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: Al < Ga < In < 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 movingfrom B to TI?

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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 corrundum? 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?

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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}B are used in nuclear reactorswhy?

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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 $Na_2\left[B_4O_5(OH)_4\right].8H_2O$ instead of $Na_2B_4O_7.10H_2O$ - 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?

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

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

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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 $\left[B(OH)_3\right]$ 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.

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

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49. State with equation what happens when diborane is treated with ammonia & then heated at 4 73 K.

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50. From which ore Al can be extracted profitably?

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51. Which Al alloys are used for constructing aircrafts?

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52. What is ammonal? Mention its use.

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

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

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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 $(\Delta_i H_1)$ ofgroup-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?

Watch Video Solution

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

Watch Video Solution

71. Diamond is effectively an electrical insulator while graphite is a good condu c tor-why?

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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?

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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.

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83. Why is CO toxic?

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

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85. Explain how carbon dioxide acts as afire extinguisher.

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

Watch Video Solution

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

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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.

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

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

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94. How will you con.firm 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 axidising agent.

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

Watch Video Solution

98. Why is solid carbon dioxide called dry ice ?

Watch Video Solution

99. Mention one use of super critical CO_2.

Watch Video Solution

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

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101. How can ultrapure silicon be prepar e d 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 .

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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 ?

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

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

Watch Video Solution

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

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

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

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

Watch Video Solution

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.

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

Watch Video Solution

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

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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 ?

Watch Video Solution

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

Watch Video Solution

20. Which compounds are formed on heating boric acid ?

Watch Video Solution

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

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

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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 ?

Watch Video Solution

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

Watch Video Solution

26. Explain why boron connot form B^{3+} ions.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

29. What are boranes ?

Watch Video Solution

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 ?

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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?

Watch Video Solution

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?

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36. Which member of carbon famil y has the lowest melting point?

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

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

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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?

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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?

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46. What is buckminsterfullerene ?

Watch Video Solution

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^- ?

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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?

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

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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.

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

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

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57. What is carborundum ?

Watch Video Solution

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

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59. What are zeoutes ?

Watch Video Solution

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.

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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 aluminuum is amphoteric in nature.

Watch Video Solution

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

Watch Video Solution

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

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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?

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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 ?

Watch Video Solution

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 furthur addition of NaOH solution. Explain the observation using suitable chemical reactions.

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21. Difine 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?

Watch Video Solution

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

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25. What is the chemical composition of borax bead?

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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 $\left[B(OH)_4\right]^-$, whereas aluminium trichloride forms $\left[Al(H_2O)_6\right]^{3+}$ 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.

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3. Graphite is used as lubricant.

Watch Video Solution

4. Silicones are water repelling in nature.

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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.

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

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

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11. 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.

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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.

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

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

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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.

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10. What is dry ice?

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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 Al Cl 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?

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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?

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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 phenolphthaline is added to aqueous solution of borax the colour of the solution turns pink which is again tum colourless if glycerol is added to it.

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

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

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27. Which of the following has a bridge bond-

A. water

B. inorganic benzene

C. phenol

D. diborane

Answer:

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28. $SiCl_4$ undergoes hydrolysis, but 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 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 triflouride 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.

Watch Video Solution

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.

Watch Video Solution

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.

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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.

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

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

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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.

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

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

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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 aircarft body.

Watch Video Solution

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 enthalypy for canbon to sillican ?

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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 NaOH to give soluble complex (B). Compound (A) si 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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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 meterial 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 a 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, $H_3BO_3 \xrightarrow{\Delta}$

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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 AlC_3 and hydrated $AlCl_3$, 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. AIF_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.

Watch Video Solution

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?

Watch Video Solution

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?

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

26. Explain why BF_3 exists whereas BH_3 does not.

Watch Video Solution

Watch Video Solution

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 -

A. $BCl_3 < AlCl_3 < GaCl_3$

B. $GaCl_3 < AlCl_3 < BCl_3$

C. $BCl_3 < GaCl_3 < AlCl_3$

D. $AlCl_3 < BCl_3 < GaCl_3$

Answer: C

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3. In borax, the number of B -0 -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 f bonding in the bridges is-

A. six

B. two

C. eight

D. four

Answer: D

Watch Video Solution

5. The main reason that $SiCl_4$ is easily hydrolysed as compared to CCl_4 is that -

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

B. $SiCl_4$ can form hydrogen bonds

C. $SiCl_4$ is covalent

D. Si can extend its coordination number beyond four

Answer: D

Watch Video Solution

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

A. BF_6^{3-}

B. BH_4^-

C. $B(OH)_4^-$

D. BO_2^-

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 disso l ves in liquid ammonia to give blue solution

B. Na OH r eacts with glass to give sodium silicate

C. aluminium reacts with excess Na OH to give $Al(OH)_3$

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

Watch Video Solution

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

Watch Video Solution

13. Which of the following is electron deficient-

A. $(BH_3)_2$

B. PH_3

C. $(CH_3)_2$

D. $(SiH_3)_2$

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

Watch Video Solution

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

A. $PhSiCl_3$

B. $MeSiCl_3$

C. Me_2SiCl_2

D. Me_3SiCl

Answer: D

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

A. B_2H_6

B. BN

C. B

D. B_4C

Answer: A

Watch Video Solution

17. The basic structural unit of silicate is -

A. SiO_4^{2-}

B. SiO^-

C. SiO_4^{4-}

D. SiO_3^{2-}

Answer: C

Watch Video Solution

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

A. Galt Inlt Al lt Tl

B. Al lt Ga lt In lt Tl

C. Tllt Inlt Galt Al

D. In lt Tl lt Ga lt 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

C. $K[AlF_3H]$

D. $K_3[AlF_3H_3]$

Answer: A

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20. Boric acid is an acid because its molecule

A. gives up a proton

B. accepts $\overset{\Theta}{O}H$ 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

Watch Video Solution

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

Watch Video Solution

Watch Video Solution

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

A. B lt Ga lt Al lt In lt Tl

B. B lt Al lt In lt Ga lt Tl

C. B lt Ga lt Al lt Tl lt In

D. B lt Al lt Ga lt In lt 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-

A. B_2H_6

B. sodium hydride

C. HI

D. I_3^-

Answer: A

Watch Video Solution

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

Watch Video Solution

29. The pair of amphoteric hydroxides is -

A. $Be(OH)_2, Al(OH)_3$

B. $Al(OH)_3, LiOH$

C. $B(OH)_3, Be(OH)_2$

D. $Be(OH)_2, Mg(OH)_2$

Answer: A

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

$BF_3 + F^- \rightarrow BF_4^-$ ...(I)

$BF_3 + 3F^- otBF_6^{3-}$ ... (II)

$AIF_3 + 3F^- \rightarrow AIF_6^{3-}$ ... (III)

A. Only (I)

B. Only(II)

C. Only(III)

D. Only (I) and (Ill)

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-

A. R_3SiCl

B. R_4Si

C. $RSiCl_3$

D. R_2SiCl_3

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-

A. $SnSO_4$

B. $PbSO_4$

C. $BiOCl$

D. $CdSO_4$

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

Watch Video Solution

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 -

A. HF, H_2SiF_4

B. HF, H_2SiF_6

C. HCl, H_2SiCl_6

D. HI, H_2SiI_6

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-

A. BF_3

B. BCl_3

C. BBr_3

D. BH_3

Answer: D

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11. Correct order of decreasing Lewis acid character is

-

A. $BCl_3 > AlCl_3 > GaCl_3 > InCl_3$

B. $AlCl_3 > BCl_3 > InCl_3 > GaCl_3$

C. $AlCl_3 > GaCl_3 > BCl_3 > InCl_3$

D. $InCl_3 > GaCl_3 > AlCl_3 > BCl_3$

Answer: A

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

A. $\left(Si_2O_5^{2-}\right)_n$

B. $\left(SiO_3^{2-}\right)_n$

C. SiO_4^{4-}

D. $Si_2O_7^{6-}$

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

D. 1

Answer: C

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

A. R_4Si

B. $RSiCl_3$

C. R_2SiCl_2

D. R_3SiCl

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

D. In_2O_3

Answer: A

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20. Which is the strongest Lewis acid-

A. BF_3

B. BCl_3

C. BBr_3

D. BI_3

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. Al < Ga < In < Tl

B. Tl < In < Ga& lt Al

C. In < Tl < Ga < Al

D. Ga < In < Al < Tl

Answer: A

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25. Which of the following is acidic in nature-

A. B_2O_3

B. Al_2O_3

C. Ga_2O_3

D. In_2O_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 gt Si gt Ge gt Sn

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

C. Si gt C gt Sn gt Ge

D. Ge gt Sn gt Si gt C

Answer: B

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29. The repeating structural unit in silicone is-

A. SiO_2

B. $-\overset{\overset{R}{|}}{\underset{\underset{R}{|}}{Si}}-O-$

C. $\overset{R}{|}O-\underset{\underset{R}{|}}{Si}-O-$

D. $-\overset{|}{\underset{\underset{R}{|}}{Si}}-O-O-R$

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

View Text Solution

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-

A. $MeSiCl_3$

B. Me_2SiCl_2

C. Me_3SiCl

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 σ -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. $B_2H_6.NH_3$

B. Borazole

C. $B_2H_{6.3}NH_3$

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

Answer: D

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36. $CuO + B_2O_3 \xrightarrow[\text{flame}]{\text{Oxidising}} X \xrightarrow[\text{flame}]{\text{Reducing}} Y \xrightarrow{\Delta} Z$

X, Y, Zand 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-

A. $Na_2\left[B_4O_4(OH)_3\right].9H_2O$

B. $Na_2\left[B_4O_5(OH)_4\right].8H_2O$

C. $Na_2\left[B_4O_6(OH)_5[\right].7H_2O$

D. $Na_2\left[B_4O_7(OH)_6\right].6H_2O$

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 temperatur

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.

$B(OH)_3 + NaOH \Leftrightarrow NaBO_2 + Na\left[B(OH)_4\right] + H_2O$

,

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. $B_2H_6.2NH_3$ 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-

A. $(CH_3)_3N: \rightarrow BF_3$

B. $(CH_3)_3N: \rightarrow B(CH_3)_2F$

C. $(CH_3)_3N: \rightarrow B(CH_3)_3$

D. $(CH_3)_3N: \rightarrow B(CH_3)F_2$

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-

A. $Al_2(SO_4)_3 + NaHCO_3$

B. $Al_2(SO_4)_3 + Na_2CO_3$

C. $Fe_2(SO_4)_3 + Na_2CO_3$

D. $CuSO_4 + NaHCO_3$

Answer: A

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

A. $Al_2(CH_3)_6$

B. $In(C_6H_5)_3$

C. B_2H_6

D. Al_2Cl_6

Answer: A::C

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

A. ZnO

B. Fe_2O_3

C. CaO

D. Na_2O

Answer: A::B

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

A. $SnCl_2$

B. $HgCl_2$

C. SCl_2

D. ZnI_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

C. $SiCl_4$

D. $PbCl_4$

Answer: A::C::D

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

A. $TlCl_3$

B. $GaCl$

C. InCl

D. TlCl

Answer: B::C

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59. Me_3SiCl is used during polymerisation of organoisilicones because-

A. chain length of organosilicone polymers can be controlled by adding $MeSiCl$

B. Me_3SiCl 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-

A. $H_2B_4O_7$

B. H_3BO_3

C. HF

D. KHF_2

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 tartarate

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-

A. $O - C \equiv O$

B. $O = C = O$

C. $O \equiv C - O^{+}$

D. $^{-}O - C \equiv O^{+}$

Answer: B::D

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68. Which of the following species are not known-

A. $[SiCl_6]^{2-}$

B. $[CF_6]^{2-}$

C. $[PbCl_6]^{2-}$

D. $[SiF_6]^{2-}$

Answer: B::C

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

A. stability of dihalides: $CX_2 > SiX_2 > GeX_2 > SnX_2$

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?

Watch Video Solution

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

Watch Video Solution

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 ?

Watch Video Solution

7. Which are called boranes?

Watch Video Solution

8. What is the correct structural formula of borax?

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

Watch Video Solution

14. How can boric acid form polymer?

Watch Video Solution

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

Watch Video Solution

16. What is duralurnin? Mention its uses.

Watch Video Solution

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

Watch Video Solution

18. Borazine is more reactive than benzene-why?

Watch Video Solution

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

View Text Solution

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

View Text Solution

21. What is water gas?

Watch Video Solution

22. Carbon compounds are relatively less reactive- why?

Watch Video Solution

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

View Text Solution

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

Watch Video Solution

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

View Text Solution

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

View Text Solution

27. What is dry ice?

Watch Video Solution

28. What is the basic structural unit of silicates?

View Text Solution

29. Write the general formula of silicones.

View Text Solution

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

View Text Solution

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

View Text Solution

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

View Text Solution

33. Write names of two greenhouse gases.

View Text Solution

34. What is ivory black?

View Text Solution

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

View Text Solution

36. What is the anion present in pyrosilicates?

View Text Solution

Fill In The Blanks

1. Boric acid is a _____ acid and not a _____ acid.

View Text Solution

View Text Solution

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

View Text Solution

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

View Text Solution

4. Tl^{3+} ion acts as _____ agent.

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5. $AlCl_3$ is a _____ Lewis acid than BCl_3.

View Text Solution

6. BCl_3 is a _____ Lewis acid than BF_3.

View Text Solution

7. AlF_3 is an _____ compound, but $AlCl_3$ is a _____ compound.

View Text Solution

8. The hydrides of boron are called _____ .

Watch Video Solution

9. Inorganic benzene is chemically known as _____ .

Watch Video Solution

10. Anhydrous aluminium chloride exists as a _____ .

Watch Video Solution

11. When H_3BO_3 is strongly heated, _____ is finally obtained.

View Text Solution

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 _____ .

View Text Solution

14. Except _____ all members of carbon family exhibit allotropy.

Watch Video Solution

15. $SnCl_2$ acts as a ___ agent.

Watch Video Solution

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

View Text Solution

17. Carbides which on hydrolysis product CH_4 are called _____ .

Watch Video Solution

18. The hydrides of silicon are called _____ .

Watch Video Solution

19. _____ is called 'sugar of lead'.

Watch Video Solution

Watch Video Solution

20. Formic acid on dehydration produces _____ .

Watch Video Solution

21. Due to absence of _____ carbon cannot form complex.

Watch Video Solution

22. Mica is an example of _____ .

Watch Video Solution

23. $PbCl_4$ exists but _____ does not.

Watch Video Solution

24. Out of CO and CO_2, _____ is used as a fuel.

Watch Video Solution

25. Zircon $(ZrSiO_4)$ is an example of _____.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

Short Type Questions

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

Watch Video Solution

2. Explain why BF_3 forms addition compound with NH_3 .

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

View Text Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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?

Watch Video Solution

18. Explain why carbon monoxide is a poisonous gas.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

21. CO is a superior fuel-why?

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

View Text Solution

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

Watch Video Solution

30. Which are called methanides?

View Text Solution

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

View Text Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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 ?

Watch Video Solution

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

Watch Video Solution

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 ?

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

14. CO is a superiorfuelbut CO_2 is not. Explain ?

Watch Video Solution

15. When dilute HCI 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 arnmoniacal cuprous chloride solution . Identify (A), (B), (C) and (D) and give the relevant reactions.

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16. Write with equation what happen when:

Silica is treated with hydrofluoric acid.

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17. Write with equation what happen when:

Water is added to calcium carbide.

Watch Video Solution

Watch Video Solution

18. Write with equation what happen when:

Formic acid is heated with concentrated sulphuric acid.

Watch Video Solution

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.

Watch Video Solution

26. Write formulae of the following substances

Asbestos.

Watch Video Solution

Practive Set 11

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

Watch Video Solution

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

Watch Video Solution

3. What is ammonal? Mention its use.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

9. Write chemical equation for the preparation of urea.

Watch Video Solution

10. Mention the use of borax.

Watch Video Solution

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.

Watch Video Solution

12. What happen when :

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

Watch Video Solution

Watch Video Solution

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 $300^\circ C$.

Watch Video Solution

14. What happen when :

SiO_2 is treated with HF.

Watch Video Solution

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

Watch Video Solution