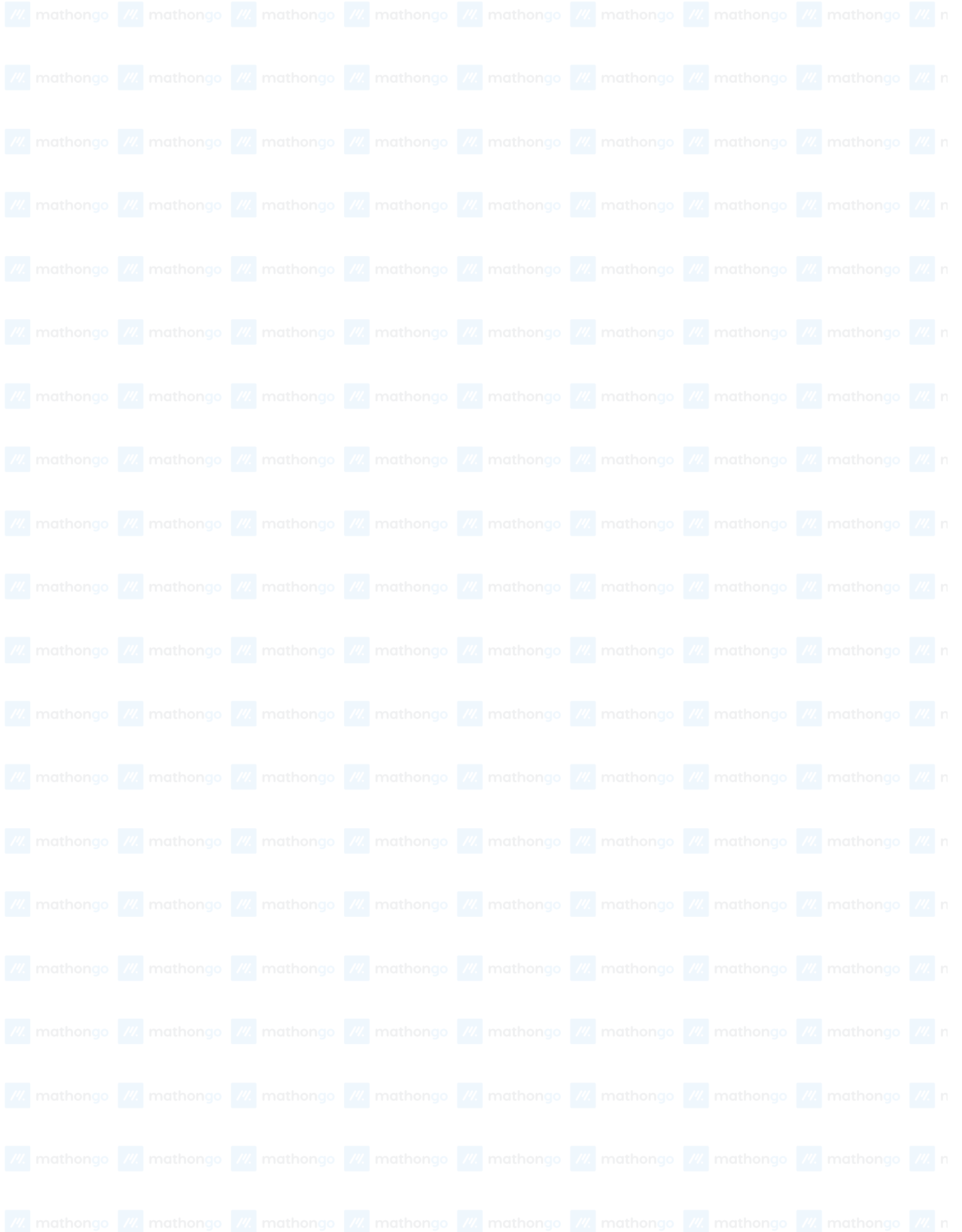


- In ammonium–phosphomolybdate, the oxidation state of Mo is +-----
[2023 (06 Apr Shift 1)]
- In chromyl chloride, the number of d-electrons present on chromium is same as in (Given at no. of Ti : 22, V : 23, Cr : 24, Mn : 25, Fe : 26)
[2023 (08 Apr Shift 1)]
 - V (IV)
 - Mn (VII)
 - Fe (III)
 - Ti (III)
- Which halogen is known to cause the reaction given below?
[2023 (08 Apr Shift 1)]
 - All halogens
 - Only Bromine
 - Only Iodine
 - Only Chlorine
- Given below are two statements:
Statement I : Aqueous solution of $K_2Cr_2O_7$ is preferred as a primary standard in volumetric analysis over $Na_2Cr_2O_7$ aqueous solution.
Statement II : $K_2Cr_2O_7$ has a higher solubility in water than $Na_2Cr_2O_7$. In the light of the above statements, choose the correct answer from the options given below:
[2023 (10 Apr Shift 1)]
 - Statement I is false but Statement II is true
 - Both Statement I and Statement II are true
 - Statement I is true but Statement II is false
 - Both Statement I and Statement II are false
- Prolonged heating is avoided during the preparation of ferrous ammonium sulphate to
[2023 (10 Apr Shift 1)]
 - Prevent hydrolysis
 - Prevent reduction
 - Prevent breaking
 - Prevent oxidation
- Which of the following statements are correct?
 - The M^{3+}/M^{2+} reduction potential for iron is greater than manganese.
 - The higher oxidation states of first row d-block elements get stabilized by oxide ion
 - Aqueous solution of Cr^{2+} can liberate hydrogen from dilute acid
 - Magnetic moment of V^{2+} is observed between 4.4 – 5.2 BMChoose the correct answer from the options given below:
[2023 (10 Apr Shift 1)]
 - (B), (C) only
 - (A), (B), (D) only
 - (C), (D) only
 - (A), (B) only
- When a solution of mixture having two inorganic salts was treated with freshly prepared ferrous sulphate in acidic medium, a dark brown ring was formed whereas on treatment with neutral $FeCl_3$, it gave deep red colour which disappeared on boiling and a brown red ppt was formed. The mixture contains
[2023 (11 Apr Shift 1)]
 - SO_3^{2-} & CH_3COO^-
 - CH_3COO^- & NO_3^-
 - SO_3^{2-} & $C_2O_4^{2-}$
 - $C_2O_4^{2-}$ & NO_3^-
- The pair of lanthanides in which both elements have high third-ionization energy is:
[2023 (13 Apr Shift 1)]
 - Dy, Gd
 - Lu, Yb
 - Eu, Yb
 - Eu, Gd
- In Chromyl chloride, the oxidation state of chromium is (+) _____.
[2023 (15 Apr Shift 1)]



#MathBoleTohMathonGo

To practice more chapter-wise JEE Main PYQs, [click here to download the MARKS app](#) from Playstore

ANSWER KEYS

1. (6) 2. (2) 3. (3) 4. (3) 5. (4) 6. (1) 7. (2) 8. (3)
9. (6)

1. (6)

Phosphomolybdate is an anion containing both phosphorus and molybdenum, with the chemical formula $(\text{NH}_4)_3\text{PO}_4 \cdot 12\text{MoO}_3$.

The ammonium ion has a total charge of +3, and the phosphate ion has a total charge of -3. Therefore, the 12 MoO_3 units in the compound must have a total charge of $+3 - (-3) = +6$.

Each MoO_3 unit contains one Mo atom and three O atoms. The total oxidation state of the three O atoms is -6, since each O atom has an oxidation state of -2.

So,

$$\text{Mo} + (-6) = 0$$

$$\text{Mo} = +6$$

2. (2)

In chromyl chloride (CrO_2Cl_2), the oxidation state of chromium (Cr) is +6.

$$\text{So, Cr (VI)} = [\text{Ar}]^{18} 3d^0$$

For the given elements the configuration is, $\text{Mn(VII)} = [\text{Ar}]^{18} 3d^0$

$$\text{Fe(III)} = [\text{Ar}]^{18} 3d^5$$

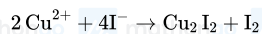
$$\text{Ti(III)} = [\text{Ar}]^{18} 3d^1$$

$$\text{V(IV)} = [\text{Ar}]^{18} 3d^1$$

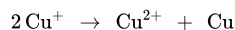
So among the given options Mn(VII) and Cr (VI) will have same number of d-electrons.

3. (3)

All Cu^{2+} halides are known except the iodide. In this case, Cu^{2+} oxidises I^- to I_2 .



However, many copper (I) compounds are unstable in aqueous solution and undergo disproportionation.



4. (3)

$\text{K}_2\text{Cr}_2\text{O}_7$ is generally preferred than $\text{Na}_2\text{Cr}_2\text{O}_7$ in volumetric analysis as $\text{Na}_2\text{Cr}_2\text{O}_7$ is hygroscopic in nature, therefore it is difficult to prepare its standard solution for volumetric analysis as accurate weighing is not possible in normal atmospheric conditions. A hygroscopic substance can absorb moisture from the atmosphere due to which there will be inaccuracy in weight.

5. (4)

The formula for ferrous ammonium sulphate is $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$. It is prepared by dissolving equimolar mixture of hydrated ferrous sulphate and ammonium sulphate in water containing a little sulphuric acid. The solution is subjected to crystallisation, ferrous ammonium sulphate separates out from the solution.

The chemical reaction is given below.



Avoid prolonged heating while preparing crystals of ferrous ammonium sulphate, as it may oxidise ferrous ions to ferric ions and change the stoichiometry of the crystals.

6. (1)

The valence electronic configuration of Mn^{3+} is $3d^4$ and that of Mn^{2+} is stable $3d^5$. The valence electronic configuration of Fe^{3+} is $3d^5$ and that of Fe^{2+} is $3d^6$.

The reduction electrode potential of $\text{Mn}^{3+}/\text{Mn}^{2+}$ is +1.57 V while that of $\text{Fe}^{3+}/\text{Fe}^{2+}$ is +0.77 V, hence A is wrong. Higher oxidation state of smaller d-block elements is stabilised (or say form compounds) with smaller anion oxide that can be explained by steric reason hence B is correct.

The oxidation electrode potential of $\text{Cr}^{2+}/\text{Cr}^{3+}$ is +0.41 V hence, it can reduce H^+ and so liberate H_2 .

The unpaired electrons in V^{2+} are 3 hence, the magnetic moment of V^{2+} will be lesser than 4.4 BM.

Hence, only B and C are correct.

7. (2) The brown ring test is a typical nitrate test that involves adding iron(II) sulphate to a nitrate solution, then slowly adding strong sulfuric acid until the acid forms a layer below the aqueous solution. The existence of the nitrate ion will be shown by the formation of a brown ring at the junction of the two layers. Dark brown ring is formed in the confirmatory test of NO_3^- ions. Deep red precipitate with FeCl_3 is formed in the presence of CH_3COO^- ions.

8. (3)
Europium has an atomic number of 63 and a stable electronic configuration of $[\text{Xe}]4f^76s^2$.
Ytterbium, on the other hand, has an atomic number of 70 and a stable electronic configuration of $[\text{Xe}]4f^{14}6s^2$.
Both have high 3rd ionisation energy due to half filled & fully filled configuration respectively.

9. (6)
The chemical formula of Chromyl chloride is CrO_2Cl_2 . The oxidation state of chromium in chromyl chloride (CrO_2Cl_2) is +6.

Let the oxidation number of Chromium be "x", the oxidation state of oxygen is -2, the oxidation state of chlorine is -1.

Then,

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

$$x - 6 = 0$$

$$x = 6$$