

CHEMISTRY · JEE MAIN

d & f Block Elements

Chapter-wise previous year questions, with answer key

131

PYQS

2020–2025

PAPERS

6

TOPICS

Variable Oxidation States and Colour

Magnetic Properties

Properties of Transition Metals

KMnO₄ and K₂Cr₂O₇

Lanthanides and Lanthanoid Contraction

Actinides

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

Every question has a free step-by-step solution on PrepWiser — tap “Step-by-step solution” under it.

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Variable Oxidation States and Colour · 18 PYQs

Q1 JEE Main 2025 · 28 Jan · Shift 2

The spin only magnetic moment (μ) value (B.M.) of the compound with strongest oxidising power among Mn_2O_3 , TiO and VO is _____ B.M. (Nearest integer).

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/NyuUrLnz_w](https://www.prepwiser.in/questions/NyuUrLnz_w)

Q2 JEE Main 2025 · 23 Jan · Shift 1

The correct set of ions (aqueous solution) with same colour from the following is:

(A) V^{2+} , Cr^{3+} , Mn^{3+}

(B) Ti^{4+} , V^{4+} , Mn^{2+}

(C) Sc^{3+} , Ti^{3+} , Cr^{2+}

(D) Zn^{2+} , V^{3+} , Fe^{3+}

[Step-by-step solution ► prepwiser.in/questions/Ki79C8pq70](https://www.prepwiser.in/questions/Ki79C8pq70)

Q3 JEE Main 2024 · 9 Apr · Shift 1

The electronic configuration of Cu(II) is $3d^9$ whereas that of Cu(I) is $3d^{10}$. Which of the following is correct?

(A) Cu(II) is more stable

(B) Cu (II) is less stable

(C) Cu(I) and Cu(II) are equally stable

(D) Stability of Cu(I) and Cu(II) depends on nature of copper salts

[Step-by-step solution ► prepwiser.in/questions/0WXmL7TNSe](https://www.prepwiser.in/questions/0WXmL7TNSe)

Q4 JEE Main 2024 · 5 Apr · Shift 1

The metal that shows highest and maximum number of oxidation state is :

(A) Co

(B) Mn

(C) Fe

(D) Ti

[Step-by-step solution ► prepwiser.in/questions/Ce11n6UBRA](https://www.prepwiser.in/questions/Ce11n6UBRA)

Q5 JEE Main 2024 · 4 Apr · Shift 1

The element which shows only one oxidation state other than its elemental form is :

(A) Nickel

(B) Titanium

(C) Cobalt

(D) Scandium

[Step-by-step solution ► prepwiser.in/questions/OECAZje25K](https://www.prepwiser.in/questions/OECAZje25K)

Q6 JEE Main 2024 · 1 Feb · Shift 2

Which of the following compounds show colour due to d-d transition?

- (A) $\text{K}_2\text{Cr}_2\text{O}_7$
- (B) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
- (C) KMnO_4
- (D) K_2CrO_4

[Step-by-step solution ► prepwiser.in/questions/Ngrw6tIJBz](https://www.prepwiser.in/questions/Ngrw6tIJBz)

Q7 JEE Main 2024 · 30 Jan · Shift 2

The orange colour of $\text{K}_2\text{Cr}_2\text{O}_7$ and purple colour of KMnO_4 is due to

- (A) Charge transfer transition in both.
- (B) $d \rightarrow d$ transitions in KMnO_4 and charge transfer transitions in $\text{K}_2\text{Cr}_2\text{O}_7$.
- (C) $d \rightarrow d$ transitions in both
- (D) $d \rightarrow d$ transitions in $\text{K}_2\text{Cr}_2\text{O}_7$ and charge transfer transitions in KMnO_4 .

[Step-by-step solution ► prepwiser.in/questions/nZZp0bxJ1M](https://www.prepwiser.in/questions/nZZp0bxJ1M)

Q8 JEE Main 2024 · 27 Jan · Shift 1

Element not showing variable oxidation state is :

- (A) Bromine
- (B) Iodine
- (C) Chlorine
- (D) Fluorine

[Step-by-step solution ► prepwiser.in/questions/zKRqwCM_2F](https://www.prepwiser.in/questions/zKRqwCM_2F)

Q9 JEE Main 2023 · 31 Jan · Shift 1

The correct order of basicity of oxides of vanadium is :

- (A) $\text{V}_2\text{O}_3 > \text{V}_2\text{O}_5 > \text{V}_2\text{O}_4$
- (B) $\text{V}_2\text{O}_3 > \text{V}_2\text{O}_4 > \text{V}_2\text{O}_5$
- (C) $\text{V}_2\text{O}_5 > \text{V}_2\text{O}_4 > \text{V}_2\text{O}_3$
- (D) $\text{V}_2\text{O}_4 > \text{V}_2\text{O}_3 > \text{V}_2\text{O}_5$

[Step-by-step solution ► prepwiser.in/questions/2sNDrv4d0j](https://www.prepwiser.in/questions/2sNDrv4d0j)

Q10 JEE Main 2023 · 29 Jan · Shift 2

A solution of CrO_5 in amyl alcohol has a _____ colour.

- (A) Yellow
- (B) Orange-Red
- (C) Green
- (D) Blue

[Step-by-step solution ► prepwiser.in/questions/yUxajj_wKN](https://www.prepwiser.in/questions/yUxajj_wKN)

Q11 JEE Main 2023 · 29 Jan · Shift 2

The set of correct statements is :

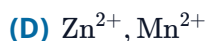
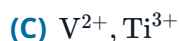
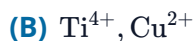
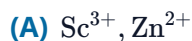
- (i) Manganese exhibits +7 oxidation state in its oxide.
- (ii) Ruthenium and Osmium exhibit +8 oxidation in their oxides.
- (iii) Sc shows +4 oxidation state which is oxidizing in nature.
- (iv) Cr shows oxidising nature in +6 oxidation state.

- (A) (ii), (iii) and (iv)
- (B) (ii) and (iii)
- (C) (i) and (iii)
- (D) (i), (ii) and (iv)

[Step-by-step solution ► prepwiser.in/questions/OJEKLZkUmx](https://www.prepwiser.in/questions/OJEKLZkUmx)

Q12 JEE Main 2022 · 29 Jul · Shift 1

In following pairs, the one in which both transition metal ions are colourless is :



[Step-by-step solution](https://www.prepwiser.in/questions/QWypJQ0KwE) ► [prepwiser.in/questions/QWypJQ0KwE](https://www.prepwiser.in/questions/QWypJQ0KwE)

Q13 JEE Main 2022 · 27 Jun · Shift 1

The number of statements correct from the following for Copper (at. no. 29) is/are _____.

(A) Cu(II) complexes are always paramagnetic.

(B) Cu(I) complexes are generally colourless

(C) Cu(I) is easily oxidized

(D) In Fehling solution, the active reagent has Cu(I)

Numerical answer — enter the value.

[Step-by-step solution](https://www.prepwiser.in/questions/TBpyF6zAQn) ► [prepwiser.in/questions/TBpyF6zAQn](https://www.prepwiser.in/questions/TBpyF6zAQn)

Q14 JEE Main 2021 · 25 Jul · Shift 1

The correct order of following 3d metal oxides, according to their oxidation numbers is :

(a) CrO_3 , (b) Fe_2O_3 , (c) MnO_2 , (d) V_2O_5 , (e) Cu_2O

(A) (d) > (a) > (b) > (c) > (e)

(B) (a) > (c) > (d) > (b) > (e)

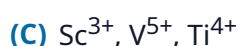
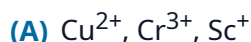
(C) (a) > (d) > (c) > (b) > (e)

(D) (c) > (a) > (d) > (e) > (b)

[Step-by-step solution](https://www.prepwiser.in/questions/ZG1iKWtvAY) ► [prepwiser.in/questions/ZG1iKWtvAY](https://www.prepwiser.in/questions/ZG1iKWtvAY)

Q15 JEE Main 2021 · 22 Jul · Shift 2

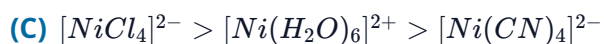
The set having ions which are coloured and paramagnetic both is :



[Step-by-step solution](https://www.prepwiser.in/questions/zAfrDKx-WB) ► [prepwiser.in/questions/zAfrDKx-WB](https://www.prepwiser.in/questions/zAfrDKx-WB)

Q16 JEE Main 2021 · 20 Jul · Shift 1

The correct order of intensity of colors of the compounds is :



[Step-by-step solution](https://www.prepwiser.in/questions/C93xhooPm4) ► [prepwiser.in/questions/C93xhooPm4](https://www.prepwiser.in/questions/C93xhooPm4)

Q17 JEE Main 2021 · 17 Mar · Shift 2

The common positive oxidation states for an element with atomic number 24, are :

- (A) +1 and +3 (B) +2 to +6
(C) +1 to +6 (D) +1 and +3 to +6

[Step-by-step solution ► prepwisser.in/questions/-RmlDXrSVw](https://www.prepwisser.in/questions/-RmlDXrSVw)

Q18 JEE Main 2020 · 2 Sep · Shift 2

The oxidation states of transition metal atoms in $K_2Cr_2O_7$, $KMnO_4$ and K_2FeO_4 , respectively, are x, y and z. The sum of x, y and z is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/OB7vAqzERR](https://www.prepwisser.in/questions/OB7vAqzERR)

Magnetic Properties · 31 PYQs

Q19 JEE Main 2025 · 8 Apr · Shift 2

The correct decreasing order of spin only magnetic moment values (BM) of Cu^+ , Cu^{2+} , Cr^{2+} and Cr^{3+} ions is :

- (A) $Cr^{3+} > Cr^{2+} > Cu^+ > Cu^{2+}$
(B) $Cu^+ > Cu^{2+} > Cr^{3+} > Cr^{2+}$
(C) $Cr^{2+} > Cr^{3+} > Cu^{2+} > Cu^+$
(D) $Cu^{2+} > Cu^+ > Cr^{2+} > Cr^{3+}$

[Step-by-step solution ► prepwisser.in/questions/i1H7ZUpIaW](https://www.prepwisser.in/questions/i1H7ZUpIaW)

Q20 JEE Main 2025 · 4 Apr · Shift 1

Pair of transition metal ions having the same number of unpaired electrons is

- (A) Ti^{3+} , Mn^{2+} (B) Ti^{2+} , Co^{2+}
(C) Fe^{3+} , Cr^{2+} (D) V^{2+} , Co^{2+}

[Step-by-step solution ► prepwisser.in/questions/yer-x93mSc](https://www.prepwisser.in/questions/yer-x93mSc)

Q21 JEE Main 2025 · 3 Apr · Shift 1

The metal ions that have the calculated spin-only magnetic moment value of 4.9 B.M. are :

- A. Cr^{2+}
B. Fe^{2+}
C. Fe^{3+}
D. Co^{2+}
E. Mn^{3+}

Choose the correct answer from the options given below:

- (A) A, D and E Only (B) A, B and E Only
(C) A, C and E Only (D) B and E Only

[Step-by-step solution ► prepwisser.in/questions/sc9bKFOpVf](https://www.prepwisser.in/questions/sc9bKFOpVf)

Q22 JEE Main 2024 · 8 Apr · Shift 1

The 'spin only' magnetic moment value of MO_4^{2-} is _____ BM. (Where M is a metal having least metallic radii. among Sc, Ti, V, Cr, Mn and Zn).

(Given atomic number: Sc = 21, Ti = 22, V = 23, Cr = 24, Mn = 25 and Zn = 30)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/rYUqD9N_h_](https://www.prepwiser.in/questions/rYUqD9N_h_)

Q23 JEE Main 2024 · 6 Apr · Shift 2

Among VO_2^+ , MnO_4^- and $\text{Cr}_2\text{O}_7^{2-}$, the spin-only magnetic moment value of the species with least oxidising ability is _____ BM (Nearest integer).

(Given atomic member V = 23, Mn = 25, Cr = 24)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/Kgk6XxZJqQ](https://www.prepwiser.in/questions/Kgk6XxZJqQ)

Q24 JEE Main 2024 · 6 Apr · Shift 1

Among CrO , Cr_2O_3 and CrO_3 , the sum of spin-only magnetic moment values of basic and amphoteric oxides is _____ 10^{-2}BM (nearest integer).

(Given atomic number of Cr is 24)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/ynMX6VsVrRr](https://www.prepwiser.in/questions/ynMX6VsVrRr)

Q25 JEE Main 2024 · 5 Apr · Shift 1

The spin-only magnetic moment value of the ion among Ti^{2+} , V^{2+} , Co^{3+} and Cr^{2+} , that acts as strong oxidising agent in aqueous solution is _____ BM (Near integer).

(Given atomic numbers : Ti : 22, V : 23, Cr : 24, Co : 27)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/h2SCyw_AcI](https://www.prepwiser.in/questions/h2SCyw_AcI)

Q26 JEE Main 2024 · 4 Apr · Shift 2

A first row transition metal in its +2 oxidation state has a spin-only magnetic moment value of 3.86BM. The atomic number of the metal is

(A) 22

(B) 23

(C) 26

(D) 25

[Step-by-step solution ► prepwiser.in/questions/uZUiKkzt1Z](https://www.prepwiser.in/questions/uZUiKkzt1Z)

Q27 JEE Main 2024 · 27 Jan · Shift 1

Which of the following electronic configuration would be associated with the highest magnetic moment?

(A) $[\text{Ar}]3d^7$

(B) $[\text{Ar}]3d^8$

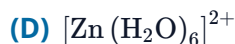
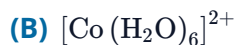
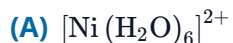
(C) $[\text{Ar}]3d^3$

(D) $[\text{Ar}]3d^6$

[Step-by-step solution ► prepwiser.in/questions/kEVnSgnO_U](https://www.prepwiser.in/questions/kEVnSgnO_U)

Q28 JEE Main 2023 · 13 Apr · Shift 2

Which of the following complexes will exhibit maximum attraction to an applied magnetic field?



[Step-by-step solution ► prepwiser.in/questions/vq192K8PZH](https://www.prepwiser.in/questions/vq192K8PZH)

Q29 JEE Main 2023 · 10 Apr · Shift 2

For a metal ion, the calculated magnetic moment is 4.90 BM. This metal ion has _____ number of unpaired electrons.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/FAe9nxGgO7](https://www.prepwiser.in/questions/FAe9nxGgO7)

Q30 JEE Main 2023 · 8 Apr · Shift 2

The observed magnetic moment of the complex $[\text{Mn}(\underline{NCS})_6]^{x-}$ is 6.06 BM. The numerical value of x is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/pskfUFKpbt](https://www.prepwiser.in/questions/pskfUFKpbt)

Q31 JEE Main 2023 · 1 Feb · Shift 2

The spin only magnetic moment of $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ complexes is _____ B.M. (Nearest integer)
(Given : Atomic no. of Mn is 25)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/wUFvRqM0CK](https://www.prepwiser.in/questions/wUFvRqM0CK)

Q32 JEE Main 2023 · 25 Jan · Shift 1

How many of the following metal ions have similar value of spin only magnetic moment in gaseous state? _____

(Given : Atomic number V, 23; Cr, 24; Fe, 26; Ni, 28)



Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/8eKWvKq9g](https://www.prepwiser.in/questions/8eKWvKq9g)

Q33 JEE Main 2023 · 24 Jan · Shift 1

The magnetic moment of a transition metal compound has been calculated to be 3.87 B.M. The metal ion is



[Step-by-step solution ► prepwiser.in/questions/Rb9Bx16VBp](https://www.prepwiser.in/questions/Rb9Bx16VBp)

Q34 JEE Main 2022 · 27 Jul · Shift 2

The spin only magnetic moment of the complex present in Fehling's reagent is _____ B.M. (Nearest integer).

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/TYxspktvaM](https://www.prepwisser.in/questions/TYxspktvaM)

Q35 JEE Main 2022 · 27 Jul · Shift 1

Given below are two statements.

Statement I: O_2 , Cu^{2+} , and Fe^{3+} are weakly attracted by magnetic field and are magnetized in the same direction as magnetic field.

Statement II: NaCl and H_2O are weakly magnetized in opposite direction to magnetic field.

In the light of the above statements, choose the most appropriate answer from the options given below.

- (A) Both Statement I and Statement II are correct.
- (B) Both Statement I and Statement II are incorrect.
- (C) Statement I is correct but Statement II is incorrect.
- (D) Statement I is incorrect but Statement II is correct.

[Step-by-step solution ► prepwisser.in/questions/O-2eTnuvMb](https://www.prepwisser.in/questions/O-2eTnuvMb)

Q36 JEE Main 2022 · 26 Jul · Shift 2

The spin-only magnetic moment value of the compound with strongest oxidizing ability among MnF_4 , MnF_3 and MnF_2 is _____ B.M. [nearest integer]

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/25A5uMUnTq](https://www.prepwisser.in/questions/25A5uMUnTq)

Q37 JEE Main 2022 · 25 Jul · Shift 2

The spin-only magnetic moment value of M^{3+} ion (in gaseous state) from the pairs $\text{Cr}^{3+} / \text{Cr}^{2+}$, $\text{Mn}^{3+} / \text{Mn}^{2+}$, $\text{Fe}^{3+} / \text{Fe}^{2+}$ and $\text{Co}^{3+} / \text{Co}^{2+}$ that has negative standard electrode potential, is _____ B.M. [Nearest integer]

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/WCKxTU4ogd](https://www.prepwisser.in/questions/WCKxTU4ogd)

Q38 JEE Main 2022 · 25 Jul · Shift 1

Among Co^{3+} , Ti^{2+} , V^{2+} and Cr^{2+} ions, one if used as a reagent cannot liberate H_2 from dilute mineral acid solution, its spin-only magnetic moment in gaseous state is _____ B.M. (Nearest integer)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/pMZxkVFCQB](https://www.prepwisser.in/questions/pMZxkVFCQB)

Q39 JEE Main 2022 · 26 Jun · Shift 1

The spin-only magnetic moment value of the most basic oxide of vanadium among V_2O_3 , V_2O_4 and V_2O_5 is _____ B.M. (Nearest integer)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/5N5E6914VI](https://www.prepwisser.in/questions/5N5E6914VI)

Q40 JEE Main 2022 · 25 Jun · Shift 2

The metal ion (in gaseous state) with lowest spin-only magnetic moment value is :

- (A) V^{2+}
- (B) Ni^{2+}
- (C) Cr^{2+}
- (D) Fe^{2+}

[Step-by-step solution ► prepwiser.in/questions/0avLAHTKjq](https://www.prepwiser.in/questions/0avLAHTKjq)

Q41 JEE Main 2021 · 27 Aug · Shift 1

Match items of List-I with those of List-II :

List - I (Property)	List - II (Example)
(a) Diamagnetism	(i) MnO
(b) Ferrimagnetism	(ii) O_2
(c) Paramagnetism	(iii) NaCl
(d) Antiferromagnetism	(iv) Fe_3O_4

Choose the most appropriate answer from the options given below :

- (A) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)
- (B) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)
- (C) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
- (D) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)

[Step-by-step solution ► prepwiser.in/questions/-LjH6_5iIo](https://www.prepwiser.in/questions/-LjH6_5iIo)

Q42 JEE Main 2021 · 25 Jul · Shift 2

The spin only magnetic moments (in BM) for free Ti^{3+} , V^{2+} and Sc^{3+} ions respectively are :

(At.No. Sc : 21, Ti : 22, V : 23)

- (A) 3.87, 1.73, 0
- (B) 1.73, 3.87, 0
- (C) 1.73, 0, 3.87
- (D) 0, 3.87, 1.73

[Step-by-step solution ► prepwiser.in/questions/RIf8uNsLim](https://www.prepwiser.in/questions/RIf8uNsLim)

Q43 JEE Main 2021 · 25 Jul · Shift 1

Which one of the following species responds to an external magnetic field?

- (A) $[Fe(H_2O)_6]^{3+}$
- (B) $[Ni(CN)_4]^{2-}$
- (C) $[Co(CN)_6]^{3-}$
- (D) $[Ni(CO)_4]$

[Step-by-step solution ► prepwiser.in/questions/iIOcb9cDeM](https://www.prepwiser.in/questions/iIOcb9cDeM)

Q44 JEE Main 2021 · 20 Jul · Shift 2

Which one of the following species doesn't have a magnetic moment of 1.73 BM, (spin only value)?

- (A) O_2^+
- (B) CuI
- (C) $[Cu(NH_3)_4]Cl_2$
- (D) O_2^-

[Step-by-step solution ► prepwiser.in/questions/84aaX25gaf](https://www.prepwiser.in/questions/84aaX25gaf)

Q45 JEE Main 2021 · 18 Mar · Shift 2

The oxide that shows magnetic property is :

- (A) MgO
- (B) SiO_2
- (C) Mn_3O_4
- (D) Na_2O

[Step-by-step solution ► prepwiser.in/questions/7juZMCz15x](https://www.prepwiser.in/questions/7juZMCz15x)

Q46 JEE Main 2021 · 17 Mar · Shift 2

In the ground state of atomic Fe ($Z = 26$), the spin-only magnetic moment is _____ $\times 10^{-1}$ BM.
(Round off to the Nearest Integer). [Given : $\sqrt{3} = 1.73$, $\sqrt{2} = 1.41$]

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/enyTNb1t1n](https://www.prepwiser.in/questions/enyTNb1t1n)

Q47 JEE Main 2021 · 17 Mar · Shift 1

What is the spin-only magnetic moment value (BM) of a divalent metal ion with atomic number 25, in its aqueous solution?

- (A) zero
- (B) 5.26
- (C) 5.0
- (D) 5.92

[Step-by-step solution ► prepwiser.in/questions/bRtx2GhjjC](https://www.prepwiser.in/questions/bRtx2GhjjC)

Q48 JEE Main 2021 · 16 Mar · Shift 2

Arrange the following metal complex/compounds in the increasing order of spin only magnetic moment. Presume all the three, high spin system.

(Atomic numbers Ce = 58, Gd = 64 and Eu = 63)

(a) $(NH_4)_2[Ce(NO_3)_6]$

(b) $Gd(NO_3)_3$ and

(c) $Eu(NO_3)_3$

- (A) (a) < (b) < (c)
- (B) (b) < (a) < (c)
- (C) (a) < (c) < (b)
- (D) (c) < (a) < (b)

[Step-by-step solution ► prepwiser.in/questions/N5U03HLFYD](https://www.prepwiser.in/questions/N5U03HLFYD)

Q49 JEE Main 2020 · 4 Sep · Shift 1

The pair in which both the species have the same magnetic moment (spin only) is :

- (A) $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{CoCl}_4]^{2-}$
- (B) $[\text{Co}(\text{OH})_4]^{2-}$ and $[\text{Fe}(\text{NH}_3)_6]^{2+}$
- (C) $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{Cr}(\text{H}_2\text{O})]^{2+}$
- (D) $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$

[Step-by-step solution ► prepwisser.in/questions/UwRTKf-eAp](https://www.prepwisser.in/questions/UwRTKf-eAp)

Properties of Transition Metals · 28 PYQs

Q50 JEE Main 2025 · 7 Apr · Shift 1

The first transition series metal ' M ' has the highest enthalpy of atomisation in its series. One of its aquated ion (M^{n+}) exists in green colour. The nature of the oxide formed by the above M^{n+} ion is:

- (A) basic
- (B) neutral
- (C) amphoteric
- (D) acidic

[Step-by-step solution ► prepwisser.in/questions/RetkU4Grnx](https://www.prepwisser.in/questions/RetkU4Grnx)

Q51 JEE Main 2025 · 7 Apr · Shift 1

The number of valence electrons present in the metal among Cr, Co, Fe and Ni which has the lowest enthalpy of atomisation is :

- (A) 10
- (B) 6
- (C) 9
- (D) 8

[Step-by-step solution ► prepwisser.in/questions/cke-iasxaM](https://www.prepwisser.in/questions/cke-iasxaM)

Q52 JEE Main 2025 · 3 Apr · Shift 2

Given below are two statements:

Statement I : CrO_3 is a stronger oxidizing agent than MoO_3

Statement II : Cr(VI) is more stable than Mo(VI)

In the light of the above statements, choose the correct answer from the options given below

- (A) Statement I is true but Statement II is false
- (B) Both Statement I and Statement II are true
- (C) Both Statement I and Statement II are false
- (D) Statement I is false but Statement II is true

[Step-by-step solution ► prepwisser.in/questions/nXV6fCSaPr](https://www.prepwisser.in/questions/nXV6fCSaPr)

Q53 JEE Main 2025 · 29 Jan · Shift 1

The correct option with order of melting points of the pairs (Mn, Fe), (Tc, Ru) and (Re, Os) is :

- (A) $\text{Fe} < \text{Mn}$, $\text{Ru} < \text{Tc}$ and $\text{Re} < \text{Os}$
- (B) $\text{Fe} < \text{Mn}$, $\text{Ru} < \text{Tc}$ and $\text{Os} < \text{Re}$
- (C) $\text{Mn} < \text{Fe}$, $\text{Tc} < \text{Ru}$ and $\text{Re} < \text{Os}$
- (D) $\text{Mn} < \text{Fe}$, $\text{Tc} < \text{Ru}$ and $\text{Os} < \text{Re}$

[Step-by-step solution ► prepwisser.in/questions/D48dyAg3Ee](https://www.prepwisser.in/questions/D48dyAg3Ee)

Q54 JEE Main 2025 · 28 Jan · Shift 2

The amphoteric oxide among V_2O_3 , V_2O_4 and V_2O_5 , upon reaction with alkali leads to formation of an oxide anion. The oxidation state of V in the oxide anion is :

- (A) + 4
- (B) + 5
- (C) + 3
- (D) + 7

[Step-by-step solution ► prepwiser.in/questions/i6qTpxnsSo](https://www.prepwiser.in/questions/i6qTpxnsSo)

Q55 JEE Main 2024 · 9 Apr · Shift 2

Give below are two statements :

Statement I : The higher oxidation states are more stable down the group among transition elements unlike p-block elements.

Statement II : Copper can not liberate hydrogen from weak acids.

In the light of the above statements, choose the correct answer from the options given below :

- (A) Statement I is true but Statement II is false
- (B) Both Statement I and Statement II are false
- (C) Both Statement I and Statement II are true
- (D) Statement I is false but Statement II is true

[Step-by-step solution ► prepwiser.in/questions/fxgdF9YKlc](https://www.prepwiser.in/questions/fxgdF9YKlc)

Q56 JEE Main 2024 · 9 Apr · Shift 2

A transition metal 'M' among Sc, Ti, V, Cr, Mn and Fe has the highest second ionisation enthalpy. The spin-only magnetic moment value of M^+ ion is _____ BM (Near integer)

(Given atomic number

Sc : 21, Ti : 22, V : 23, Cr : 24, Mn : 25, Fe : 26

)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/-kkjVccEhQ](https://www.prepwiser.in/questions/-kkjVccEhQ)

Q57 JEE Main 2024 · 6 Apr · Shift 2

Arrange the following elements in the increasing order of number of unpaired electrons in it.

- (A) Sc
- (B) Cr
- (C) V
- (D) Ti
- (E) Mn

Choose the correct answer from the options given below :

- (A)** (A) < (D) < (C) < (B) < (E)
- (B)** (A) < (D) < (C) < (E) < (B)
- (C)** (B) < (C) < (D) < (E) < (A)
- (D)** (C) < (E) < (B) < (A) < (D)

[Step-by-step solution ► prepwiser.in/questions/LPvqV_ZLp8](https://www.prepwiser.in/questions/LPvqV_ZLp8)

Q58 JEE Main 2024 · 5 Apr · Shift 2

While preparing crystals of Mohr's salt, dil H_2SO_4 is added to a mixture of ferrous sulphate and ammonium sulphate, before dissolving this mixture in water, dil H_2SO_4 is added here to :

- (A)** prevent the hydrolysis of ferrous sulphate
- (B)** prevent the hydrolysis of ammonium sulphate
- (C)** increase the rate of formation of crystals
- (D)** make the medium strongly acidic

[Step-by-step solution ► prepwiser.in/questions/DqW8vzimRn](https://www.prepwiser.in/questions/DqW8vzimRn)

Q59 JEE Main 2024 · 5 Apr · Shift 2

The number of ions from the following that have the ability to liberate hydrogen from a dilute acid is _____.

Ti^{2+} , Cr^{2+} and V^{2+}

- (A)** 1 **(B)** 2
- (C)** 3 **(D)** 0

[Step-by-step solution ► prepwiser.in/questions/DiWhvoT1NV](https://www.prepwiser.in/questions/DiWhvoT1NV)

Q60 JEE Main 2024 · 4 Apr · Shift 2

A first row transition metal with highest enthalpy of atomisation, upon reaction with oxygen at high temperature forms oxides of formula M_2O_n (where $n = 3, 4, 5$). The 'spin-only' magnetic moment value of the amphoteric oxide from the above oxides is _____ BM (near integer)

(Given atomic number:

Sc : 21, Ti : 22, V : 23, Cr : 24, Mn : 25, Fe : 26, Co : 27, Ni : 28, Cu : 29, Zn : 30

)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/R1clIn6umd](https://www.prepwiser.in/questions/R1clIn6umd)

Q61 JEE Main 2024 · 1 Feb · Shift 2

The transition metal having highest 3rd ionisation enthalpy is :

- (A) Mn (B) Fe
(C) Cr (D) V

[Step-by-step solution ► prepwiser.in/questions/LE_FPKJ6IV](https://www.prepwiser.in/questions/LE_FPKJ6IV)

Q62 JEE Main 2024 · 1 Feb · Shift 2

Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : In aqueous solutions Cr^{2+} is reducing while Mn^{3+} is oxidising in nature.

Reason (R) : Extra stability to half filled electronic configuration is observed than incompletely filled electronic configuration.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (A) (A) is true but (R) is false
(B) Both (A) and (R) are true and (R) is the correct explanation of (A)
(C) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(D) (A) is false but (R) is true

[Step-by-step solution ► prepwiser.in/questions/mHptgCTOOH](https://www.prepwiser.in/questions/mHptgCTOOH)

Q63 JEE Main 2024 · 31 Jan · Shift 2

Choose the correct statements from the following

- A. Mn_2O_7 is an oil at room temperature
B. V_2O_4 reacts with acid to give VO_2^{2+}
C. CrO is a basic oxide
D. V_2O_5 does not react with acid

Choose the correct answer from the options given below :

- (A) A, B and D only (B) A, B and C only
(C) A and C only (D) B and C only

[Step-by-step solution ► prepwiser.in/questions/gQB1U28F-q](https://www.prepwiser.in/questions/gQB1U28F-q)

Q64 JEE Main 2024 · 29 Jan · Shift 2

Which of the following statements are correct about Zn, Cd and Hg ?

- A. They exhibit high enthalpy of atomization as the d-subshell is full.
B. Zn and Cd do not show variable oxidation state while Hg shows +I and +II.
C. Compounds of Zn, Cd and Hg are paramagnetic in nature.
D. Zn, Cd and Hg are called soft metals.

Choose the most appropriate from the options given below:

- (A) C, D only (B) B, C only
(C) A, D only (D) B, D only

[Step-by-step solution ► prepwiser.in/questions/xD0jpdDJIU](https://www.prepwiser.in/questions/xD0jpdDJIU)

Q65 JEE Main 2023 · 10 Apr · Shift 1

Prolonged heating is avoided during the preparation of ferrous ammonium sulphate to :

- (A) prevent hydrolysis (B) prevent breaking
(C) prevent oxidation (D) prevent reduction

[Step-by-step solution ► prepwiser.in/questions/pwHo609_6g](https://www.prepwiser.in/questions/pwHo609_6g)

Q66 JEE Main 2023 · 10 Apr · Shift 1

Which of the following statements are correct?

- (A) The M^{3+}/M^{2+} reduction potential for iron is greater than manganese.
(B) The higher oxidation states of first row d-block elements get stabilized by oxide ion.
(C) Aqueous solution of Cr^{2+} can liberate hydrogen from dilute acid.
(D) Magnetic moment of V^{2+} is observed between 4.4 - 5.2 BM.

Choose the correct answer from the options given below :

- (A) (B), (C) only (B) (A), (B) only
(C) (A), (B), (D) only (D) (C), (D) only

[Step-by-step solution ► prepwiser.in/questions/9AjTk_-veY](https://www.prepwiser.in/questions/9AjTk_-veY)

Q67 JEE Main 2023 · 1 Feb · Shift 2

Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : Cu^{2+} in water is more stable than Cu^{+} .

Reason (R) : Enthalpy of hydration for Cu^{2+} is much less than that of Cu^{+} .

In the light of the above statements, choose the correct answer from the options given below :

- (A) (A) is correct but (R) is not correct
(B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(C) (A) is not correct but (R) is correct
(D) Both (A) and (R) are correct and (R) is the correct explanation of (A)

[Step-by-step solution ► prepwiser.in/questions/LYE7gWJw6-](https://www.prepwiser.in/questions/LYE7gWJw6-)

Q68 JEE Main 2022 · 29 Jul · Shift 1

The reaction of zinc with excess of aqueous alkali, evolves hydrogen gas and gives :

- (A) $Zn(OH)_2$
(B) ZnO
(C) $[Zn(OH)_4]^{2-}$
(D) $[ZnO_2]^{2-}$

[Step-by-step solution ► prepwiser.in/questions/cmDpSTp_x-](https://www.prepwiser.in/questions/cmDpSTp_x-)

Q69 JEE Main 2022 · 24 Jun · Shift 2

Metals generally melt at very high temperature. Amongst the following, the metal with the highest melting point will be :

- (A) Hg (B) Ag
(C) Ga (D) Cs

[Step-by-step solution ► prepwiser.in/questions/-PwF3vgpBh](https://www.prepwiser.in/questions/-PwF3vgpBh)

Q70 JEE Main 2021 · 27 Aug · Shift 2

The addition of dilute NaOH to Cr^{3+} salt solution will give :

- (A) a solution of $[\text{Cr}(\text{OH})_4]^-$
- (B) precipitate of $\text{Cr}_2\text{O}_3(\text{H}_2\text{O})_n$
- (C) precipitate of $[\text{Cr}(\text{OH})_6]^{3-}$
- (D) precipitate of $\text{Cr}(\text{OH})_3$

[Step-by-step solution ► prepwisser.in/questions/s4OHj_Ct6I](https://www.prepwisser.in/questions/s4OHj_Ct6I)

Q71 JEE Main 2021 · 27 Aug · Shift 1

The nature of oxides V_2O_3 and CrO is indexed as 'X' and 'Y' type respectively. The correct set of X and Y is :

- (A) X = basic Y = amphoteric
- (B) X = amphoteric Y = basic
- (C) X = acidic Y = acidic
- (D) X = basic Y = basic

[Step-by-step solution ► prepwisser.in/questions/WJpDujmTtb](https://www.prepwisser.in/questions/WJpDujmTtb)

Q72 JEE Main 2021 · 26 Aug · Shift 1

Which one of the following when dissolved in water gives coloured solution in nitrogen atmosphere?

- (A) CuCl_2
- (B) AgCl
- (C) ZnCl_2
- (D) Cu_2Cl_2

[Step-by-step solution ► prepwisser.in/questions/F82fIA2Cij](https://www.prepwisser.in/questions/F82fIA2Cij)

Q73 JEE Main 2021 · 25 Feb · Shift 2

The major components of German Silver are :

- | | |
|-------------------|-------------------|
| (A) Zn, Ni and Ag | (B) Cu, Zn and Ni |
| (C) Cu, Zn and Ag | (D) Ge, Cu and Ag |

[Step-by-step solution ► prepwisser.in/questions/tqMedeSivd](https://www.prepwisser.in/questions/tqMedeSivd)

Q74 JEE Main 2021 · 24 Feb · Shift 1

The electrode potential of M^{2+}/M of 3d-series elements shows positive value for :

- | | |
|--------|--------|
| (A) Zn | (B) Fe |
| (C) Cu | (D) Co |

[Step-by-step solution ► prepwisser.in/questions/8yD83hS64F](https://www.prepwisser.in/questions/8yD83hS64F)

Q75 JEE Main 2020 · 6 Sep · Shift 1

The set that contains atomic numbers of only transition elements, is :

- (A) 21, 32, 53, 64 (B) 9, 17, 34, 38
(C) 37, 42, 50, 64 (D) 21, 25, 42, 72

[Step-by-step solution ► prepwiser.in/questions/GFvdFgINyE](https://www.prepwiser.in/questions/GFvdFgINyE)

Q76 JEE Main 2020 · 4 Sep · Shift 2

The incorrect statement(s) among (a) - (c) is (are)

- (a) W(VI) is more stable than Cr(VI).
(b) In the presence of HCl, permanganate titrations provide satisfactory results.
(c) Some lanthanoid oxides can be used as phosphors.

- (A) (a) and (b) only (B) (a) only
(C) (b) only (D) (b) and (c) only

[Step-by-step solution ► prepwiser.in/questions/_aItDrq0E](https://www.prepwiser.in/questions/_aItDrq0E)

Q77 JEE Main 2020 · 9 Jan · Shift 2

5 g of zinc is treated separately with an excess of

- (a) dilute hydrochloric acid and
(b) aqueous sodium hydroxide.

The ratio of the volumes of H_2 evolved in these two reactions is :

- (A) 1 : 2 (B) 1 : 1
(C) 1 : 4 (D) 2 : 1

[Step-by-step solution ► prepwiser.in/questions/EA7a522Hik](https://www.prepwiser.in/questions/EA7a522Hik)

KMnO₄ and K₂Cr₂O₇ · 26 PYQs

Q78 JEE Main 2025 · 28 Jan · Shift 1

Which of the following oxidation reactions are carried out by both $K_2Cr_2O_7$ and $KMnO_4$ in acidic medium?

- A. $I^- \rightarrow I_2$
B. $S^{2-} \rightarrow S$
C. $Fe^{2+} \rightarrow Fe^{3+}$
D. $I^- \rightarrow IO_3^-$
E. $S_2O_3^{2-} \rightarrow SO_4^{2-}$

Choose the correct answer from the options given below :

- (A) A, B and C Only (B) C, D and E Only
(C) B, C and D Only (D) A, D and E Only

[Step-by-step solution ► prepwiser.in/questions/ObvXLraPnE](https://www.prepwiser.in/questions/ObvXLraPnE)

Q79 JEE Main 2025 · 28 Jan · Shift 1

Given below are two statements:

Statement I: In the oxalic acid vs KMnO_4 (in the presence of dil H_2SO_4) titration the solution needs to be heated initially to 60°C , but no heating is required in Ferrous ammonium sulphate (FAS) vs KMnO_4 titration (in the presence of dil H_2SO_4)

Statement II: In oxalic acid vs KMnO_4 titration, the initial formation of MnSO_4 takes place at high temperature, which then acts as catalyst for further reaction. In the case of FAS vs KMnO_4 , heating oxidizes Fe^{2+} into Fe^{3+} by oxygen of air and error may be introduced in the experiment.

In the light of the above statements, choose the correct answer from the options given below

- (A) Statement I is false but Statement II is true
- (B) Statement I is true but Statement II is false
- (C) Both Statement I and Statement II are true
- (D) Both Statement I and Statement II are false

[Step-by-step solution ► prepwiser.in/questions/fKOSA7agG6](https://www.prepwiser.in/questions/fKOSA7agG6)

Q80 JEE Main 2025 · 24 Jan · Shift 1

Preparation of potassium permanganate from MnO_2 involves two step process in which the 1st step is a reaction with KOH and KNO_3 to produce

- (A) K_3MnO_4
- (B) $\text{K}_4[\text{Mn}(\text{OH})_6]$
- (C) K_2MnO_4
- (D) KMnO_4

[Step-by-step solution ► prepwiser.in/questions/Yg3CdRbehX](https://www.prepwiser.in/questions/Yg3CdRbehX)

Q81 JEE Main 2025 · 23 Jan · Shift 2

Consider the following reactions



The products $[\text{A}]$ and $[\text{B}]$, respectively are :

- (A) $\text{K}_2\text{Cr}(\text{OH})_6$ and Cr_2O_3
- (B) K_2CrO_4 and Cr_2O_3
- (C) K_2CrO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$
- (D) K_2CrO_4 and CrO

[Step-by-step solution ► prepwiser.in/questions/i56IqDF5RS](https://www.prepwiser.in/questions/i56IqDF5RS)

Q82 JEE Main 2024 · 8 Apr · Shift 2

Given below are two statements :

Statement (I) : Fusion of MnO_2 with KOH and an oxidising agent gives dark green K_2MnO_4 .

Statement (II) : Manganate ion on electrolytic oxidation in alkaline medium gives permanganate ion.

In the light of the above statements, choose the correct answer from the options given below :

- (A) Statement I is false but Statement II is true
- (B) Statement I is true but Statement II is false
- (C) Both Statement I and Statement II are false
- (D) Both Statement I and Statement II are true

[Step-by-step solution ► prepwisser.in/questions/7x3jrNq8hC](https://www.prepwisser.in/questions/7x3jrNq8hC)

Q83 JEE Main 2024 · 6 Apr · Shift 1

The difference in the 'spin-only' magnetic moment values of KMnO_4 and the manganese product formed during titration of KMnO_4 against oxalic acid in acidic medium is _____ BM. (nearest integer)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/Bda1K00K4w](https://www.prepwisser.in/questions/Bda1K00K4w)

Q84 JEE Main 2024 · 5 Apr · Shift 2

The fusion of chromite ore with sodium carbonate in the presence of air leads to the formation of products A and B along with the evolution of CO_2 . The sum of spin-only magnetic moment values of A and B is _____ B.M. (Nearest integer)

[Given atomic number : C : 6, Na : 11, O : 8, Fe : 26, Cr : 24]

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/qZrY4v1YRK](https://www.prepwisser.in/questions/qZrY4v1YRK)

Q85 JEE Main 2024 · 4 Apr · Shift 1

Consider the following reaction



Product 'A' in neutral or acidic medium disproportionate to give products 'B' and 'C' along with water.

The sum of spin-only magnetic moment values of B and C is _____ BM. (nearest integer) (Given atomic number of Mn is 25)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/MiZ_gNNceh](https://www.prepwisser.in/questions/MiZ_gNNceh)

Q86 JEE Main 2024 · 31 Jan · Shift 1

Identify correct statements from below:

- A. The chromate ion is square planar.
- B. Dichromates are generally prepared from chromates.
- C. The green manganate ion is diamagnetic.
- D. Dark green coloured K_2MnO_4 disproportionates in a neutral or acidic medium to give permanganate.
- E. With increasing oxidation number of transition metal, ionic character of the oxides decreases.

Choose the correct answer from the options given below:

- (A) B, D, E only
- (B) A, B, C only
- (C) A, D, E only
- (D) B, C, D only

[Step-by-step solution ► prepwisser.in/questions/U-dPWY-Qsn](https://www.prepwisser.in/questions/U-dPWY-Qsn)

Q87 JEE Main 2024 · 30 Jan · Shift 2

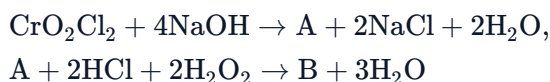
Alkaline oxidative fusion of MnO_2 gives "A" which on electrolytic oxidation in alkaline solution produces B. A and B respectively are

- (A) Mn_2O_3 and MnO_4^{2-}
- (B) Mn_2O_7 and MnO_4^-
- (C) MnO_4^{2-} and MnO_4^-
- (D) MnO_4^{2-} and Mn_2O_7

[Step-by-step solution ► prepwisser.in/questions/O7s8Cra7US](https://www.prepwisser.in/questions/O7s8Cra7US)

Q88 JEE Main 2024 · 30 Jan · Shift 2

A and B formed in the following reactions are:



- (A) $\text{A} = \text{Na}_2\text{Cr}_2\text{O}_7$, $\text{B} = \text{CrO}_5$
- (B) $\text{A} = \text{Na}_2\text{CrO}_4$, $\text{B} = \text{CrO}_5$
- (C) $\text{A} = \text{Na}_2\text{Cr}_2\text{O}_4$, $\text{B} = \text{CrO}_4$
- (D) $\text{A} = \text{Na}_2\text{Cr}_2\text{O}_7$, $\text{B} = \text{CrO}_3$

[Step-by-step solution ► prepwisser.in/questions/LpSqhO16eI](https://www.prepwisser.in/questions/LpSqhO16eI)

Q89 JEE Main 2024 · 29 Jan · Shift 1

KMnO_4 decomposes on heating at 513K to form O_2 along with

- (A) K_2MnO_4 & Mn
- (B) MnO_2 & K_2O_2
- (C) K_2MnO_4 & MnO_2
- (D) Mn & KO_2

[Step-by-step solution ► prepwisser.in/questions/NKBMkA6FyO](https://www.prepwisser.in/questions/NKBMkA6FyO)

Q90 JEE Main 2024 · 29 Jan · Shift 2

The correct IUPAC name of K_2MnO_4 is

- (A) Potassium tetraoxidomanganate (VI) (B) Dipotassium tetraoxidomanganate (VII)
(C) Potassium tetraoxopermanganate (VI) (D) Potassium tetraoxidomanganese (VI)

Step-by-step solution ► [prepwiser.in/questions/CGNYjrh1KX](https://www.prepwiser.in/questions/CGNYjrh1KX)

Q91 JEE Main 2024 · 27 Jan · Shift 1

Yellow compound of lead chromate gets dissolved on treatment with hot NaOH solution. The product of lead formed is a :

- (A) Tetraanionic complex with coordination number six
(B) Neutral complex with coordination number four
(C) Dianionic complex with coordination number six
(D) Dianionic complex with coordination number four

Step-by-step solution ► [prepwiser.in/questions/hN7IstP5I1](https://www.prepwiser.in/questions/hN7IstP5I1)

Q92 JEE Main 2023 · 25 Jan · Shift 2

Potassium dichromate acts as a strong oxidizing agent in acidic solution. During this process, the oxidation state changes from :

- (A) + 2 to + 1 (B) + 6 to + 2
(C) + 6 to + 3 (D) + 3 to + 1

Step-by-step solution ► [prepwiser.in/questions/bR68kQf4ps](https://www.prepwiser.in/questions/bR68kQf4ps)

Q93 JEE Main 2023 · 24 Jan · Shift 2

$\text{K}_2\text{Cr}_2\text{O}_7$ paper acidified with dilute H_2SO_4 turns green when exposed to :

- (A) Sulphur dioxide (B) Sulphur trioxide
(C) Hydrogen sulphide (D) Carbon dioxide

Step-by-step solution ► [prepwiser.in/questions/Khny1NbE2P](https://www.prepwiser.in/questions/Khny1NbE2P)

Q94 JEE Main 2022 · 29 Jul · Shift 1

In neutral or faintly alkaline medium, KMnO_4 being a powerful oxidant can oxidize, thiosulphate almost quantitatively, to sulphate. In this reaction overall change in oxidation state of manganese will be :

- (A) 5 (B) 1
(C) 0 (D) 3

Step-by-step solution ► [prepwiser.in/questions/GkiFlxXt69](https://www.prepwiser.in/questions/GkiFlxXt69)

Q95 JEE Main 2022 · 28 Jul · Shift 1

The disproportionation of MnO_4^{2-} in acidic medium resulted in the formation of two manganese compounds A and B. If the oxidation state of Mn in B is smaller than that of A, then the spin-only magnetic moment (μ) value of B in BM is _____. (Nearest integer)

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/yVDSepbeUZ](https://www.prepwiser.in/questions/yVDSepbeUZ)

Q96 JEE Main 2022 · 28 Jul · Shift 2

Given below are two statements : One is labelled as Assertion A and the other is labelled as Reason R
Assertion A : Permanganate titrations are not performed in presence of hydrochloric acid.

Reason R : Chlorine is formed as a consequence of oxidation of hydrochloric acid.

In the light of the above statements, choose the correct answer from the options given below

- (A) Both A and R are true and R is the correct explanation of A
- (B) Both A and R are true but R is NOT the correct explanation of A
- (C) A is true but R is false
- (D) A is false but R is true

[Step-by-step solution ► prepwisser.in/questions/GCvzD4o12Z](https://www.prepwisser.in/questions/GCvzD4o12Z)

Q97 JEE Main 2022 · 27 Jul · Shift 2

The oxidation state of manganese in the product obtained in a reaction of potassium permanganate and hydrogen peroxide in basic medium is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/XWMQRQ_xVV](https://www.prepwisser.in/questions/XWMQRQ_xVV)

Q98 JEE Main 2022 · 29 Jun · Shift 1

An acidified manganate solution undergoes disproportionation reaction. The spin-only magnetic moment value of the product having manganese in higher oxidation state is _____ B.M. (Nearest integer)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/Tmyh3Eq-OD](https://www.prepwisser.in/questions/Tmyh3Eq-OD)

Q99 JEE Main 2022 · 27 Jun · Shift 1

Acidified potassium permanganate solution oxidises oxalic acid. The spin-only magnetic moment of the manganese product formed from the above reaction is _____ B.M. (Nearest integer)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/wq7F4wmW4C](https://www.prepwisser.in/questions/wq7F4wmW4C)

Q100 JEE Main 2022 · 24 Jun · Shift 1

The difference in oxidation state of chromium in chromate and dichromate salts is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/gF7qQDmCwE](https://www.prepwisser.in/questions/gF7qQDmCwE)

Q101 JEE Main 2021 · 27 Aug · Shift 2

Potassium permanganate on heating at 513 K gives a product which is :

- (A) paramagnetic and colourless
- (B) diamagnetic and green
- (C) diamagnetic and colourless
- (D) paramagnetic and green

[Step-by-step solution ► prepwisser.in/questions/pVL6Ifk-LB](https://www.prepwisser.in/questions/pVL6Ifk-LB)

Q102 JEE Main 2021 · 17 Mar · Shift 1

Given below are two statements :

Statement I : Potassium permanganate on heating at 573K forms potassium manganate.

Statement II : Both potassium permanganate and potassium manganate are tetrahedral and paramagnetic in nature.

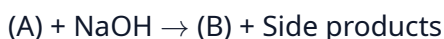
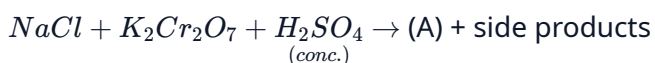
In the light of the above statements, choose the most appropriate answer from the options given below :

- (A) Statement I is true but statement II is false
- (B) Statement I is false but statement II is true
- (C) Both statement I and statement II are false
- (D) Both statement I and statement II are true

[Step-by-step solution ► prepwiser.in/questions/BbBYmHgMDj](https://www.prepwiser.in/questions/BbBYmHgMDj)

Q103 JEE Main 2020 · 7 Jan · Shift 2

Consider the following reactions :



The sum of the total number of atoms in one molecule each of (A) and (B) and (C) is

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/HNdF_Qtxd4](https://www.prepwiser.in/questions/HNdF_Qtxd4)

Lanthanides and Lanthanoid Contraction · 25 PYQs

Q104 JEE Main 2025 · 24 Jan · Shift 1

Which of the following ions is the strongest oxidizing agent? (Atomic Number of Ce = 58, Eu = 63, Tb = 65, Lu = 71)

- | | |
|---------------|---------------|
| (A) Lu^{3+} | (B) Eu^{2+} |
| (C) Tb^{4+} | (D) Ce^{3+} |

[Step-by-step solution ► prepwiser.in/questions/yoLEhpGXvF](https://www.prepwiser.in/questions/yoLEhpGXvF)

Q105 JEE Main 2025 · 22 Jan · Shift 1

Lanthanoid ions with $4f^7$ configuration are :

- (A) Eu^{2+}
- (B) Gd^{3+}
- (C) Eu^{3+}
- (D) Tb^{3+}
- (E) Sm^{2+}

Choose the correct answer from the options given below :

- | | |
|----------------------|----------------------|
| (A) (B) and (E) only | (B) (B) and (C) only |
| (C) (A) and (D) only | (D) (A) and (B) only |

[Step-by-step solution ► prepwiser.in/questions/NAywJ6SbmA](https://www.prepwiser.in/questions/NAywJ6SbmA)

Q106 JEE Main 2024 · 9 Apr · Shift 1

Number of colourless lanthanoid ions among the following is _____.



Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/vyXy9GXmnk](https://www.prepwiser.in/questions/vyXy9GXmnk)

Q107 JEE Main 2024 · 6 Apr · Shift 1

The number of element from the following that do not belong to lanthanoids is Eu, Cm, Er, Tb, Yb and Lu

- | | |
|-------|-------|
| (A) 3 | (B) 1 |
| (C) 4 | (D) 5 |

[Step-by-step solution ► prepwiser.in/questions/qR30c7brxu](https://www.prepwiser.in/questions/qR30c7brxu)

Q108 JEE Main 2024 · 30 Jan · Shift 1

Diamagnetic Lanthanoid ions are :

- | | |
|---|---|
| (A) La^{3+} & Ce^{4+} | (B) Nd^{3+} & Ce^{4+} |
| (C) Lu^{3+} & Eu^{3+} | (D) Nd^{3+} & Eu^{3+} |

[Step-by-step solution ► prepwiser.in/questions/5pGjKf712S](https://www.prepwiser.in/questions/5pGjKf712S)

Q109 JEE Main 2024 · 29 Jan · Shift 2

Which of the following acts as a strong reducing agent? (Atomic number: Ce = 58, Eu = 63, Gd = 64, Lu = 71)

- | | |
|----------------------|----------------------|
| (A) Eu^{2+} | (B) Gd^{3+} |
| (C) Lu^{3+} | (D) Ce^{4+} |

[Step-by-step solution ► prepwiser.in/questions/1EXrT9wSyG](https://www.prepwiser.in/questions/1EXrT9wSyG)

Q110 JEE Main 2024 · 27 Jan · Shift 2

Given below are two statements :

Statement (I) : In the Lanthanoids, the formation Ce^{+4} is favoured by its noble gas configuration.

Statement (II) : Ce^{+4} is a strong oxidant reverting to the common +3 state.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (A) Both Statement I and Statement II are false
- (B) Statement I is true but Statement II is false
- (C) Both Statement I and Statement II are true
- (D) Statement I is false but Statement II is true

[Step-by-step solution ► prepwiser.in/questions/74E9-HyT0M](https://www.prepwiser.in/questions/74E9-HyT0M)

Q111 JEE Main 2023 · 13 Apr · Shift 1

The pair of lanthanides in which both elements have high third - ionization energy is :

- (A) Dy, Gd
- (B) Lu, Yb
- (C) Eu, Yb
- (D) Eu, Gd

[Step-by-step solution ► prepwiser.in/questions/JLaehoBh00](https://www.prepwiser.in/questions/JLaehoBh00)

Q112 JEE Main 2023 · 12 Apr · Shift 1

Given below are two statement: one is labelled as Assertion **A** and the other is labelled as Reason **R**

Assertion A: 5f electrons can participate in bonding to a far greater extent than 4f electrons

Reason R: 5f orbitals are not as buried as 4f orbitals

In the light of the above statements, choose the correct answer from the options given below

- (A) Both A and R are true and R is the correct explanation of A
- (B) Both A and R are true but R is NOT the correct explanation of A
- (C) A is true but R is false
- (D) A is false but R is true

[Step-by-step solution ► prepwiser.in/questions/xKXrktNdMi](https://www.prepwiser.in/questions/xKXrktNdMi)

Q113 JEE Main 2023 · 31 Jan · Shift 1

$Nd^{2+} =$ _____

- (A) $4f^4 6s^2$
- (B) $4f^3$
- (C) $4f^4$
- (D) $4f^2 6s^2$

[Step-by-step solution ► prepwiser.in/questions/vuOG59zfPn](https://www.prepwiser.in/questions/vuOG59zfPn)

Q114 JEE Main 2023 · 24 Jan · Shift 2

Which one amongst the following are good oxidizing agents?

- A. Sm^{2+}
- B. Ce^{2+}
- C. Ce^{4+}
- D. Tb^{4+}

Choose the most appropriate answer from the options given below :

- (A) C and D only
- (B) A and B only
- (C) D only
- (D) C only

Step-by-step solution ► [prepwisser.in/questions/SfhJnOhAeC](https://www.prepwisser.in/questions/SfhJnOhAeC)

Q115 JEE Main 2022 · 28 Jun · Shift 1

Which one of the lanthanoids given below is the most stable in divalent form?

- (A) Ce (Atomic Number 58)
- (B) Sm (Atomic number 62)
- (C) Eu (Atomic Number 63)
- (D) Yb (Atomic Number 70)

Step-by-step solution ► [prepwisser.in/questions/HBTtNeRRad](https://www.prepwisser.in/questions/HBTtNeRRad)

Q116 JEE Main 2022 · 27 Jun · Shift 2

The 'f' orbitals are half and completely filled, respectively in lanthanide ions :

[Given : Atomic no. Eu, 63; Sm, 62; Tm, 69; Tb, 65; Yb, 70; Dy, 66]

- (A) Eu^{2+} and Tm^{2+}
- (B) Sm^{2+} and Tm^{3+}
- (C) Tb^{4+} and Yb^{2+}
- (D) Dy^{3+} and Yb^{3+}

Step-by-step solution ► [prepwisser.in/questions/TvUpwooATp](https://www.prepwisser.in/questions/TvUpwooATp)

Q117 JEE Main 2022 · 26 Jun · Shift 2

The most common oxidation state of Lanthanoid elements is +3. Which of the following is likely to deviate easily from +3 oxidation state?

- (A) Ce (At. No. 58)
- (B) La (At. No. 57)
- (C) Lu (At. No. 71)
- (D) Gd (At. No. 64)

Step-by-step solution ► [prepwisser.in/questions/G8qytIJNH-](https://www.prepwisser.in/questions/G8qytIJNH-)

Q118 JEE Main 2022 · 25 Jun · Shift 1

Cerium (IV) has a noble gas configuration. Which of the following is correct statement about it?

- (A) It will not prefer to undergo redox reactions.
- (B) It will prefer to gain electron and act as an oxidizing agent.
- (C) It will prefer to give away an electron and behave as reducing agent.
- (D) It acts as both, oxidizing and reducing agent.

Step-by-step solution ► [prepwisser.in/questions/r7qgWVFz6o](https://www.prepwisser.in/questions/r7qgWVFz6o)

Q119 JEE Main 2021 · 31 Aug · Shift 2

The Eu^{2+} ion is a strong reducing agent in spite of its ground state electronic configuration (outermost) :
[Atomic number of Eu = 63]

- (A) $4f^7 6s^2$
- (B) $4f^6$
- (C) $4f^7$
- (D) $4f^6 6s^2$

[Step-by-step solution ► prepwiser.in/questions/Pzy4ZtKGND](https://www.prepwiser.in/questions/Pzy4ZtKGND)

Q120 JEE Main 2021 · 31 Aug · Shift 1

Which one of the following lanthanides exhibits +2 oxidation state with diamagnetic nature? (Given Z for Nd = 60, Yb = 70, La = 57, Ce = 58)

- (A) Nd
- (B) Yb
- (C) La
- (D) Ce

[Step-by-step solution ► prepwiser.in/questions/EFdhIj29x-](https://www.prepwiser.in/questions/EFdhIj29x-)

Q121 JEE Main 2021 · 27 Aug · Shift 1

The number of f electrons in the ground state electronic configuration of Np (Z = 93) is _____.
(Nearest integer)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/PfjS1vMMzx](https://www.prepwiser.in/questions/PfjS1vMMzx)

Q122 JEE Main 2021 · 16 Mar · Shift 1

Given below are two statement : one is labelled as Assertion A and the other is labelled as Reason R :

Assertion A : Size of Bk^{3+} ion is less than Np^{3+} ion.

Reason R : The above is a consequence of the lanthanoid contraction.

In the light of the above statements, choose the correct answer from the options given below :

- (A) Both A and B are true and R is the correct explanation of A
- (B) A is false but R is true
- (C) A is true but R is false
- (D) Both A and B are true but R is not the correct explanation of A

[Step-by-step solution ► prepwiser.in/questions/3JX2nqGQ6H](https://www.prepwiser.in/questions/3JX2nqGQ6H)

Q123 JEE Main 2021 · 16 Mar · Shift 1

Given below are two statements :

Statement I : The E° value for $\text{Ce}^{4+} / \text{Ce}^{3+}$ is + 1.74 V.

Statement II : Ce is more stable in Ce^{4+} state than Ce^{3+} state.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (A) Statement I is incorrect but statement II is correct
- (B) Both statement I and statement II are correct
- (C) Both statement I and statement II are incorrect
- (D) Statement I is correct but statement II is incorrect

Step-by-step solution ► [prepwiser.in/questions/cCCrGZKE_-](https://www.prepwiser.in/questions/cCCrGZKE_-)

Q124 JEE Main 2021 · 26 Feb · Shift 1

Which one of the following lanthanoids does not form MO_2 ? [M is lanthanoid metal]

- | | |
|--------|--------|
| (A) Nd | (B) Dy |
| (C) Yb | (D) Pr |

Step-by-step solution ► [prepwiser.in/questions/603wxnlZqr](https://www.prepwiser.in/questions/603wxnlZqr)

Q125 JEE Main 2021 · 25 Feb · Shift 1

Given below are two statements :

Statement I : CeO_2 can be used for oxidation of aldehydes and ketones.

Statement II : Aqueous solution of EuSO_4 is a strong reducing agent.

In the light of the above statements, choose the correct answer from the options given below :

- (A) Statement I is true but Statement II is false.
- (B) Statement I is false but Statement II is true
- (C) Both Statement I and Statement II are false
- (D) Both Statement I and Statement II are true

Step-by-step solution ► [prepwiser.in/questions/WHIJBj6bf8](https://www.prepwiser.in/questions/WHIJBj6bf8)

Q126 JEE Main 2020 · 6 Sep · Shift 2

Mischmetal is an alloy consisting mainly of :

- | | |
|------------------------------------|------------------------------------|
| (A) lanthanoid and actinoid metals | (B) actinoid and transition metals |
| (C) lanthanoid metals | (D) actinoid metals |

Step-by-step solution ► [prepwiser.in/questions/qzbnvSmabo](https://www.prepwiser.in/questions/qzbnvSmabo)

Q127 JEE Main 2020 · 6 Sep · Shift 1

The lanthanoid that does NOT show +4 oxidation state is :

- (A) Tb (B) Dy
(C) Ce (D) Eu

[Step-by-step solution ► prepwisser.in/questions/vaabXOZsK3](https://www.prepwisser.in/questions/vaabXOZsK3)

Q128 JEE Main 2020 · 9 Jan · Shift 1

The electronic configurations of bivalent europium and trivalent cerium are (atomic number : Xe = 54, Ce = 58, Eu = 63)

- (A) [Xe] $4f^7 6s^2$ and [Xe] $4f^2 6s^2$
(B) [Xe] $4f^2$ and [Xe] $4f^7$
(C) [Xe] $4f^4$ and [Xe] $4f^9$
(D) [Xe] $4f^7$ and [Xe] $4f^1$

[Step-by-step solution ► prepwisser.in/questions/2BqqBNJaST](https://www.prepwisser.in/questions/2BqqBNJaST)

Actinides · 3 PYQs

Q129 JEE Main 2022 · 25 Jul · Shift 1

The IUPAC nomenclature of an element with electronic configuration [Rn] $5f^{14}6d^17s^2$ is :

- (A) Unnilbium (B) Unnilunium
(C) Unnilquadium (D) Unniltrium

[Step-by-step solution ► prepwisser.in/questions/GI-4OLm_oj](https://www.prepwisser.in/questions/GI-4OLm_oj)

Q130 JEE Main 2020 · 6 Sep · Shift 2

The atomic number of Unnilunium is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/Aq_08nP4FW](https://www.prepwisser.in/questions/Aq_08nP4FW)

Q131 JEE Main 2020 · 4 Sep · Shift 1

The elements with atomic numbers 101 and 104 belong to, respectively :

- (A) Group 6 and Actinoids (B) Actinoids and Group 4
(C) Group 11 and Group 4 (D) Actinoids and Group 6

[Step-by-step solution ► prepwisser.in/questions/GWP7hn5TWy](https://www.prepwisser.in/questions/GWP7hn5TWy)

Answer key — d & f Block Elements

Numbers match the question numbers above. For full working, open the solution link under each question.

1	5	2	A	3	A	4	B	5	D	6	B	7	A	8	D
9	B	10	D	11	D	12	A	13	3	14	C	15	A	16	C
17	B	18	19	19	C	20	D	21	B	22	0	23	0	24	877
25	5	26	B	27	D	28	B	29	4	30	4	31	6	32	2
33	B	34	2	35	A	36	5	37	4	38	5	39	3	40	B
41	C	42	B	43	A	44	B	45	C	46	49	47	D	48	C
49	D	50	A	51	B	52	A	53	D	54	B	55	C	56	6
57	B	58	A	59	C	60	0	61	A	62	B	63	C	64	D
65	C	66	A	67	A	68	C	69	B	70	B	71	D	72	A
73	B	74	C	75	D	76	C	77	B	78	A	79	C	80	C
81	C	82	D	83	6	84	6	85	4	86	A	87	C	88	B
89	C	90	A	91	D	92	C	93	A	94	D	95	4	96	A
97	4	98	0	99	6	100	0	101	D	102	A	103	18	104	C
105	D	106	2	107	B	108	A	109	A	110	C	111	C	112	A
113	C	114	A	115	C	116	C	117	A	118	B	119	C	120	B
121	18	122	C	123	D	124	C	125	D	126	C	127	D	128	D
129	D	130	101	131	B										

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