STELLA MARIS MEDICAL FOUNDATION

CHEMISTRY

p-BLOCK ELEMENTS (GROUP 15 TO 18)

Total Questions: 30 **Total Marks: 120**

1. Strong reducing behavior of H_3PO_2 is due to
   a) high electron gain enthalpy of phosphorus b) high oxidation state of phosphorus
   c) presence of two –OH groups and one P-H bond d) presence of one-OH group and two P-H bonds.

2. The variation of the boiling points of the hydrogen halides is in the order
   HF> HI>HBr> HCl
   What explains the higher boiling point of hydrogen fluoride?
   a) There is strong hydrogen bonding between HF molecules.
   b) The bond energy of HF molecules is greater than in other hydrogen halides.
   c) The effect of nuclear shielding is much reduced in fluorine which polarizes the HF molecule.
   d) The electronegativity of fluorine is much higher than for other elements in the group.

3. Which of the statements given below is incorrect?
   a) O_3 molecule is bent. b) ONF is isoelectronic with O_2N^-
   c) OF_2 is an oxide of fluorine. d) Cl_2O_2 is an anhydride of perchloric acid.

4. The formation of the oxide ion, $O^{2-}_{(g)}$ from oxygen atom requires first an exothermic and then an endothermic step as shown below:
   $O_{(g)} + e^- \rightarrow O^-_{(g)} : \Delta_f H^o = -141 KJmol^{-1}$
   $O_{(g)}^- + e^- \rightarrow O^{2-}_{(g)} : \Delta_f H^o = +780 KJmol^{-1}$
   Thus, process of formation of O^{2-} in gas phase is unfavourable even through O^{2-} is isoelectronic with neon. It is due to the fact that,
   a) O^- ion has comparatively smaller size than oxygen atom
   b) oxygen is more electronegative
   c) addition of electron in oxygen results in larger size of the ion
   d) electron repulsion outweighs the stability gained by achieving noble gas configuration.

5. Nitrogen dioxide and sulphur dioxide have some properties in common. Which property is shown by one of these compounds, but not by the other?
   a) Is soluble in water. b) Is used as a food preservative. c) Forms 'acid-rain'. d) Is a reducing agent.

6. The correct order of increasing bond angles in the following species is
   a) $Cl_2O < ClO_2 < ClO_2^-$ b) $ClO_2 < Cl_2O < ClO_2^-$ c) $Cl_2O < ClO_2^- < ClO_2$ d) $ClO_2^- < Cl_2O < ClO_2$

7. How many bridging oxygen atoms are present in P_4O_{10}?
   a) 6 b) 4 c) 2 d) 5

8. Among the following which is the strongest oxidizing agent?
   a) Br_2 b) I_2 c) Cl_2 d) F_2

9. The angular shape of ozone molecule (O_3) consists of
   a) 1σ and 1π bond b) 2σ and 1π bond c) 1σ and 2π bond d) 2σ and 2π bond

10. 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) $HOCl < HOClO < HOClO_2 < HOClO_3$

11. Acidity of diprotic acids in aqueous solutions increases in the order
    a) $H_2S < H_2Se < H_2Te$ b) $H_2Se < H_2S < H_2Te$ c) $H_2Te < H_2S < H_2Se$ d) $H_2Se < H_2Te < H_2S$

12. Which is the strongest acid in the following?
    a) $HClO_4$ b) H_2SO_3 c) H_2SO_4 d) $HClO_3$

13. Which one of the following molecules contains no π bond?
a) SO_2 b) NO_2 c) CO_2 d) H_2O

14. Which of the following does not give oxygen on heating?
a) $K_2Cr_2O_7$ b) $(NH_4)_2Cr_2O_7$ c) $KClO_3$ d) $Zn(ClO_3)_2$

15. Identify the incorrect statement, regarding the molecule XeO_4:
a) XeO_4 molecule is square planar b) There are four $p\pi - d\pi$ bonds
c) There are four $sp^3 - p, \sigma$ bonds d) XeO_4 molecule is tetrahedral

16. Strongest hydrogen bonding is shown by
a) water b) ammonia c) hydrogen fluoride d) hydrogen sulphide.

17. When chlorine is passed over dry slaked lime at room temperature, the main reaction product is
a) $Ca(ClO_2)_2$ b) $CaCl_2$ c) $CaOCl_2$ d) $Ca(OCl)_2$

18. In the manufacture of bromine from sea water the mother liquor containing bromides is treated with
a) carbon dioxide b) Chlorine c) iodine d) sulphur dioxide.

19. Which would quickly absorb oxygen?
a) Alkaline solution of pyrogallol b) Conc, H_2SO_4 c) Lime water d) alkaline solution of $CusO_4$

20. Oleum is
a) castor oil b) oil of vitriol c) fuming H_2SO_4 d) none of these

21. Pure nitrogen is prepared in the laboratory by heating a mixture of
a) $NH_4OH + NaCl$ b) $NH_4NO_3 + NaCl$ c) $NH_4Cl + NaOH$ d) $NH_4Cl + NaNO_2$

22. The bleaching action of chlorine is due to
a) reduction b) hydrogenation c) chlorination d) oxidation

23. Which of the following statement is not correct for nitrogen?
a) Its electronegativity is very high b) *d*-orbitals are available for bonding
c) It is a typical non-metal d) Its molecular size is small.

24. Which of the following compound does not exist?
a) NCl_5 b) AsF_5 c) $SbCl_5$ d) PF_5

25. Each of the following is true for white and red phosphorus except that they
a) are both soluble in CS_2 b) can be oxidized by heating in air
c) consist of the same kind of atoms d) can be converted into one another.

26. Which one of the following compounds is expected to exhibit paramagnetic behavior?
a) SiF_4 b) SF_4 c) XeF_4 d) BF_3

27. It is because of the inability of ns^2 electrons of the valence shell to participate in bonding that:
a) Sn^{2+} is reducing while Pb^{4+} is oxidizing b) Sn^{2+} is oxidizing while Pb^{4+} is reducing
c) Sn^{2+} and Pb^{2+} are both oxidizing and reducing d) Sn^{4+} is reducing while Pb^{4+} is oxidizing

28. Which one of the following is responsible for depletion of the ozone layer in the upper strata of the atmosphere?
a) Polyhalogens b) Ferrocene c) Fullerenes d) Freons

29. Among K, Ca, Fe and Zn, the element which can form more than one binary compound with chlorine is
a) Fe b) Zn c) K d) Ca

30. Which of the following statement is true?
a) Silicon exhibits 4 coordination number in its compound.
b) Bond energy of F_2 is less than Cl_2
c) Mn (III) oxidation state is more stable than Mn(II) in aqueous state.
d) Elements of 15^{th} gp shows only +3 and +5 oxidation states.

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ANSWER KEY

1	D	11	A	21	D
2	A	12	A	22	D
3	C	13	D	23	B
4	D	14	B	24	A
5	B	15	A	25	A
6	D	16	C	26	B
7	A	17	C	27	A
8	D	18	B	28	D
9	B	19	A	29	A
10	D	20	C	30	B