NARAYANA EDUCATIONAL INSTITUTIONS

GROUP -16
CHEMISTRY

1. The increasing order of acid character of the oxides; CO_2, N_2O_5, SiO_2 and SO_3 follows the sequence

   1) $CO_2 > N_2O_5 > SiO_2 > SO_3$ 2) $SiO_2 < CO_2 < N_2O_5 < SO_3$ 3) $SO_3 < N_2O_5 < CO_2 < SiO_2$

   4) $N_2O_5 < SO_3 < SiO_2 < CO_2$

2. What is the correct relationship between the pH values of isomolar solutions of sodium oxide (pH_1), sodium sulphide (pH_2), sodium selenide (pH_3) and sodium telluride (pH)?

   1) $pH_1 < pH_2 < pH_3 < pH_4$ 2) $pH_1 > pH_2 > pH_3 > pH_4$

   3) $pH_1 < pH_2 < pH_3 \approx pH_4$ 4) $pH > pH \approx pH_3 > pH_4$

3. Which of the following statements is incorrect for the SO_4^{2-} ion?

   1) It is tetrahedral

   2) All the S-O bond lengths are equal, and shorter than expected single bond length

   3) It contains four σ bonds between S and the O atoms, two π bonds delocalized over the S and four O atoms and all the S-O bonds have a bond order 1.5

   4) It is square planar

4. Identify the correct sequence of increasing number of π- bonds in the structure of the following molecules

   I. $H_2S_2O_6$ II. $H_2S_2O_3$ III. $H_2S_2O_5$

   1) I, II and III 2) II, I and III 3) II, III and I 4) I, III and II

5. $SF_4 + BF_3 \rightarrow (A)$ the compound 'A' is

   1) $[SF_5]^-[BF_2]^+$ 2) $[SF_3]^+[BF_4]^-$ 3) SF_6 4) S_2F_4

6. The structure of the SO_3 molecule in the gas phase contains

   1) only σ bonds between sulphur and oxygen

   2) σ bonds ad $p\pi - p\pi$ bond between sulphur and oxygen

   3) σ bonds and $p\pi - d\pi$ bond between sulphur and oxygen

   4) σ bonds $p\pi - p\pi$ bond and $p\pi - d\pi$ between sulphur and oxygen

7. Cyclic trimeric structure of SO_3 contains :

   1) Six S = O bonds and three S-O-S bonds

   2) Three S = O bonds and six S-O-S bonds

   3) Six S=O bondsand two S-O-S bonds

   4) Three S=O bonds and three S-O-S bonds

8. Consider the following reactions :

I) $Na_2S_2O_3 + dil\ HCl \xrightarrow{\Delta}$ II) $Na_2S_2O_3\,(aq.) + I_2 \xrightarrow{\Delta}$

III) $SO_2 + H_2S \xrightarrow{\Delta}$ IV) $H_2S + H_2O_2 \xrightarrow{\Delta}$

The reaction (s) which give (s) yellow turbidity is / are

1) II, III and IV 2) III and IV only 3) I, III and IV 4) I, II, III and IV

9. Which of the following reactions does not occur?

1) $H_2SO_4 + HNO_3 \rightarrow HSO_4^- + NO_2^+ + H_2O$

2) $KIO_3 + SO_2 + H_2O \rightarrow I_2 + KHSO_4 + H_2SO_4$

3) $NaHSO_3 + Na_2CO_3 \rightarrow Na_2SO_3 + H_2O + CO_2$ 4) $2SO_{2(g)} \rightarrow SO^{2+} + SO_3^{2-}$

10. Which of the following is correct?

1) $S_3O_9^-$ contains no S-S linkage 2) S_2O_6 contains –O-O linkage

3) $(HPO_3)_8^-$ contains P-P linkage 4) $S_2O_8^{2-}$ contains S-S linkage

11. S-S bond is present in :

$H_2S_2O_6$	$H_2S_2O_8$	$H_2S_2O_7$	$H_2S_2O_5$
I	II	III	IV

1) I, IV 2) II, IV 3) I, II 4) III, IV

12. Choose the correct statement

1) Basicity of phosphorous acid is three

2) Perbrommic acid has one peroxy linkage

3) $\beta - SO_3$ has cyclic structure

4) Borazine has zero dipole moment

13. Selecting from each set the molecule or ion having the smallest bond angle, pick out the correct option.

I. $NH_3, PH_3\ or\ AsH_3$ II. O_3^-, O_3

III. NO_2, O_3 IV. $X - S - X$ angle in $SOCl_2$ and SOF_2

1) $NH_3, O_3^-, O_3, SOCl_2$ 2) PH_3, O_3^+, NO_2, SOF_2 3) AsH_3, O_3, NO_2, SOF_2

4) AsH_3, O_3^+, O_3, SOF_2

14. $SO_3 +$ conc. $HCl \rightarrow (A)$

A) on hydrolysis gives

1) H_2SO_3 2) H_2SO_4 3) H_2SO_5 4) $H_2S_2O_8$

15. Consider the following bond angles : $\alpha = O - O - O$ n ozone

$\beta = P - P - P$ in P_4 (white)

$\gamma = N - N - N$ in azide anion (N_3)

$\delta = C - C - C$ in diamond then,

1) $\alpha + \beta = \gamma$ 2) $\beta + \delta > \gamma$ 3) $\frac{\delta}{\beta} > \frac{\gamma}{\alpha}$ 4) $\gamma - \alpha = \alpha - \beta$

16. In the reaction of hypo with dil acids

1) one sulphur is oxidized

2) one sulphur is oxidized, one sulphur is reduced

3) one sulphur is reduced

4) sulphur is neither oxidized nor educed

17. In sulphur trioxide trimer, each sulphur atom is bonded to

1) four oxygen atoms 2) three oxygen atoms

3) two oxygen atoms 4) two sulphur atoms

18. A pale yellow precipitate and a gas with pungent odour are formed on warming dil. Hydrochloric acid with a solution containing :

1) sulphate ion 2) sulphide ion 3) thiosulphate ion

4) sulphite ion

19. In which of the following reaction change of oxidation state of Br is more than unity

I. $H_2SO_4 + 2KBr \rightarrow$ II. $KBr + H_3PO_4 \rightarrow$ III. $Cl_2 + KBr + OH \rightarrow$

IV. $Br_2 + NaClO_3 \rightarrow$

1) I, II and III 2) III and IV 3) II, III and IV 4) I and IV

20. A yellow powder is reacted with F_2 to form a colourless gas X which is used as gaseous insulator in high power generators. It does not get hydrolyzed. Another compound is obtained by reaction of sulphur dichloride with NaF. It can be easily hydrolyzed ad has a sec – saw shape. X and Y respectively are

1) Agl, AgBr 2) SF_6, SF_4 3) SF_4, SF_6 4) SCl_4, SCl_6

21. Liquid oxygen and liquid nitrogen are allowed to flow between the poles of an electromagnet. Choose the correct option

1) Both will be attracted but to opposing poles

2) Both will be attracted to the same pole

3) Liquid oxygen will be attracted ad liquid nitrogen will be repelled

4) liquid oxygen will be attracted but liquid nitrogen unaffected

22. Urea reacts with SO_3 in the presence of H_2SO_4 to produce

1) NH_2SO_3H (sulphamic acid) 2) NH_2OH

3) NH_2CSNH_2 (Thio urea) 4) $\left(NH_4\right)_2 CO_3$

23. Sodium pyrosulphate, $Na_2S_2O_7$ can be made by heating

1) $NaHSO_4$ strongly 2) $NaHSO_3$ strongly

3) a mixture of $Na_2S_2O_3$ and SO_2

4) a mixture of Na_2SO_3 and excess of sulphur

24. When $KHSO_4$ is added to a concentrated solution of H_2SO_4, the acidity of the solution

1) increases 2) decreases

3) remains constant 4) cannot be preditcted

25. When ferric chloride is added to excess hypo solution a violet colour appears and disappears immediately. The disappearance of violet colour is due to

1) formation of ferric sulphide 2) conversion into colourless complex

3) reduction of ferric chloride to ferrous chloride

4) the violet complex is unstable and dissociates immediate

26. Hypo is used to remove excess chlorine from fabric in textile industry where chlorine oxidizes hypo to a single product. In this reaction the change in the oxidation state of terminal sulphur of hypo is

1) 4 units 2) 6 units 3) 8 units 4) no change

27. A silver foil turning black in the presence of ozone involves

1) oxidation reaction 2) reduction reaction 3) both oxidation and reduction

4) neither oxidation nor reduction

28. The structure of ozone involves

1) delocalized three – centred σ bonding 2) delocalized three centred π bonding

3) delocalized three – centred σ as well as π bonding

4) localized π - bonding

29. O_2F_2 is unstable yellow orange solid and H_2O_2 is colourless liquid, both having O-O bond. The O-O bond lengths in H_2O_2 & O_2F_2 are respectively.

1) $1.22A^0 1.48A^0$ 2) $1.48A^0 1.22A^0$ 3) $1.22A^0 1.22A^0$ 4) $1.48A^0 1.48A^0$

30. Which of the following statements is incorrect regarding sulphur compounds?

1) $H_2S_2O_8$ and H_2SO_5 both have one O-O linkage

2) In SF_6 all S-F bonds are equivalent

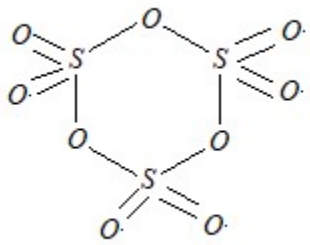
3) In both $SCl_2(OCH_3)_2$ the $-OCH_3$ groups occupy the equatorial position

4) In $H_2S_2O_3$ oxidation number of sulphur is +6 and -2

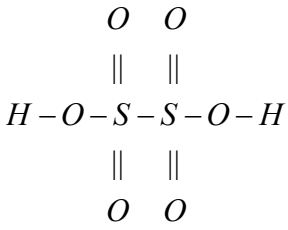
CHEMISTRY KEY & SOLUTIONS

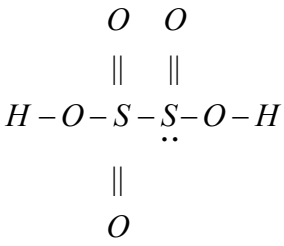
1-10	**2**	**2**	**4**	**3**	**2**	**4**	**1**	**3**	**4**	**1**
11-20	**1**	**4**	**3**	**2**	**3**	**2**	**1**	**3**	**2**	**2**
21-30	**2**	**6**	**13.8**	**1**	**0,4**	**0**	**1,2**	**44.8**	**5**	**2**

1. $SiO_2 < CO_2 < N_2O_5 < SO_3$
2. $PH_1 > PH_2 > PH_3 > PH_4$
3. SO_4^{-2} is letrahedral
4. I, III and I
5. $[SF_3]^+, [BF_4]^-$
6. σ bonds, $p\pi - p\pi$ bonds, $p\pi - d\pi$ between S and O
7. 6
   S=O and 3-S-O-S bond



8. 1, III and IV
9. $2SO_2 \rightarrow SO^{2+} + SO_3^{2-}$
10. $S_3O_9^-$ contain no. S-S linkage
11. I, IV $H_2S_2O_6, H_2S_2O_5$





12. Borazine has zero dipole moment $B_3N_3H_6$
13. "C" $ASH_3, O_3, NO_2^-, SOF_2$
14. "B" $SO_3 + HCl \rightarrow ClSO_3H$

    $ClSO_3 + H_2O \rightarrow H_2SO_4 + HCl$
15. "C" $\alpha = 116.8; \beta = 60, \gamma = 180; \delta = 109.281$
16. "B" $Na_2S_2O_3 + 2HCl \rightarrow 2NaCl + H_2O + SO_2 + S$

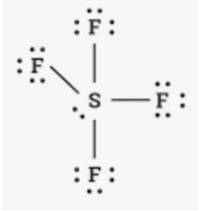
    Oxidation state of terminal 'S' increases from -2 to O.

    Oxidation state of central S decrease from +6 to +4.

17. "A" 4 oxygen atom.
18. "C" Thio sulphate ion
19. "B"
20. $S + 3F_2 \rightarrow SF_6$

    SF_6 is used as gaseous insulatar

    $SCl_2 + 4NaF \rightarrow SF_4 + 2NaCl + Na_2S$



21. +2

    $(x + (2x - 1)) = 0$

    $= x - 2 = 0$

    $x = O - (-2)$

=+2

22. 2
23. 13.8
24. 1
25. 0,4
26. 0
27. 1,2

    Two $p\pi - d\pi$ (bonds) have one pure p-orbital and two pure d-orbitals in sulphur. These three orbitals are involved in one $p\pi - d\pi$ bond and two $p\pi - d\pi$ bond.

28. 44.8 litro
28. 5

    $x = 1, y = 6, z = 1, m - 6, \mathrm{H} = 2$

    $$\frac{y^2 - x^2}{2 + m} = \frac{6^2 - 1^2}{1 + 6} = \frac{36 - 1}{7} = \frac{35}{7} = 5$$

30. Two bond axial bonds and equatorial bonds.