DPP - Daily Practice Problems

Date : | **Start Time :** | **End Time :**

CHEMISTRY CC21

SYLLABUS : The p-Block Elements (Group 15, 16, 17 and 18)

Max. Marks : 120 **Marking Scheme :** + 4 for correct & (–1) for incorrect **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet 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.

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 NH_3 (106°) to SbH_3 (101°) 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 sp^3

3. The deep blue colour produced on adding excess of ammonia to copper sulphate is due to presence of
(a) Cu^{2+} (b) $Cu(NH_3)_4^{2+}$
(c) $Cu(NH_3)_6^{2+}$ (d) $Cu(NH_3)_2^{2+}$

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. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ

5. In nitroprusside ion, the iron and NO exist as Fe^{++} and NO^{+} rather than Fe^{+++} and NO. These forms can be differentiated by
   (a) estimating the concentration of iron
   (b) measuring the concentration of CN^{-}
   (c) measuring the solid state magnetic moment
   (d) thermally decomposing the compound

6. The brown ring test for NO_2^- and NO_3^- is due to the formation of complex ion with a formula
   (a) $[Fe(H_2O)_6]^{2+}$
   (b) $[Fe(NO)(CN)_5]^{2+}$
   (c) $[Fe(H_2O)_5NO]^{2+}$
   (d) $[Fe(H_2O)(NO)_5]^{2+}$

7. Which compound is used in photography?
   (a) Na_2SO_5
   (b) $Na_2S_2O_8$
   (c) $Na_2S_2O_6$
   (d) $Na_2S_2O_3$

8. Concentrated hydrochloric acid when kept in open air sometimes produces a cloud of white fumes. The explanation for it is that
   (a) oxygen in air reacts with the emitted HCl gas to form a cloud of chlorine gas
   (b) strong affinity of HCl gas for moisture in air results in forming of droplets of liquid solution which appears like a cloudy smoke.
   (c) 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.
   (d) concentrated hydrochloric acid emits strongly smelling HCl gas all the time.

9. The hybridization in ICl_7 is
   (a) sp^3d^3
   (b) d^2sp^3
   (c) sp^3d
   (d) sp^3

10. The compound of sulphur that can be used as refrigerant is
   (a) SO_2
   (b) SO_3
   (c) S_2Cl_2
   (d) H_2SO_4

11. Which of the following is a saline oxide ?
   (a) Na_2O_2 (b) BaO_2
   (c) Na_2O (d) Fe_2O_3

12. Which one of the following substances has the highest proton affinity ?
   (a) H_2S (b) NH_3
   (c) PH_3 (d) H_2O

13. Which one of the following statement regarding helium is **incorrect** ?
   (a) It is used to produce and sustain powerful superconducting magnets
   (b) It is used as a cryogenic agent for carrying out experiments at low temperatures
   (c) It is used to fill gas balloons instead of hydrogen because it is lighter and non-inflammable
   (d) It is used in gas-cooled nuclear reactors

14. Caro's acid is
   (a) H_2SO_3
   (b) $H_3S_2O_5$
   (c) H_2SO_5
   (d) $H_2S_2O_8$

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) H_3PO_4 (b) H_3PO_3

(c) H_3BO_3 (d) $H_3PO_2^-$

16. Which of the following species is not a pseudo halide

(a) CNO^- (b) $RCOO^-$

(c) OCN^- (d) NNN^-

17. Gaseous HCl is a poor conductor of electricity while its aqueous solution is a good conductor this is because

(a) H_2O is a good conductor of electricity

(b) a gas cannot conduct electricity but a liquid can

(c) HCl gas does not obey Ohm's law, whereas the solution does

(d) 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) HCl and Cl_2O

(b) HCl and $HClO_3$

(c) $HClO_3$ and Cl_2O

(d) $HClO_2$ and $HClO_4$

20. Shape of $XeOF_4$ is

(a) octahedral

(b) square pyramidal

(c) pyramidal

(d) T-shaped

21. Yellow ammonium sulphide is

(a) $(NH_4)_2S_8$

(b) $(NH_4)_2S$

(c) $(NH_4)_2S_x$

(d) $(NH_4)_2S_4$

22. The correct order of increasing bond angles in the following species are :

(a) $Cl_2O < ClO_2 < ClO_2^-$

(b) $ClO_2 < Cl_2O < ClO_2^-$

(c) $Cl_2O < ClO_2^- < ClO_2$

(d) $ClO_2^- < Cl_2O < ClO_2$

23. Which one of the following reactions of xenon compounds is not feasible?

(a) $3XeF_4 + 6H_2O \longrightarrow 2Xe + XeO_3 + 12HF + 1.5O_2$

(b) $2XeF_2 + 2H_2O \longrightarrow 2Xe + 4HF + O_2$

(c) $XeF_6 + RbF \longrightarrow Rb[XeF_7]$

(d) $XeO_3 + 6HF \longrightarrow XeF_6 + 3H_2O$

24. Trigonal bipyramidal geometry is shown by :

(a) XeO_3F_2

(b) XeO_3F_2

(c) $FXeOSO_2F$

(d) $[XeF_8]^{2-}$

RESPONSE GRID					
15. ⓐⓑⓒⓓ	**16.** ⓐⓑⓒⓓ	**17.** ⓐⓑⓒⓓ	**18.** ⓐⓑⓒⓓ	**19.** ⓐⓑⓒⓓ
20. ⓐⓑⓒⓓ	**21.** ⓐⓑⓒⓓ	**22.** ⓐⓑⓒⓓ	**23.** ⓐⓑⓒⓓ	**24.** ⓐⓑⓒⓓ

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) $FeO + SO_2 + H_2O$

(b) $FeO + SO_3 + H_2SO_4 + H_2O$

(c) $Fe_2O_3 + SO_2 + H_2SO_4 + H_2O$

(d) $Fe_2O_3 + H_2SO_4 + H_2O$

28. Which one of the following orders correctly represents the increasing acid strengths of the given acids?

(a) $HOClO < HOCl < HOClO_3 < HOClO_2$

(b) $HOClO_2 < HOClO_3 < HOClO < HOCl$

(c) $HOClO_3 < HOClO_2 < HOClO < HOCl$

(d) $HOCl < HOClO < HOClO_2 < HOClO_3$

29. Shapes of certain interhalogen compounds are stated below. Which one of them is not correctly stated?

(a) IF_7 : pentagonal bipyramid

(b) BrF_5 : trigonal bipyramid

(c) BrF_3 : planar T-shaped

(d) ICl_3 : planar dimeric

30. The nitrogen oxides that contain(s) N–N bond(s) is /are

(i) N_2O (ii) N_2O_3

(iii) N_2O_4 (iv) N_2O_5

(a) (i) , (ii) (b) (ii) , (iii) , (iv)

(c) (iii) , (iv) (d) (i), (ii) and (iii)

RESPONSE GRID	**25.** ⓐⓑⓒⓓ **26.** ⓐⓑⓒⓓ **27.** ⓐⓑⓒⓓ **28.** ⓐⓑⓒⓓ **29.** ⓐⓑⓒⓓ **30.** ⓐⓑⓒⓓ

DAILY PRACTICE PROBLEM DPP CHAPTERWISE 21 - CHEMISTRY			
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)			

1. **(a)** Hypophosphorous acid is H_3PO_2 in which O.S. of P is +1

2. **(b)** The bond angle decreases on moving down the group due to decrease in bond pair-bond pair repulsion.

NH_3	PH_3	AsH_3	SbH_3	BiH_3
107°	94°	92°	91°	90°

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

3. **(b)** $CuSO_4 + 4NH_3 \rightarrow [Cu(NH_3)_4]SO_4$

Blue complex due to $Cu(NH_3)_4^{2+}$

4. **(a)**

5. **(c)** The nitroprusside ion is $[Fe(CN)_6NO^+]^{2-}$. The magnetic moment measurements reveal the presence of 4 unpaired electrons in Fe which must be then in Fe^{++} ($3d^6$) and not Fe^{+++}($3d^5$)

6. **(c)** $[Fe(H_2O)_5NO]^{2+}$ ion is formed

7. **(d)**

8. **(a)** $4HCl + O_2 \rightarrow 2Cl_2 + 2H_2O$
air cloud of white fumes

9. **(a)** ICl_7. The hybridisation is $\frac{1}{2}(7+7+0-0) = 7\ (sp^3d^3)$

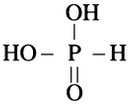
10. **(a)** Due to large enthalpy of vaporisation SO_2 can be used as refrigerant

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

12. **(b)** Among the given compounds, the $\dot{N}H_3$ is most basic. Hence has highest proton affinity

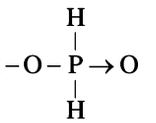
13. **(c)** Helium is heavier than hydrogen although it is non-inflammable

14. **(c)** It is H_2SO_5.

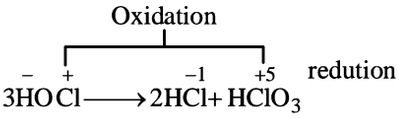
15. **(b)**  it can form two series of salts by replacement of H attached to oxygen

16. **(b)** $RCOO^-$ is not pseudo halide.

17. **(d)** In gaseous state the HCl is covalent in nature while in aqueous solution it ionises to give H^+ and Cl^- ions

18. **(c)** Hypophosphorous acid 
Two H-atoms are attached to P atom.

19. **(b)** During disproportionation same compound undergo simultaneous oxidation and reduction.

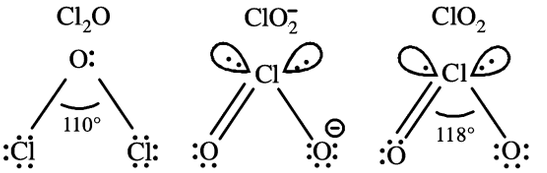


20. **(b)** $XeOF_4$ is square pyramidal.

21. **(c)** Yellow ammonium sulphide is $(NH_4)_2S_x$

22. **(c)** The correct order of increasing bond angle is

$Cl_2O < ClO_2^- < ClO_2$



In ClO_2^- there are 2 lone pairs of electrons present on the central chlorine atom. Therefore the bond angle in ClO_2^- is less than 118° which is the bond angle in ClO_2 which has less number of electrons on central chlorine atom.

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

$XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF$.

24. **(b)** The hybridization of XeO_3F_2 is sp^3d 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.

25. **(d)**

26. **(a)** $2S_2O_3^{-2} + I_2 \rightarrow \underset{\text{Tetrathionate}}{S_4O_6^{-2}} + 2I^-$

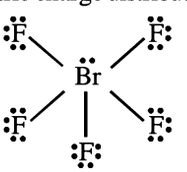
27. **(c)** $FeSO_4.7H_2O \rightarrow FeSO_4 + 7H_2O$

$2FeSO_4 \xrightarrow{\Delta} Fe_2O_3 + SO_2 + SO_3$

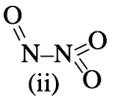
28. **(d)** $\underset{+1}{HOCl} < \underset{+3}{HOClO} < \underset{+5}{HOClO_2} < \underset{+7}{HOClO_3}$

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

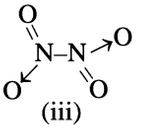
29. **(b)** The molecular geometry of BrF_5 is square pyramidal with asymmetric charge distribution on the central atom.



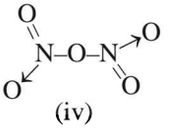
30. **(d)** $N{\equiv}N{\rightarrow}O$ (i)



(ii)



(iii)



(iv)