride ( $BF_3$ ) is-**

- A. an electron-deficient compound



B. a Lewis acid

C. an ionic compound

D. used as rocket fuel

**Answer: A::B**



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**57.** Compounds which readily undergoes hydrolysis are-

A.  $AlCl_3$

B.  $CCl_4$



**Answer: A::C::D**



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**58.** Which of the following compounds undergo disproportionation in aqueous solution-



D.  $\text{TiCl}$

Answer: B::C



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59.  $\text{Me}_3\text{SiCl}$  is used during polymerisation of organosilicones because-

A. chain length of organosilicone polymers can be controlled by adding  $\text{MeSiCl}$

B.  $\text{Me}_3\text{SiCl}$  blocks the end terminal of silicone polymer

C.  $Me_3SiCl$  improves the quality and yield of the polymer

D.  $Me_3SiCl$  acts as a catalyst during polymerisation

**Answer: A::B**



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**60.** Which of the following acids, on dehydration, produce oxides of carbon-

A. succinic acid

B. propanoic acid

C. malonic acid

D. formic acid

**Answer: C::D**



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**61.** Which of the following are basic in nature-

A.  $B_2O_3$

B.  $Tl_2O$

C.  $In_2O_3$

D.  $Al_2O_3$

**Answer: B::C**



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**62.** The linear shape of  $CO_2$  is due to-

A.  $sp^3$  - hybridisation of C

B.  $sp$ -hybridisation of C

C.  $p\pi - p\pi$  bonding between C and O

D.  $sp^2$  -hybridisation of C

**Answer: B::C**



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**63.** Which metallic salts exhibit same colouration both in oxidising and reducing flame in borax-bead test-

A. Fe

B. Mn

C. Co

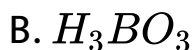
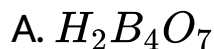
D. Cr

**Answer: C::D**



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64. Which of the following two acidic substances react to give an alkaline solution-



Answer: B::D



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**65.** Which of the following are the ingredients of baking powder-

A. NaOH

B. tartaric acid

C. formic acid

D. potassium hydrogen tartrate

**Answer: B::D**



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**66.** Which of the following are sheet silicates-

A. diopside

B. kaolinite

C. talc

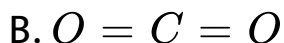
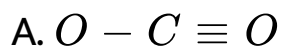
D. beryl

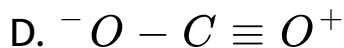
**Answer: B::C**



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**67.** Identify the correct resonating structures-



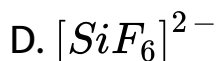


**Answer: B::D**



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**68.** Which of the following species are not known-



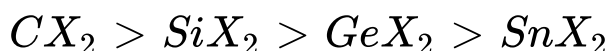
Answer: B::C



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69. Which of the following are correct with respect to Gr-14 elements-

A. stability of dihalides:



B. tendency to form  $p\pi - p\pi$  multiple bond increases down the group

C. tendency of catenation decreases down the group

D. each of them forms oxide of the type  $MO_2$

**Answer: B::C::D**



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### Exercise Very Short Type Questions

1. Which two elements of group-13 form amphoteric hydroxides?



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2. What are the two stable natural isotopes of boron?



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3. Which of the group-13 elements has the most stable + 1 oxidation state?



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4. Which of the Gr-13 elements forms only covalent compounds?



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5. The melting point of boron is very high, even though it is a non-metal-why?



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6. Which acid is obtained when an aqueous solution of borax is acidified ?



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7. Which are called boranes?



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8. What is the correct structural formula of borax?



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9. What happens when orthoboric acid is heated till red hot ?



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10. What is inorganic benzene? Why is it called so?



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**11.** What is the common oxidation state of group-13 elements?



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**12.** Write down the chemical composition of the coloured compound obtained finally in borax bead test?



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**13.** Arrange boron halides in decreasing strength as Lewis acid.



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14. How can boric acid form polymer?

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15. Explain why  $BF_6^{3-}$  does not exist.

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16. What is duralurnin? Mention its uses.

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17. Cone nitric acid can be stored in an aluminium vessel-why?



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18. Borazine is more reactive than benzene-why?



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19. Some metals are extracted from their oxides by reducing with aluminium instead of carbon-why?



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20. Which out of  $CCl_4$  and  $SiCl_4$  reacts with water and why?



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21. What is water gas?



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22. Carbon compounds are relatively less reactive-why?



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23. Diamond is a non-conductor of electricity but a good conductor of heat-why?



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24. What is the value of dipole moment of carbon suboxide and why?



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25. Mention hybridisation state of carbon in  $CO_3^{2-}$  and  $CO_2$ .



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**26.** Write the name of a neutral oxide of carbon.



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**27.** What is dry ice?



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**28.** What is the basic structural unit of silicates?



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29. Write the general formula of silicones.



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30. What is called the mixture containing 95%  $O_2$  and 5%  $CO_2$  ?



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31. What is the purest allotropic form of amorphous carbon?



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**32.** What is the molecular. mass of most available natural fullerene?



**View Text Solution**

**33.** Write names of two greenhouse gases.



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**34.** What is ivory black?



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35. Which out of carbon and silicon forms multiple bond and why?



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36. What is the anion present in pyrosilicates?



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## Fill In The Blanks

1. Boric acid is a \_\_\_\_\_ acid and not a \_\_\_\_\_ acid.



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 View Text Solution

2. Due to \_\_\_\_\_  $Tl^+$  ion is more stable than  $n^{3+}$  ion.



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3. Two types of bonds in diborane are covalent and \_\_\_\_\_ bond.



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4.  $Tl^{3+}$  ion acts as \_\_\_\_\_ agent.





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5.  $AlCl_3$  is a \_\_\_\_\_ Lewis acid than  $BCl_3$ .



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6.  $BCl_3$  is a \_\_\_\_\_ Lewis acid than  $BF_3$ .



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7.  $AlF_3$  is an \_\_\_\_\_ compound, but  $AlCl_3$  is a  
\_\_\_\_\_ compound.



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8. The hydrides of boron are called \_\_\_\_\_.



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9. Inorganic benzene is chemically known as \_\_\_\_\_.



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10. Anhydrous aluminium chloride exists as a  
\_\_\_\_\_.



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11. When  $H_3BO_3$  is strongly heated, \_\_\_\_\_ is finally obtained.



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12. BN is a crystalline solid having structure similar to \_\_\_\_\_.



[View Text Solution](#)

13. On moving down the group, stability of +1 oxidation state of the members of boron family \_\_\_\_\_, while that of +3 oxidation state \_\_\_\_\_.



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14. Except \_\_\_\_\_ all members of carbon family exhibit allotropy.



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15.  $\text{SnCl}_2$  acts as a \_\_\_\_ agent.



[Watch Video Solution](#)

16. Due to \_\_\_\_\_, the +2 oxidation state of group 14 elements gradually becomes stable down the group.



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17. Carbides which on hydrolysis product  $CH_4$  are called \_\_\_\_\_ .



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18. The hydrides of silicon are called \_\_\_\_\_ .



[Watch Video Solution](#)

19. \_\_\_\_\_ is called 'sugar of lead'.



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 Watch Video Solution

20. Formic acid on dehydration produces \_\_\_\_\_ .



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21. Due to absence of \_\_\_\_\_ carbon cannot form complex.



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22. Mica is an example of \_\_\_\_\_ .



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23.  $PbCl_4$  exists but \_\_\_\_\_ does not.



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24. Out of CO and  $CO_2$ , \_\_\_\_\_ is used as a fuel.



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25. Zircon ( $ZrSiO_4$ ) is an example of \_\_\_\_\_.



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26. In silicones, \_\_\_\_\_ units are held by Si-O-Si linkages.



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27. Asbestos ( \_\_\_\_\_ ) is a silicate mineral existing in nature.



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**Short Type Questions**

1. Explain why the compounds of boron are called electron deficient compounds.



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2. Explain why  $BF_3$  forms addition compound with  $NH_3$ .



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3. Out of  $TlCl_3$  and  $TlCl$ , which one is more stable and why?



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4. Out of  $InCl_3$  and  $InCl$ , which one is more stable and why?



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5. Explain why boron does not form  $B_6^{3-}$  ion.



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6.  $BF_3$  is a weaker Lewis acid than  $BCl_3$  -why?



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7. How can you identify a cobalt salt by borax bead test?



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8. Comment on the shapes of  $BF_3$  molecule and  $BF_4^-$  ion.



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9. Explain why aluminium vessel can be used for storing concentrated nitric acid.



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10. Explain why melting and boiling points of boron is much higher.



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11.  $p\pi - p\pi$  back bonding occurs in the case of boron halides but not in the case of aluminium halides-why?



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12.  $AlF_3$  is insoluble in anhydrous HF but dissolves when NaF is added to the mixture-why?



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**13.** Metallic aluminium is frequently used as a reducing agent in the extraction of Cr, Mn, Fe etc.- why?



**Watch Video Solution**

**14.** Is boric acid a protonic acid? Explain.



**Watch Video Solution**

**15.** When phenolphthalein is added to an aqueous solution of borax, the solution becomes pink in colour. However, when glycerol is added to the solution, it becomes colourless again. Explain.



**Watch Video Solution**

**16.** Explain why diamond is hard but graphite is soft.



**Watch Video Solution**

**17.** Graphite is a conductor of electricity but diamond is not-why?





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18. Explain why carbon monoxide is a poisonous gas.



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19.  $SiCl_4$  undergoes easy hydrolysis but  $CCl_4$  does not undergo hydrolysis-why?



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20.  $CO_2$  gets absorbed in alkaline solution but CO does not under ordinary conditions-why?



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21. CO is a superior fuel-why?



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22. How will you get pure nickel using carbon monoxide?



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23. Explain why solid carbon dioxide is called dry ice.



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24. Give example: Two solids combine to give a liquid.



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25. Explain why diamond appears to be very bright and lustrous.



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26.  $(SiH_3)_3N$  is weaker base than  $(CH_3)_3N$ - why ?



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27. CO cannot be dried by concentrated sulphuric acid  
-why?



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28.  $N(CH_3)_3$  is pyramidal but  $N(SiH_3)_3$  is planar-  
explain.



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29. Carbon exhibits catenation property but lead does  
not-why?

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30. Which are called methanides?

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31.  $(CH_3)_3SiOH$  is more acidic than  $(CH_3)_3COH$ , even though carbon is more electronegative than silicon-explain.

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32. Silicon is unable to form structure like graphite-why?



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33. Mention one property of fullerene which differs from that of diamond and graphite.



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34. CO gets readily absorbed in ammoniacal silver nitrate solution but  $CO_2$  does not-explain.



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35. Which out of anhydrous and hydrous  $AlCl_3$  is more soluble in ether and why?



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### Long Type Questions

1.  $[SiF_6]^{2-}$  exists while  $[SiCl_6]^{2-}$  does not. Explain ?



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2.  $Tl(NO_3)_3$  acts as an oxidising agent. Explain ?



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3. Boric acid can be titrated with sodium hydroxide solution using methyl orange as indicator only in the presence of polyhydroxy compounds such as catechol, mannitol, etc . Explain ?



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4. Four types of disubstituted borazine is possible. Explain ?





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5. The aqueous solution of a salt (A) is alkaline. When (A) is heated strongly, it swells up and melts to give a transparent bead. When the bead is heated with a sulphate salt (C), the bead becomes deep blue in colour. A white crystalline compound (D) is obtained when concentrated  $H_2SO_4$  is added to a hot solution of (A). Identify (A), (B), (C) and (D) and give the reactions involved.



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6. What happen when :

Boron tribromide is subjected to react with hydrogen.



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7. What happen when :

Colemanite is heated with sodium carbonate.



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8. What happen when :

Boron trifluoride is treated with  $LiAlH_4$ .



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9. What happen when :

Boric acid is heated with methanol and the vapours formed are ignited.



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10.  $PbO_2$  is a strong oxidising agent than  $SnO_2$ .

Explain ?



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11. Silanes are small in number but alkanes are large in number. Explain ?



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12.  $PbCl_4$  readily dissociates on heating. Explain ?



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13. The first ionisation enthalpy of C is higher than that of B but its second ionisation enthalpy is lower. Explain ?



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14. CO is a superior fuel but  $CO_2$  is not. Explain ?



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15. When dilute HCl is added to a white substance (A), a colourless gas (B) is evolved. When the gas (B) is passed through clear lime water, a white precipitate (C) is obtained. The precipitate dissolves when excess of the gas (B) is passed through the lime water. The residue obtained on heating the solid substance (A) is yellow when hot but white when cold. When the gas (B) is passed through red hot charcoal, another gas

(D) is obtained. The gas (D) gets absorbed in ammoniacal cuprous chloride solution. Identify (A), (B), (C) and (D) and give the relevant reactions.



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**16.** Write with equation what happens when:

Silica is treated with hydrofluoric acid.



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**17.** Write with equation what happens when:

Water is added to calcium carbide.



**Watch Video Solution**



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**18.** Write with equation what happen when:

Formic acid is heated with concentrated sulphuric acid.



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**19.** Write with equation what happen when:

$CO_2$  is heated with liquid ammonia at about  $200^{\circ}C$  under 220 atmospheric pressure.



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**20.** Write formulae of the following substances

Litharge.



**Watch Video Solution**

**21.** Write formulae of the following substances

White lead.



**Watch Video Solution**

**22.** Write formulae of the following substances

Carborundum.



**Watch Video Solution**



**23.** Write formulae of the following substances

Red lead.



**Watch Video Solution**

**24.** Write formulae of the following substances

Sugar of lead.



**Watch Video Solution**

**25.** Write formulae of the following substances

Phosgene.





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26. Write formulae of the following substances

Asbestos.



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## Practive Set 11

1. How will you separate CO and  $CO_2$  from a mixture?



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2. Diamond is effectively an electrical insulator while graphite is a good conductor-why?



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3. What is ammonal? Mention its use.



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4. Although boric acid  $[B(OH)_3]$  contains three -OH groups, yet it is sparingly soluble in water-why?



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5. Aqueous solution of  $BCl_3$  is acidic in nature-why?



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6. Why do nitrogen and carbon monoxide show similarities in their physical properties?



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7. Mention 3 similarities in the nature of B and Si.



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8. If B-Cl bond has a dipole moment, explain why  $BCl_3$  molecule has a zero dipole moment?



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9. Write chemical equation for the preparation of urea.



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10. Mention the use of borax.



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11. When metal X is treated with sodium hydroxide, a white precipitate A is obtained, which is soluble in excess of NaOH to give soluble complex B. Compound A is soluble in dilute HCl to form compound C. The compound A when heated strongly gives, D which is used to extract metal . Identify X, A, B, C and D. Write suitable equations to support their identities.



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12. What happen when :

A mixture of sand and sodium carbonate is melted on heating.



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**13.** What happen when :

At  $200^{\circ}C$  and under high pressure, carbon monoxide is passed through caustic soda solution and the product is heated to  $300^{\circ}C$ .



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**14.** What happen when :

$SiO_2$  is treated with HF.



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**15.** Anhydrous aluminium chloride cannot be prepared by heating hydrated aluminium chloride. Why?



**Watch Video Solution**