PHYSICAL / INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 38

Total Marks : 33

Max. Time : 35 min.

Topic : p-block elements (Nitrogen and Oxygen family)

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.4	(3 marks, 3 min.)	[12, 12]
Multiple choice objective ('–1' negative marking) Q.5	(4 marks, 4 min.)	[4, 4]
Assertion and Reason (no negative marking) Q.6 to Q. 8	(3 marks, 3 min.)	[9, 9]
Subjective Questions ('–1' negative marking) Q.9 to Q.10	(4 marks, 5 min.)	[8, 10]

1. $NH_4ClO_4 + HNO_3(dilute) \longrightarrow HClO_4 + [X]$

$[X] \xrightarrow{\Delta} Y(g)$

[X] and [Y] are respectively.

(A) NH_4NO_3 and N_2O (B) NH_4NO_2 and N_2 (C) HNO_4 and O_2 (D) None

2. Match the following

(A) $H_2O > H_2Te > H_2Se > H_2S$	(p) Basic character
(B) $NH_3 > PH_3 > AsH_3 > SbH_3$	(q) Acidic character
(C) $H_2O < H_2S < H_2Se < H_2Te$	(r) Boiling point
(D) $KCl < CaCl_2 < AlCl_3 < SnCl_4$	(s) Ionic character
	(t) Covalent character

(A) (A) – r ; (B) – p ; (C) – q ; (D) – t (B) (A) – p ; (B) – r ; (C) – q ; (D) – t

(C) (A) – s ; (B) – p ; (C) – p ; (D) – t (D) (A) – r ; (B) – p ; (C) – q; (D) – s

3. In the following reaction, $2MnO_4^- + 5H_2O_2^{18} + 6H^+ \rightarrow 2Mn^{2+} + 8H_2O + 5O_2$

The radioactive oxygen will appear in :

(A) H_2O (B) O_2

(C) bothH_2O & O_2 (D) above reaction does not take place

4. **(a)** Which is correct regarding the cyclic trimer of SO_3

(A) It contains three S – S, σ bonds

(B) It contains three O – O, σ bonds

(C) It contains six O – O, π bonds

(D) The total number of σ and π bonds in it are 12 and 6 respectively

(b) In SO_2 molecule, there are two σ-bonds and two π-bonds. The two π-bonds are formed by :

(A) $p\pi - p\pi$ overlap between S and O atoms

(B) $sp^2 - p$ overlap between S and O atoms

(C) one by $p\pi - p\pi$ overlap and other by $p\pi - d\pi$ overlap

(D) both by $p\pi - d\pi$ overlap

5. Identify the correct statement(s)

(A) P_4O_{10} is used as a drying agent

(B) P_4O_{10} contains $p\pi$–$p\pi$ back bonding

(C) In P_4O_{10} each P atom is bonded to three oxygen atoms

(D) P_4O_{10} hydrolyse in water forming phosphorus acid

6. **S_1 :** H_2O_2 solutions are stored in dark coloured plastic or wax coated glass vessels often with negative catalysts such as urea or sodium stannate added as stabilizers.

S_2 : With stronger oxidising agents H_2O_2 is oxidised and in such cases O_2 is always evolved.

S_3 : H_2O_2 is more hydrogen bonded than is water and so has a higher boiling point than water.

S_4 : In dilute aqueous solution H_2O_2 is more acidic than water.

(A) T T F T (B) T T T T (C) T T T F (D) T F T T

7. **Statement-1 :** Molecular oxygen is attracted by magnetic field.
Statement-2 : Molecular oxygen contains 2 unpaired electrons which occupy two different π – molecular orbitals
(A) Statement 1 and statement 2 are correct and statement 2 is the correct explanation of statement 1
(B) Statement 1 and statement 2 are correct but statement 2 is not correct explanation of statement 1
(C) Statement 1 is correct but statement 2 is false
(D) Statement 1 is false but statement 2 is correct

8. **Statement-1 :** Mercury in contact with ozone loses its mobility and starts sticking to the glass surface.
Statement-2 : This is known as tailing of mercury.
(A) Statement 1 and statement 2 are correct and statement 2 is the correct explanation of statement 1
(B) Statement 1 and statement 2 are correct but statement 2 is not correct explanation of statement 1
(C) Statement 1 is correct but statement 2 is false
(D) Statement 1 is false but statement 2 is correct

9. What happens when ?
(a) Hypophosphorus acid is heated.
(b) Phosphorus penta oxide reacts with PCl_5.

10. ***Integer Answer Type***

This section contains 3 questions. The answer to each of the questions is a single digit integer, ranging from 0 to 9.

(i) If Phosphorous acid, Tetrathionic acid and Pyrophosphoric acid have number of acidic hydrogen per molecule respectively as x, y and z, then find the value of x + y – z.

(ii) How many orders among following are correct with respect to the properties indicated :

(1) $NH_3 < H_2O < H_2S$	Boiling point
(2) $PH_3 < AsH_3 < NH_3 < SbH_3$	Boiling point
(3) $BF_3 < BCl_3 < BBr_3$	Extent of hydrolysis
(4) $CH_3Cl > CH_3F > CH_3Br > CH_3I$	Dipole moment
(5) $BF_3 < BCl_3 < BBr_3$	Lewis acidic strength
(6) $Na^+ > Mg^{+2} > Al^{+3}$	Extent of hydration

(iii) Depending upon the nature of oxides, they are classified as acidic, basic, amphoteric and neutral oxides.
Among the following, the total number of acidic oxides are :
NO_2, CuO, NO, CO_2, P_4O_6, CO, PbO_2, SiO_2, SnO_2.

Answer Key

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1.	(A)	**2.**	(A)	**3.**	(B)	**4.**	**(a)** (D) **(b)** (C)
5.	(A,B)	**6.**	(B)	**7.**	(A)	**8.**	(B)

9. (a) $2H_3PO_2 \longrightarrow H_3PO_4 + PH_3$ (b) $P_4O_{10} + 6\,PCl_5 \longrightarrow 10POCl_3$

10. **(i)** 0 **(ii)** 4 **(iii)** 4

Hints & Solutions

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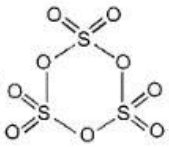
1. $NH_4ClO_4 + HNO_3 \longrightarrow HClO_4 + NH_4NO_3$

$2NH_4NO_3 \xrightarrow{\Delta} 2N_2O + 4H_2O$

3. During oxidation of H_2O_2, O–O bond is not broken.

4. **(a)** 

Hence, Ans.(D)

(b) 

6. S_1 : It is correct statement. Dark coloured bottle prevents the auto oxidation of H_2O_2 by light. Urea and sodium stannate act as negative catalyst for the decomposition of H_2O_2.

S_2 : $2KMnO_4 + 5H_2O_2 + 3H_2SO_4 \longrightarrow 2MnSO_4 + K_2SO_4 + 5O_2 + 8H_2O$.

S_3 : H_2O_2 , boiling point 152°C.

S_4 : $H_2O_2 \longrightarrow H^+ + HO_2^-$, $K_{20°C} = 1.5 \times 10^{-12}$.

7. O_2 : KK, $\sigma 2s^2$, $\sigma^* 2s^2$, $\sigma 2px^2$, $\pi 2py^2$, $\pi 2pz^2$, $\pi^* 2py^1$, $\pi^* 2pz^1$

8. $2Hg + O_3 \longrightarrow Hg_2O + O_2$

Hg_2O dissolves in Hg and thus its mobility decreases.

10. **(i)** Phosphorous acid (H_3PO_3) Dibasic $\therefore$ x = 2

Tetrathionic acid ($H_2S_4O_6$) Dibasic $\therefore$ y = 2

Pyrophosphoric acid ($H_4P_2O_7$) tetrabasic $\therefore$ z = 4

(iii) P_4O_6, SiO_2, CO_2, NO_2 are acidic oxides, CO and NO are neutral oxides and PbO_2 and SnO_2 are amphoteric oxides.