PART B - CHEMISTRY

SECTION I - MULTIPLE ANSWER CORRECT TYPE

1. **b)** Mn^{2+}
   c) Fe^{3+}

2. **a)** $CO_2 < SiO_2 < SnO_2 < PbO_2$: **increasing oxidizing power**
   b) **HF < HCl < HBr < HI: increasing acidic strength**
   d) **B < C < O < N: increasing first ionization energy**

3. **a)** ICl_4^-
   b) BrF_4^-
   c) XeF_4

4. **b)** **Both AX_3 and YX_3 may be pyramidal**
   d) **ZW_3 is planar**

5. **b)** **Molar volume of a gas at standard conditions is 22.4 L.**
   d) **Atomic masses of most elements are fractional.**
   a. not applicable if the elements exists in different isotopes which may be involved in the formation compound.
   b. At 1 atm, 25°C molar volume = 22.7 L
   c. Mw = 2 × VD.
   d. Due to existence of isotopes.

6. **a)** **Both bulbs contain same number of atoms**
   d) **Bulb A contains $N_A/2$ molecules while bulb B contains $N_A/3$ molecules.**
   (N_A = Avogadro's number)
   a. Number of of O_2 atoms = $\frac{16}{32} \times 2 \times N_A = 1 \times N_A$
   b. Number of of O_3 atoms = $\frac{16}{48} \times 3 \times N_A = 1 \times N_A$
   c. i. Number of of O_2 molecules
   $= \frac{16}{32} \times N_A = \frac{1}{2} N_A$
   ii. Number of of O_2 molecules
   $= \frac{16}{48} \times N_A = \frac{1}{3} N_A$

7. **b)** **2s**
   d) **3p**

8. **a)** $\mathbf{n = 3, l = 3, m = +1, s = +\frac{1}{2}}$
   c) $\mathbf{n = 3, l = 3, m = +2, s = -\frac{1}{2}}$
   $(a \rightarrow q, r, s)$
   $n_1 \rightarrow n_\infty$ in H atoms:
   UV region (Lyman series)
   $\Delta E = \frac{hc}{\lambda} = hcR \times 1^2 \times \left(\frac{1}{1^2} - \frac{1}{\infty^2}\right) = hcR$
   (Rydberg energy)
   Ionisation energy
   $(b \rightarrow s)$
   $n_4 \rightarrow n_2$ in $He^{\oplus}$ ion:
   UV region (check yourself)
   Corresponding to Ionisation energy
   $(d \rightarrow p)$
   $n_4 \rightarrow n_2$ in ion
   Visible region (Balmer series)

SECTION II - MATRIX MATCH TYPE

1. **A-R, B-Q, C-P, D-S**

2. **A-PQR, B-PQR, C-QS, D-S**
   ($A \rightarrow P,Q,R$)
   P., R. mol of $KMnO_4 = \frac{15.8}{158} = 0.1$ mol
   Q. 0.1 mol $KMnO_4$ = 0.4 mol O atoms
   $= 0.4 \times 6.023 \times 10^{22}$ atoms of oxygen
   ($B \rightarrow P,Q,R$)
   P,R mole of $H_2C_2O_4 = \frac{9.0}{9.0} = 0.1$ mol
   $= 6.023 \times 10^{22}$ molecules
   Q 0.1 mol $H_2C_2O_4$ = 0.4 mol O atoms
   $= 24.092 \times 10^{22}$ atom of oxygen
   ($C \rightarrow Q,S$)

mole of $CO_2 = \frac{8.8}{44} = 0.2$ mol

1 mol CO_2 = 2 mol of O atoms

0.2 Mole CO_2 = 0.4 of O atoms

= 24.092×10^{22} atoms of oxygen

(D → S) Mol of CO = $\frac{5.6}{28} = 0.2$ mol

SECTION III - INTEGER TYPE

1. **8**

Weight of NaOH = $\left(\frac{92\,g}{100\,g\,solution}\right)$ (100 g solution)

Weight of H_2O = 100 – 92 = 8.0 g H_2O

2. **2**

O, Cl, F, N, P, Sn, Tl, Na, Ti

Na shows only + 1.

F shows only –1.

3. **3**

$Be_nAl_2Si6O_{18}$

(2n) = (3 × 2) + (4 × 6) + (–2 × 18) = 0

or 2n + 30 –36 = 0

or 2n = 6

or n = 3

4. **9**

n = 3 ⇒ 1 = 0, 1, 2

for l = 0, m = 0 ⇒ m_s = –1/2 and + 1/2

for l = 0, m = –1 ⇒ m_s = –1/2 and + 1/2

0 ⇒ m_s = –1/2 and + 1/2

–1 ⇒ m_s = –1/2 and + 1/2

for l = 2, m = –2 ⇒ m_s = –1/2 and + 1/2

– 1 ⇒ m_s = –1/2 and + 1/2

0 ⇒ m_s = –1/2 and + 1/2

1 ⇒ m_s = –1/2 and + 1/2

2 ⇒ m_s = –1/2 and + 1/2

Alternatively n = 3

∴ Number of electrons = $2n^2 = 2 \times 3^2 = 18$

Number of electrons with ms = $-\frac{1}{2} = \frac{18}{2} = 9$

5. **4**

Since the value of hc = 1240 eV nm

Energy corresponding to l = 300 nm is

$\frac{1240\,eV\,nm}{300\,nm} = 4.134$ eV

Elements having ϕ < 4.134 eV will show photoelectric effect are Li, na, k, and Mg ⇒ 4

So, number of metals showing photo-electric will be four

i.e., Li, Na, k, and Mg.

6. **1**

B_2 has 1 π bond, according to M.O.T.

7. **5**

8. **4**