

**CHEMISTRY****The p-Block Elements  
(Group 15, 16, 17 and 18)**

No. of Questions

**30**

Maximum Marks

**120**

Time

**1 Hour***Speed***TEST****50**

Chapter-wise

**GENERAL INSTRUCTIONS**

- This test contains 30 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.
- You have to evaluate your Response Grids yourself with the help of solutions provided at the end of this book.
- Each correct answer will get you 4 marks and 1 mark shall be deducted for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

1. The oxyacid of phosphorous in which phosphorous has the lowest oxidation state is
  - (a) hypophosphorous acid
  - (b) orthophosphoric acid
  - (c) pyrophosphoric acid
  - (d) metaphosphoric acid
2. The decreasing values of bond angles from  $\text{NH}_3$  ( $106^\circ$ ) to  $\text{SbH}_3$  ( $101^\circ$ ) down group-15 of the periodic table is due to
  - (a) decreasing lp-bp repulsion
  - (b) decreasing electronegativity
  - (c) increasing bp-bp repulsion
  - (d) increasing p-orbital character in  $\text{sp}^3$
3. The deep blue colour produced on adding excess of ammonia to copper sulphate is due to presence of
  - (a)  $\text{Cu}^{2+}$
  - (b)  $\text{Cu}(\text{NH}_3)_4^{2+}$
  - (c)  $\text{Cu}(\text{NH}_3)_6^{2+}$
  - (d)  $\text{Cu}(\text{NH}_3)_2^{2+}$
4. In a cyclotrimetaphosphoric acid molecule, how many single and double bonds are present?
  - (a) 3 double bonds; 9 single bonds
  - (b) 6 double bonds; 6 single bonds
  - (c) 3 double bonds; 12 single bonds
  - (d) Zero double bonds; 12 single bonds

**RESPONSE GRID**

1. (a)(b)(c)(d) 2. (a)(b)(c)(d) 3. (a)(b)(c)(d) 4. (a)(b)(c)(d)

5. In nitroprusside ion, the iron and NO exist as  $\text{Fe}^{++}$  and  $\text{NO}^+$  rather than  $\text{Fe}^{+++}$  and NO. These forms can be differentiated by
- estimating the concentration of iron
  - measuring the concentration of  $\text{CN}^-$
  - measuring the solid state magnetic moment
  - thermally decomposing the compound
6. The brown ring test for  $\text{NO}_2^-$  and  $\text{NO}_3^-$  is due to the formation of complex ion with a formula
- $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$
  - $[\text{Fe}(\text{NO})(\text{CN})_5]^{2+}$
  - $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]^{2+}$
  - $[\text{Fe}(\text{H}_2\text{O})(\text{NO})_5]^{2+}$
7. Which compound is used in photography?
- $\text{Na}_2\text{SO}_5$
  - $\text{Na}_2\text{S}_2\text{O}_8$
  - $\text{Na}_2\text{S}_2\text{O}_6$
  - $\text{Na}_2\text{S}_2\text{O}_3$
8. Concentrated hydrochloric acid when kept in open air sometimes produces a cloud of white fumes. The explanation for it is that
- oxygen in air reacts with the emitted HCl gas to form a cloud of chlorine gas
  - strong affinity of HCl gas for moisture in air results in forming of droplets of liquid solution which appears like a cloudy smoke.
  - due to strong affinity for water, concentrated hydrochloric acid pulls moisture of air towards itself. This moisture forms droplets of water and hence the cloud.
  - concentrated hydrochloric acid emits strongly smelling HCl gas all the time.
9. The hybridization in  $\text{ICl}_7$  is
- $sp^3d^3$
  - $d^2sp^3$
  - $sp^3d$
  - $sp^3$
10. The compound of sulphur that can be used as refrigerant is
- $\text{SO}_2$
  - $\text{SO}_3$
  - $\text{S}_2\text{Cl}_2$
  - $\text{H}_2\text{SO}_4$
11. Which of the following is a saline oxide ?
- $\text{Na}_2\text{O}_2$
  - $\text{BaO}_2$
  - $\text{Na}_2\text{O}$
  - $\text{Fe}_2\text{O}_3$
12. Which one of the following substances has the highest proton affinity ?
- $\text{H}_2\text{S}$
  - $\text{NH}_3$
  - $\text{PH}_3$
  - $\text{H}_2\text{O}$
13. Which one of the following statement regarding helium is **incorrect** ?
- It is used to produce and sustain powerful superconducting magnets
  - It is used as a cryogenic agent for carrying out experiments at low temperatures
  - It is used to fill gas balloons instead of hydrogen because it is lighter and non-inflammable
  - It is used in gas-cooled nuclear reactors
14. Caro's acid is
- $\text{H}_2\text{SO}_3$
  - $\text{H}_3\text{S}_2\text{O}_5$
  - $\text{H}_2\text{SO}_5$
  - $\text{H}_2\text{S}_2\text{O}_8$

**RESPONSE  
GRID**

5. (a)(b)(c)(d) 6. (a)(b)(c)(d) 7. (a)(b)(c)(d) 8. (a)(b)(c)(d) 9. (a)(b)(c)(d)  
10. (a)(b)(c)(d) 11. (a)(b)(c)(d) 12. (a)(b)(c)(d) 13. (a)(b)(c)(d) 14. (a)(b)(c)(d)

15. The acid which forms two series of salts is  
 (a)  $\text{H}_3\text{PO}_4$  (b)  $\text{H}_3\text{PO}_3$   
 (c)  $\text{H}_3\text{BO}_3$  (d)  $\text{H}_3\text{PO}_2^-$
16. Which of the following species is not a pseudo halide  
 (a)  $\text{CNO}^-$  (b)  $\text{RCOO}^-$   
 (c)  $\text{OCN}^-$  (d)  $\text{NNN}^-$
17. Gaseous  $\text{HCl}$  is a poor conductor of electricity while its aqueous solution is a good conductor this is because  
 (a)  $\text{H}_2\text{O}$  is a good conductor of electricity  
 (b) a gas cannot conduct electricity but a liquid can  
 (c)  $\text{HCl}$  gas does not obey Ohm's law, whereas the solution does  
 (d)  $\text{HCl}$  ionises in aqueous solution
18. The number of hydrogen atom(s) attached to phosphorus atom in hypophosphorous acid is  
 (a) three (b) one  
 (c) two (d) zero
19. What products are expected from the disproportionation reaction of hypochlorous acid?  
 (a)  $\text{HCl}$  and  $\text{Cl}_2\text{O}$   
 (b)  $\text{HCl}$  and  $\text{HClO}_3$   
 (c)  $\text{HClO}_3$  and  $\text{Cl}_2\text{O}$   
 (d)  $\text{HClO}_2$  and  $\text{HClO}_4$
20. Shape of  $\text{XeOF}_4$  is  
 (a) octahedral  
 (b) square pyramidal  
 (c) pyramidal  
 (d) T-shaped
21. Yellow ammonium sulphide is  
 (a)  $(\text{NH}_4)_2\text{S}_8$   
 (b)  $(\text{NH}_4)_2\text{S}$   
 (c)  $(\text{NH}_4)_2\text{S}_x$   
 (d)  $(\text{NH}_4)_2\text{S}_4$
22. The correct order of increasing bond angles in the following species are :  
 (a)  $\text{Cl}_2\text{O} < \text{ClO}_2 < \text{ClO}_2^-$   
 (b)  $\text{ClO}_2 < \text{Cl}_2\text{O} < \text{ClO}_2^-$   
 (c)  $\text{Cl}_2\text{O} < \text{ClO}_2^- < \text{ClO}_2$   
 (d)  $\text{ClO}_2^- < \text{Cl}_2\text{O} < \text{ClO}_2$
23. Which one of the following reactions of xenon compounds is not feasible?  
 (a)  $3\text{XeF}_4 + 6\text{H}_2\text{O} \longrightarrow 2\text{Xe} + \text{XeO}_3 + 12\text{HF} + 1.5\text{O}_2$   
 (b)  $2\text{XeF}_2 + 2\text{H}_2\text{O} \longrightarrow 2\text{Xe} + 4\text{HF} + \text{O}_2$   
 (c)  $\text{XeF}_6 + \text{RbF} \longrightarrow \text{Rb}[\text{XeF}_7]$   
 (d)  $\text{XeO}_3 + 6\text{HF} \longrightarrow \text{XeF}_6 + 3\text{H}_2\text{O}$
24. Trigonal bipyramidal geometry is shown by :  
 (a)  $\text{XeO}_3\text{F}_2$   
 (b)  $\text{XeO}_3\text{F}_2$   
 (c)  $\text{FXeOSO}_2\text{F}$   
 (d)  $[\text{XeF}_8]^{2-}$

**RESPONSE  
GRID**

15. (a) (b) (c) (d)  
20. (a) (b) (c) (d)

16. (a) (b) (c) (d)  
21. (a) (b) (c) (d)

17. (a) (b) (c) (d)  
22. (a) (b) (c) (d)

18. (a) (b) (c) (d)  
23. (a) (b) (c) (d)

19. (a) (b) (c) (d)  
24. (a) (b) (c) (d)

25. Which of the following is used to produce and sustain powerful superconducting magnets to form an essential part of NMR spectrometer ?  
 (a) Ar (b) Ne  
 (c) Rn (d) He
26. Oxidation of thiosulphate by iodine gives  
 (a) tetrathionate ion (b) sulphide ion  
 (c) sulphate ion (d) sulphite ion
27. The crystals of ferrous sulphate on heating give :  
 (a)  $\text{FeO} + \text{SO}_2 + \text{H}_2\text{O}$   
 (b)  $\text{FeO} + \text{SO}_3 + \text{H}_2\text{SO}_4 + \text{H}_2\text{O}$   
 (c)  $\text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{H}_2\text{SO}_4 + \text{H}_2\text{O}$   
 (d)  $\text{Fe}_2\text{O}_3 + \text{H}_2\text{SO}_4 + \text{H}_2\text{O}$
28. Which one of the following orders correctly represents the increasing acid strengths of the given acids?  
 (a)  $\text{HOClO} < \text{HOCl} < \text{HOClO}_3 < \text{HOClO}_2$   
 (b)  $\text{HOClO}_2 < \text{HOClO}_3 < \text{HOClO} < \text{HOCl}$   
 (c)  $\text{HOClO}_3 < \text{HOClO}_2 < \text{HOClO} < \text{HOCl}$   
 (d)  $\text{HOCl} < \text{HOClO} < \text{HOClO}_2 < \text{HOClO}_3$
29. Shapes of certain interhalogen compounds are stated below. Which one of them is not correctly stated?  
 (a)  $\text{IF}_7$  : pentagonal bipyramid  
 (b)  $\text{BrF}_5$  : trigonal bipyramid  
 (c)  $\text{BrF}_3$  : planar T-shaped  
 (d)  $\text{ICl}_3$  : planar dimeric
30. The nitrogen oxides that contain(s) N–N bond(s) is /are  
 (i)  $\text{N}_2\text{O}$  (ii)  $\text{N}_2\text{O}_3$   
 (iii)  $\text{N}_2\text{O}_4$  (iv)  $\text{N}_2\text{O}_5$   
 (a) (i), (ii) (b) (ii), (iii), (iv)  
 (c) (iii), (iv) (d) (i), (ii) and (iii)

**RESPONSE  
GRID**

25. (a) (b) (c) (d)  
30. (a) (b) (c) (d)

26. (a) (b) (c) (d)

27. (a) (b) (c) (d)

28. (a) (b) (c) (d)

29. (a) (b) (c) (d)

**CHEMISTRY CHAPTERWISE SPEED TEST-50**

Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	35	Qualifying Score	51
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

# HINTS & SOLUTIONS (CHEMISTRY – Chapter-wise Tests)

## Speed Test-50

- (a) Hypophosphorous acid is  $\text{H}_3\text{PO}_2$  in which O.S. of P is +1
- (b) The bond angle decreases on moving down the group due to decrease in bond pair-bond pair repulsion.

$\text{NH}_3$	$\text{PH}_3$	$\text{AsH}_3$	$\text{SbH}_3$	$\text{BiH}_3$
$107^\circ$	$94^\circ$	$92^\circ$	$91^\circ$	$90^\circ$

This can also be explained by the fact that as the size of central atom increases  $\text{sp}^3$  hybrid orbital becomes more distinct with increasing size of central atom i.e. pure p-orbitals are utilized in M-H bonding.

- (b)  $\text{CuSO}_4 + 4\text{NH}_3 \rightarrow [\text{Cu}(\text{NH}_3)_4]\text{SO}_4$

Blue complex due to  $\text{Cu}(\text{NH}_3)_4^{2+}$

- (a)
- (c) The nitroprusside ion is  $[\text{Fe}(\text{CN})_6\text{NO}]^{2-}$ . The magnetic moment measurements reveal the presence of 4 unpaired electrons in Fe which must be then in  $\text{Fe}^{2+}$  ( $3d^6$ ) and not  $\text{Fe}^{3+}$  ( $3d^5$ )

- (c)  $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]^{2+}$  ion is formed

- (d)

- (a)  $4\text{HCl} + \text{O}_2 \rightarrow 2\text{Cl}_2 + 2\text{H}_2\text{O}$   
air cloud of white fumes

- (a)  $\text{ICl}_7$ . The hybridisation is  $\frac{1}{2}(7 + 7 + 0 - 0) = 7$  ( $\text{sp}^3\text{d}^3$ )

- (a) Due to large enthalpy of vaporisation  $\text{SO}_2$  can be used as refrigerant

- (c) Oxides which are more ionic in nature (salt-like) are known as saline oxides e.g. oxides of alkali metals

- (b) Among the given compounds, the  $\text{NH}_3$  is most basic. Hence has highest proton affinity

- (c) Helium is heavier than hydrogen although it is non-inflammable

- (c) It is  $\text{H}_2\text{SO}_5$ .

- (b)  $\text{HO}-\overset{\text{OH}}{\underset{\text{O}}{\text{P}}}-\text{H}$  it can form two series of salts by replacement of H attached to oxygen

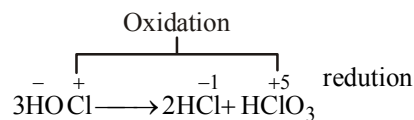
- (b)  $\text{RCOO}^-$  is not pseudo halide.

- (d) In gaseous state the HCl is covalent in nature while in aqueous solution it ionises to give  $\text{H}^+$  and  $\text{Cl}^-$  ions

- (c) Hypophosphorous acid  $\text{H}-\text{O}-\overset{\text{H}}{\underset{\text{H}}{\text{P}}}-\text{O}$

Two H-atoms are attached to P atom.

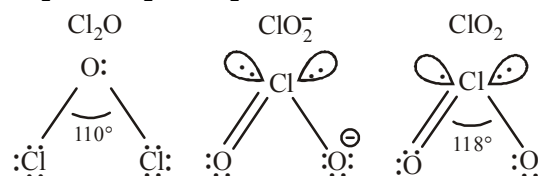
- (b) During disproportionation same compound undergo



- (b)  $\text{XeOF}_4$  is square pyramidal.

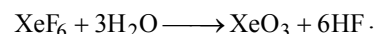
- (c) Yellow ammonium sulphide is  $(\text{NH}_4)_2\text{S}_x$

- (c) The correct order of increasing bond angle is  $\text{Cl}_2\text{O} < \text{ClO}_2^- < \text{ClO}_2$



In  $\text{ClO}_2^-$  there are 2 lone pairs of electrons present on the central chlorine atom. Therefore the bond angle in  $\text{ClO}_2^-$  is less than  $118^\circ$  which is the bond angle in  $\text{ClO}_2$  which has less number of electrons on central chlorine atom.

- (d) The products of the concerned reaction react each other forming back the reactants.

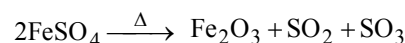


- (b) The hybridization of  $\text{XeO}_3\text{F}_2$  is  $\text{sp}^3\text{d}$  and its structure is trigonal bipyramidal in which oxygen atoms are situated on the plane and the fluoride atoms are on the top and bottom.

- (d)

- (a)  $2\text{S}_2\text{O}_3^{2-} + \text{I}_2 \rightarrow \text{S}_4\text{O}_6^{2-} + 2\text{I}^-$   
Tetrathionate

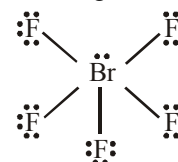
- (c)  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O} \rightarrow \text{FeSO}_4 + 7\text{H}_2\text{O}$



- (d)  $\text{HOCl} < \text{HOClO} < \text{HOClO}_2 < \text{HOClO}_3$   
+1      +3      +5      +7

In case of oxyacids of similar element as the oxidation number of the central atom increases, strength of acid also increases.

- (b) The molecular geometry of  $\text{BrF}_5$  is square pyramidal with asymmetric charge distribution on the central atom.



- (d)  $\text{N} \equiv \text{N} \rightarrow \text{O}$   
(i)

