

CHEMISTRY

NCERT - NCERT CHEMISTRY(ENGLISH)

THE P-BLOCK ELEMENTS

Solved Example

1. (a) Standard electrode potential value E° for Al^{3+} / Al is $-1.66V$ and that of Tl^{3+} / Tl is $+1.26V$. Predict about the formation of

M^{3+} ion in solution and compare the electropositive character of the two metals.

(b) White fumes appear around the bottle of anhydrous aluminium chloride. Give reason.

(c) Boron is unable to form BF_6^{3-} ion. Explain.

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2. White fumes appear around the bottle of anhydrous aluminium chloride. Give reason.

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3. Boron is unable to form BF_6^{3-} ion.

Explain.



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4. Why is boric acid considered as a weak acid

?



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5. a. Select the member s of group 14 that (i) forms the most acidic iodide (ii) is commonly found in $+2$ oxidation state and (iii) used as semiconductor .

(Solved NCERT Problem 11.5)

b. $|\text{SiF}_5|^{2-}$ is known, whereas $|\text{SiCl}_5|^{2-}$ not.

Give possible reasons .

(Solved NCEGT Pronlem 11.6)

c . Diamond is covalent , yet covalent , yet it has high melting point . Why ?

(Solved NCEGT Pronlem 11.7) .



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6. SiF_6^{2-} exist but not CF_6^{2-} explain why ?



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7. Diamond is covalent, yet it has high melting point. Why ?



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8. What are silicones ?



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Exercise

1. Discuss the pattern of variation in the oxidation states of (a) $B \rightarrow TI$ and (b) $C \rightarrow Pb$.



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



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



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4. Consider the compounds, BCl_3 and CCl_4

.How will they behave with water? Justify.



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5. Is boric acid a protic acid? Explain.



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6. Explain what happens when boric acid is heated.



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7. Describe the shapes of BF_3 and BH_4^\ominus .

Assign the hybridisation of boron in these species.



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8. Write reaction of justify amphoteric nature of aluminium.



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



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10. Write the resonance structure of CO_3^{2-} and HCO_3^\ominus .



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11. What is the state of hybridisation of carbon in (a) CO_3^{2-} , (b) diamond and (c) graphite?



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



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13. Rationalise the given statements and give chemical reactions.

a. Lead(II) chloride does not react with Cl_2 to give $PbCl_4$.

b. Lead(IV) chloride is highly unstable towards heat.

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



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



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



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16. AlF_3 is insoluble in anhydrous HF but dissolves on addition of NaF . AlF_3 precipitates out of the resulting solution when gaseous BF_3 is bubbled through. Give reasons.



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



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18. How is excessive content of CO_2 responsible for global warming?



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19. Explain structures of diborane and boric acid.



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20. What happens when

(a) Borax is heated strongly,

(b) Boric acid is added to water,

(c) Aluminium is treated with dilute NaOH,

(d) BF_3 is reacted with ammonia ?



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21. Explain the following reactions

(a) Silicon is heated with methyl chloride at

high temperature in the presence of copper,

(b) Silicon dioxide is treated with hydrogen fluoride,

(c) CO is heated with ZnO,

(d) Hydrated alumina is treated with aqueous NaOH solution.



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22. Give reasons :

(i) Conc. HNO_3 can be transported in aluminium container.

(ii) A mixture of dilute NaOH and aluminium

pieces is used to open drain.

(iii) Graphite is used as lubricant.

(iv) Diamond is used as an abrasive.

(v) Aluminium alloys are used to make aircraft body.

(vi) Aluminium utensils should not be kept in water overnight.

(vii) Aluminium wire is used to make transmission cables.



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23. Explain why is there a phenomenal decrease in ionisation enthalpy from carbon to silicon?



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



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25. What are allotropes? Sketch the structure of two allotropes of carbon namely diamond and graphite. What is the impact of structure on physical properties of two allotropes?



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26. a. 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 .

b. Write suitable chemical reaction to show their nature.



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27. In some of the reactions, thallium resembles aluminium whereas in others it resembles with group 1 metals. Support this statement by giving some evidence.



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28. 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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29. What do you understand by (a) inert pair effect (b) allotropy and (c) catenation?



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30. A certain salt (X) gives the following tests :

(a) Its aqueous solution is alkaline to litmus.

(b) On strong heating, it swells up to give a glassy material (Y).

(c) When conc. H_2SO_4 is added to a hot concentrated solution of (X), white crystal of

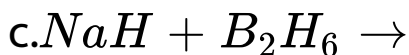
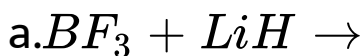
a weak acid (Z) separates out.

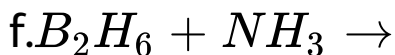
Identify (X), (Y) and (Z) and write down the chemical equations for reaction at steps a , b and c .



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31. Write balanced equations for:





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



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33. Oxides formed by *p*-block elements may be

(*i*) basic

(*ii*) acidic

(*iii*) amphoteric

(*iv*) neutral



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34. Boric acid is polymeric due to



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35. The type of hybridisation of boron in diborane is

(a) sp , (b) sp^2 , (c) sp^3 , (d) dsp^2



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36. Thermodynamically the most stable form of carbon is

(a) diamond , (b) graphite

(c) fullerenes , (d) coal



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37. Elements of group 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



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





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