1. Aqueous solution of orthoboric acid can be titrated against NaOH using Phenolphthalein as indicator only in presence of
(A) Trans–glycerol  (B) Catechol  (C) Cis–glycerol  (D) Both 2 & 3.

2. \[ \text{Mg}_2\text{B}_2\text{O}_4 \xrightarrow{\text{aq} \text{HCl}} \text{X} + \text{MgCl}_2 \]
\[ \text{[X]} + \text{H}_2\text{O} \xrightarrow{\text{aq} \text{HCl}} \text{Y} + \text{H}_2 \uparrow \]
For X and Y the incorrect choice is
(A) X = BCl\(_3\), Y = H\(_3\)BO\(_3\)  (B) X \rightarrow B_2H_6 ; Y \rightarrow H_3BO_3
(C) X with air and Y on strong heating (Red heat) gives same compound.
(D) In ‘Y’, B completes its octet by removing OH\(^–\) from H\(_2\)O molecule.

3. \(\text{XeF}_4 + \text{O}_2\text{F}_2 \rightarrow \text{X} + \text{O}_2\) (Unbalanced equation)
The correct statement(s) for ‘X’.
(A) Partial hydrolysis of ‘X’ gives XeOF\(_4\) as main product  (B) ‘X can act as fluoride acceptor
(C) X reacts with SiO\(_2\) and form XeOF\(_4\) and SiF\(_4\)  (D) X reacts with XeO\(_3\) to form XeOF\(_4\)

4. The correct statements are
(A) XeF\(_2\), and XeF\(_6\) are readily hydrolysed
(B) The solubility of inert gases decreases with increase in atomic weight.
(C) XeO\(_3\) is colourless explosive solid and has pyramidal shape.
(D) Xe, Kr and Ne all form clathrate compound

5. \(\text{Ca}_2\text{B}_6\text{O}_{11} + \text{Na}_2\text{CO}_3 \xrightarrow{\text{D}} \text{X} + \text{CaCO}_3 + \text{NaBO}_2\) (unbalanced equation) correct choice for ‘X’ is/are
(A) Anion of crystalline ‘X’ has one ‘B’ sp\(^3\) hybridized and the other 3 ‘B’ atom sp\(^2\) hybridized
(B) X with NaOH(aq) gives a compound which on reaction with H\(_2\)O\(_2\) in alkaline medium yields a compound used as brightner in soaps.
(C) Hydrolysis of ‘X’ with H\(_2\)O\(_2\) or H\(_2\)SO\(_4\) yields a compound which on reaction with HF gives fluoro boric acid.
(D) ‘X’ on heating with chromium salts in oxidizing flames gives green coloured bead.

6. Match the following

<table>
<thead>
<tr>
<th>Compound</th>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) (\text{B}_2\text{H}_6)</td>
<td>(p) Gas</td>
</tr>
<tr>
<td>(B) (\text{BF}_3)</td>
<td>(q) Sp(^2)</td>
</tr>
<tr>
<td>(C) (\text{BN})</td>
<td>(r) Three centred two electron bonds</td>
</tr>
<tr>
<td>(D) (\text{B}_3\text{N}_3\text{H}_6)</td>
<td>(s) Graphite structure</td>
</tr>
</tbody>
</table>

7. The dissolution of Al(OH)\(_3\) by a solution of NaOH results in the formation of
(A) \[\text{Al} (\text{H}_2\text{O})_4 (\text{OH})_2 \]  (B) \[\text{Al} (\text{H}_2\text{O})_3 (\text{OH})_3 \]  (C) \[\text{Al} (\text{H}_2\text{O})_2 (\text{OH})_4 \]  (D) \[\text{Al} (\text{H}_2\text{O})_6 (\text{OH})_3 \]

8. Which is incorrect regarding AlCl\(_3\) ?
(A) It undergoes sublimation on heating  (B) Hydrated AlCl\(_3\) is Lewis acid
(C) Its molecular weight in vapour state is 133.5  (D) It forms white precipitate with excess of NH\(_4\)OH

9. The geometry of per Xenate XeO\(_{5}^–\) ion is
(A) Tetrahedral  (B) Octahedral  (C) Pyramidal  (D) Pentagonal bipyramidal
10. C and Si belong to IV group or gp. 14. The maximum co-ordination number of carbon in commonly occurring compounds is 4, whereas that of silicon is 6. This is due to:
(A) Large size of silicon  
(B) Availability of vacant d–orbitals in silicon  
(C) More electropositive nature of silicon  
(D) Silicon being vulnerable to attack by nucleophilic reagents

11. Which halide is least stable and has doubtful existence:
(A) Cl₄  
(B) GeI₄  
(C) SnI₄  
(D) PbI₄

12. R₂SiCl on hydrolysis followed by heating forms:
(A) R₂SiOH  
(B) R₂Si = O – SiR₃  
(C) R₂Si = O  
(D) None

13. The charge on the structural formula of the 3D silicate is
(A) zero  
(B) -2  
(C) -6  
(D) -4

14. Which of the following compound/s do not exist as individual molecules?
I. SiC  
II. SiO₂  
III. CO₂  
IV. C₃O₂  
(A) only I  
(B) only I and II  
(C) only II and IV  
(D) only I, II and III

15. SiCl₄ $\xrightarrow{\text{H₂O}}$ X + Y  
SiF₄ $\xrightarrow{\text{H₂O}}$ Y + Z  
‘Y’ on strong heating give ‘SiO₂’. Then correct statement/s regarding ‘Z’ is/are
(A) ‘Si’ utilizes sp³d² hybrid orbitals  
(B) Coordination number of ‘Si’ is 6.  
(C) ‘Z’ is also obtained when SiO₂ dissolves in HF.  
(D) Ionic, Covalent & dative bonds are present in Z

16. On adding ammonium hydroxide solution to Al₂(SO₄)₃ aq.:
(A) A precipitate is formed which does not dissolve in excess of ammonium hydroxide  
(B) A precipitate is formed which dissolves in excess of ammonia solution  
(C) No precipitate is formed  
(D) None

17. Carbon cannot be used in the reduction of Al₂O₃ because:
(A) It is expensive  
(B) The enthalpy of formation of CO₂ is more than that of Al₂O₃  
(C) Pure carbon is not easily available  
(D) The enthalpy of formation of Al₂O₃ is too high

18. Which of the following solution is/are alkaline
(I) Ca₂B₂O₇/H₂O  
(II) NaH/NH₃  
(III) Alum/H₂O  
(IV) Na₂SiO₃/H₂O  
(A) II and III  
(B) III and IV  
(C) II and IV  
(D) I, II, and IV

19. Which of the following statements is incorrect?
(A) The bond energy of B–X is more in BX₃ than in BX₃ Pyridine  
(B) When BF₃ is added to Na₃AlF₆, NaBF₄ is formed  
(C) All alkaline earths form peroxides on heating in excess of oxygen.  
(D) Magnesium cannot be extracted by the electrolysis of fused Mg(OH)₂

20. Which of the following method will not give boron?
(A) B₂O₃ + Mg $\rightarrow$  
(B) BCl₃ + H₂ $\xrightarrow{\text{Electric discharge}}$  
(C) Electrolytic reduction of KBF₄  
(D) BX₃ + NaH $\rightarrow$

21. Alumina dissolves in aqueous NaOH with the formation of:
(A) Sodium aluminate (Na₃AlO₃)  
(B) Sodium metaluminate (NaAlO₂)  
(C) Aluminium hydroxide  
(D) Alumina
22. Match the following

<table>
<thead>
<tr>
<th>Reaction</th>
<th>One of the product formed</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) $\text{B}_2\text{O}_3 + 6\text{NH}_4\text{BF}_4 \rightarrow$</td>
<td>(p) $\text{NH}_3$</td>
</tr>
<tr>
<td>(B) $\text{B}_3\text{N}_3\text{H}_6 + \text{H}_2\text{O}$</td>
<td>(q) $\text{BF}_3$</td>
</tr>
<tr>
<td>(C) $\text{AlN} + \text{H}_2\text{O}$</td>
<td>(r) $\text{H}_2$</td>
</tr>
<tr>
<td>(D) $\text{H}_3\text{BO}_3 + \text{HF}$</td>
<td>(s) Gaseous product undergoes $\text{sp}^3$</td>
</tr>
</tbody>
</table>

ANSWERS