

CUET · CHEMISTRY · CLASS XII · CODE 306

The d- and f-Block Elements

CUET unit: The d- and f-Block Elements

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Snapshot

- Establishes the chemistry of the d-block (Groups 3–12, four series 3d/4d/5d/6d) and the f-block (lanthanoids 4f, actinoids 5f) of the periodic table.
- Builds the characteristic features that arise from partly filled $(n-1)d$ and 4f/5f orbitals: variable oxidation states, paramagnetism, coloured ions, complex formation, catalytic action, interstitial compounds and alloys.
- Develops trends across the 3d series: atomic/ionic radii, ionisation enthalpy, enthalpy of atomisation, M^{2+}/M and M^{3+}/M^{2+} electrode potentials, with special role of half-filled and fully-filled d-configurations.
- Treats two anchor compounds in depth — $K_2Cr_2O_7$ (from chromite) and $KMnO_4$ (from pyrolusite) — including preparation and oxidising action in acidic/neutral/alkaline media.
- Closes with lanthanoid contraction and its consequences, and the more complex chemistry of the radioactive actinoids — favourite CUET territory.

Detailed Notes

2.1 Core concepts

- The d-block contains Groups 3–12 in which $(n-1)d$ orbitals are progressively filled across four long periods, giving four series: 3d (Sc–Zn), 4d (Y–Cd), 5d (La and Hf–Hg) and 6d (Ac and Rf–Cn) (NCERT §Intro/§4.1, p. 89–90).
- IUPAC defines transition metals as metals having an incomplete d subshell either in the neutral atom or in ions; Zn, Cd, Hg (and Cn) have full d^{10} configuration in ground state and common oxidation states, so they are not regarded as transition metals though studied with them (NCERT §Intro, p. 89).
- The general outer electronic configuration is $(n-1)d^{1-10} ns^{1-2}$, except Pd which is $4d^{10}5s^0$; small $(n-1)d$ – ns energy gap plus extra stability of half/fully filled sets explains anomalies — Cr is $3d^54s^1$ (not $3d^44s^2$) and Cu is $3d^{10}4s^1$ (not $3d^94s^2$) (NCERT §4.2, p. 90).
- Almost all transition elements show typical metallic properties — high tensile strength, ductility, malleability, high thermal/electrical conductivity, metallic lustre, hcp/bcc/ccp structures (exceptions Zn, Cd, Hg, Mn) (NCERT §4.3.1, p. 92).
- Melting points are high and rise to a maximum at d^5 in each row (with anomalies at Mn and Tc); high enthalpies of atomisation arise because one unpaired electron per

- d orbital favours strong interatomic bonding; 2nd and 3rd series have higher $\Delta_a H$ than the first, explaining frequent metal-metal bonding in heavy transition metals (NCERT §4.3.1, p. 92–93).
- Atomic/ionic radii decrease across a series due to ineffective d-electron shielding; 4d radii > 3d radii, but 5d radii are nearly equal to 4d because of lanthanoid contraction — the regular size decrease across the 4f series caused by imperfect shielding of one 4f electron by another (e.g., Zr 160 pm \approx Hf 159 pm; Nb \approx Ta; Mo \approx W) (NCERT §4.3.2, p. 93–94).
 - Ionisation enthalpies increase from left to right but more gently than in non-transition elements; irregularities (e.g., Mn⁺, Fe²⁺ stabilities) are explained via exchange energy and the special stability of d⁵ and d¹⁰ configurations. Differences in IE values are also small, so several oxidation states are accessible (NCERT §4.3.3, p. 95–96).
 - Transition elements show a great variety of oxidation states differing by unity; Mn shows the widest range from +2 to +7; the highest oxidation states up to Mn equal the sum of s + d electrons (TiO₂ +4, V₂O₅ +5, CrO₄²⁻ +6, MnO₄⁻ +7); +2 is the lowest common state for the 3d series; Sc shows only +3, Zn only +2 (NCERT §4.3.4, Table 4.3, p. 96–97).
 - Stability of higher oxidation states is greatest with O and F because they have small size and high electronegativity; fluorine stabilises through high lattice energy/bond enthalpy (CrF₆, VF₅, CoF₃), oxygen also via multiple bonds (Mn₂O₇) and tetrahedral [MO₄]ⁿ⁻ species (NCERT §4.3.7, p. 99–100).
 - E°(M²⁺/M) values become less negative across the 3d series due to rising sum of first two ionisation enthalpies; Cu has positive E°(+0.34 V) so Cu cannot liberate H₂ from non-oxidising acids; values for Mn, Ni, Zn deviate due to d⁵ stability (Mn), high hydration enthalpy (Ni) and d¹⁰ (Zn) (NCERT §4.3.5/§4.3.8, p. 98–101).
 - Paramagnetism arises from unpaired electrons; for 3d ions orbital contribution is quenched and the spin-only formula $\mu = \sqrt{n(n+2)}$ BM is used; a single unpaired electron gives 1.73 BM, two gives 2.84 BM, three 3.87, four 4.90, five 5.92 BM (NCERT §4.3.9, p. 101–102).
 - Coloured ions arise from d–d transitions: an electron is excited from a lower-energy d orbital to a higher-energy d orbital, the absorbed frequency lies in the visible region, and the observed colour is complementary (e.g., Cu²⁺ d⁹ absorbs in orange-red, looks blue); Sc³⁺ (d⁰) and Zn²⁺ (d¹⁰) are colourless because no d–d transition is possible (NCERT §4.3.10, Table 4.8, p. 103).
 - Transition metals readily form complexes due to small size, high charge density and availability of d orbitals; examples include [Fe(CN)₆]³⁻, [Fe(CN)₆]⁴⁻, [Cu(NH₃)₄]²⁺, [PtCl₄]²⁻ (NCERT §4.3.11, p. 103–104).
 - Catalytic activity is linked to variable oxidation states and complex-forming ability; V₂O₅ in the Contact Process for SO₃, finely divided Fe in the Haber Process for NH₃,

- Ni in catalytic hydrogenation of vegetable oils; Fe^{3+} catalyses the reaction of I^- with $\text{S}_2\text{O}_8^{2-}$ by alternating $\text{Fe}^{3+} \rightleftharpoons \text{Fe}^{2+}$ (NCERT §4.3.12, p. 104).
- Interstitial compounds (e.g., TiC , Mn_4N , Fe_3H , $\text{VH}_{0.56}$, $\text{TiH}_{1.7}$) form when small atoms (H, C, N) occupy crystal-lattice voids; they are hard, high-melting, retain metallic conductivity and are chemically inert (NCERT §4.3.13, p. 104).
 - Alloys (e.g., ferrous alloys with Cr, V, W, Mo, Mn — stainless steel; brass = Cu–Zn; bronze = Cu–Sn; nichrome = Ni–Cr) form readily because transition metals have similar metallic radii (within ~15%) (NCERT §4.3.14, p. 104).
 - $\text{K}_2\text{Cr}_2\text{O}_7$ is prepared from chromite ore: $4 \text{FeCr}_2\text{O}_4 + 8 \text{Na}_2\text{CO}_3 + 7 \text{O}_2 \rightarrow 8 \text{Na}_2\text{CrO}_4 + 2 \text{Fe}_2\text{O}_3 + 8 \text{CO}_2$; sodium chromate is acidified with H_2SO_4 to give dichromate then treated with KCl to crystallise $\text{K}_2\text{Cr}_2\text{O}_7$ (less soluble than the Na salt). In acidic medium: $\text{Cr}_2\text{O}_7^{2-} + 14 \text{H}^+ + 6 \text{e}^- \rightarrow 2 \text{Cr}^{3+} + 7 \text{H}_2\text{O}$ ($E^\circ = 1.33 \text{ V}$); on raising pH chromate forms: $\text{Cr}_2\text{O}_7^{2-} + 2 \text{OH}^- \rightarrow 2 \text{CrO}_4^{2-} + \text{H}_2\text{O}$. Chromate is tetrahedral; dichromate is two tetrahedra sharing a corner with Cr–O–Cr angle $\approx 126^\circ$ (NCERT §4.4.1, p. 105–106).
 - KMnO_4 is prepared by fusion of MnO_2 with $\text{KOH} + \text{O}_2/\text{KNO}_3$ giving K_2MnO_4 (green), then electrolytic oxidation (or disproportionation) of MnO_4^{2-} to MnO_4^- (purple); commercially $\text{MnO}_2 \rightarrow \text{MnO}_4^{2-} \rightarrow \text{MnO}_4^-$. KMnO_4 crystals are dark purple, isostructural with KClO_4 ; on heating: $2 \text{KMnO}_4 \rightarrow \text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2$. MnO_4^- is diamagnetic and tetrahedral; manganate (green) is paramagnetic (one unpaired e^-) (NCERT §4.4.1, p. 106–107).
 - Acidified KMnO_4 oxidises $\text{I}^- \rightarrow \text{I}_2$, $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+}$, $\text{C}_2\text{O}_4^{2-} \rightarrow \text{CO}_2$ (at 333 K), $\text{H}_2\text{S} \rightarrow \text{S}$, $\text{SO}_3^{2-} \rightarrow \text{SO}_4^{2-}$, $\text{NO}_2^- \rightarrow \text{NO}_3^-$; in neutral/faintly alkaline solution it oxidises $\text{I}^- \rightarrow \text{IO}_3^-$, $\text{S}_2\text{O}_3^{2-} \rightarrow \text{SO}_4^{2-}$ and $\text{Mn}^{2+} \rightarrow \text{MnO}_2$. HCl cannot be used as the medium because it is itself oxidised to Cl_2 — H_2SO_4 is the preferred acid for KMnO_4 titrations (NCERT §4.4.1, p. 107–108).
 - Lanthanoids (Ce–Lu, with La included) have common configuration $[\text{Xe}]4f^n 5d^{0-1} 6s^2$; Ln^{3+} ions have $4f^n$; +3 is dominant, with occasional +2 (Eu, Yb, Sm) and +4 (Ce, Pr, Nd, Tb, Dy) — these unusual states are stabilised by empty ($\text{Ce}^{4+} 4f^0$), half-filled ($\text{Eu}^{2+} 4f^7$) or fully-filled ($\text{Yb}^{2+} 4f^{14}$) f-subshells (NCERT §4.5.1/§4.5.3, p. 109).
 - Lanthanoid contraction (gradual decrease in size across La \rightarrow Lu, ~10 pm total) is due to imperfect shielding of one 4f electron by another; consequences include nearly equal sizes of 4d/5d transition elements (Zr \approx Hf, Nb \approx Ta, Mo \approx W), the close occurrence and difficult separation of these pairs, and the high density of 5d metals (NCERT §4.5.2, p. 109).
 - Lanthanoids are silvery white soft metals, good conductors, with Ln^{3+} $E^\circ \approx -2.2$ to -2.4 V (Eu about -2.0 V); they burn in halogens, give Ln_2O_3 and $\text{Ln}(\text{OH})_3$ (basic), and form LnH , $\text{Ln}_3\text{C}/\text{Ln}_2\text{C}_3/\text{LnC}_2$, and LnN . Mischmetall (~95% Ln + ~5% Fe + traces of S, C, Ca, Al) is used in Mg-alloy bullets/lighter flints; mixed Ln oxides catalyse petroleum cracking; Ln oxides are TV phosphors (NCERT §4.5.4, p. 110–111).

- Actinoids (Th–Lr, with Ac included) are 5f elements; all are radioactive; configuration is $7s^2$ with variable 5f/6d occupancy. The 5f orbitals are less buried than 4f, so 5f electrons participate in bonding much more — hence a far greater range of oxidation states (up to +7 in Np) (NCERT §4.6, §4.6.1, §4.6.3, p. 111–112).
- Actinoid contraction is greater than lanthanoid contraction owing to poorer shielding by 5f electrons; +3 is the general state but the earlier elements show high states (Th +4; Pa +5; U +6; Np +7); the elements beyond U ($Z > 92$) are all synthetic (NCERT §4.6.2, §4.6.3, Table 4.11, p. 112).
- Applications: Fe/steel (with Cr, Mn, Ni); TiO_2 in pigments; MnO_2 in dry cells; Zn and Ni/Cd in batteries; V_2O_5 catalyses SO_2 oxidation; $TiCl_4/Al(CH_3)_3$ are Ziegler catalysts for polymerisation; Fe catalyses Haber process; Ni catalyses fat hydrogenation; $PdCl_2$ in the Wacker process for acetaldehyde; AgBr in photography (NCERT §4.7, p. 113–114).

2.2 Definitions to memorise

Term	Definition	Page
Transition metal (IUPAC)	A metal that has an incomplete d subshell either in its neutral atom or in any of its ions.	89
Inner transition (f-block) elements	Elements in which 4f or 5f orbitals are progressively filled; the two series are lanthanoids and actinoids.	89
3d series	Sc(21) to Zn(30); first transition series	89
4d series	Y(39) to Cd(48); second transition series	89
5d series	La, Hf to Hg (after 4f insertion); third transition series	89
Lanthanoid (Ln)	f-block element from Ce(58) to Lu(71); La often included	109
Actinoid (An)	f-block element from Th(90) to Lr(103); Ac often included	111
Lanthanoid contraction	The regular decrease in atomic and ionic radii across the lanthanoid series (La → Lu) caused by imperfect shielding of one 4f electron by another.	93, 109
Actinoid contraction	The gradual decrease in size of atoms/ M^{3+} ions across the actinoid series, greater than lanthanoid contraction due to poor 5f shielding.	112
Enthalpy of atomisation ($\Delta_a H$)	Energy needed to break a metal lattice into gaseous atoms; max near d^5 in each series	92-93
Spin-only magnetic moment	$\mu = \sqrt{n(n+2)}$ BM, where n is the number of unpaired electrons; orbital contribution is quenched for first-row transition ions.	102
Disproportionation	A reaction in which a single oxidation state simultaneously gives one higher and one lower oxidation state; e.g., $3 MnO_4^{2-} + 4 H^+ \rightarrow 2 MnO_4^- + MnO_2 + 2 H_2O$.	105, 106

Term	Definition	Page
Interstitial compound	A non-stoichiometric compound formed when small atoms (H, C, N) occupy lattice voids of a metal; hard, high-melting, conducting, inert.	104
Alloy	A homogeneous solid solution of metals with metallic radii within about 15% of one another.	104
Pyrolusite	MnO ₂ ore — starting material for KMnO ₄	106
Chromite	FeCr ₂ O ₄ ore — starting material for K ₂ Cr ₂ O ₇	105
Permanganate ion (MnO ₄ ⁻)	Mn ⁷⁺ d ⁰ ; tetrahedral, diamagnetic, dark purple	106
Manganate ion (MnO ₄ ²⁻)	Mn ⁶⁺ d ¹ ; tetrahedral, paramagnetic, dark green	106
Chromate (CrO ₄ ²⁻)	Cr ⁶⁺ ; single tetrahedron; yellow in alkaline medium	106
Dichromate (Cr ₂ O ₇ ²⁻)	Cr ⁶⁺ ; two tetrahedra sharing a corner; orange in acidic medium	106
Mischmetall	An alloy of ~95% lanthanoid metal and ~5% Fe with traces of S, C, Ca, Al; used in Mg-based alloys for bullets, shells and lighter flints.	111
Transuranium elements	Z > 92 actinoids; synthetic, radioactive	111
Coloured ion	Transition-metal ion absorbing visible light via d-d transition; complementary colour observed	103

2.3 Diagrams / processes to remember

- **Table 4.1 (p. 90–91)** — Outer electronic configurations of all four transition series — note Cr (3d⁵4s¹), Cu (3d¹⁰4s¹), Mo (4d⁵5s¹), Ag (4d¹⁰5s¹), Pd (4d¹⁰5s⁰), Pt (5d⁹6s¹), Au (5d¹⁰6s¹) anomalies; understand that half-filled and fully-filled d configurations have extra exchange energy stabilisation.
- **Fig. 4.1 (p. 92)** — Trends in melting points of 3d/4d/5d series: rises to a peak around d⁵ (Cr 2130 K, Mo 2890 K, W 3680 K), dips at Mn (1517 K, due to weak Mn–Mn bonding from d⁵s² unpaired e⁻ distribution) and Tc; falls steeply at Zn, Cd, Hg (d¹⁰s² — no unpaired d e⁻ for bonding, so Hg is liquid at room T).
- **Fig. 4.2 (p. 93)** — Enthalpies of atomisation across the series; peak at d⁵ correlates with maximum unpaired electrons available for M–M bonding; second and third series have Δ_aH roughly 1.5–2 times the first series.
- **Fig. 4.3 (p. 94)** — Trends in atomic radii — 3d < 4d ≈ 5d due to lanthanoid contraction; Zr 160 pm ≈ Hf 159 pm, Nb 146 ≈ Ta 146, Mo 139 ≈ W 139.
- **Fig. 4.4 (p. 98)** — Observed vs calculated E°(M²⁺/M) for Ti–Zn — deviations at Mn (less negative than expected, because of extra stability of Mn²⁺ d⁵), Ni (more

- negative than expected, high hydration enthalpy) and Zn (more negative because $d^{10}s^2$ is easy to lose).
- **Table 4.7 (p. 102)** — Calculated (spin-only) and observed magnetic moments of 3d ions in aqueous solution: Ti^{3+} (d^1) 1.73, V^{3+} (d^2) 2.83, Cr^{3+} (d^3) 3.87, Mn^{3+} (d^4) 4.90, Mn^{2+} (d^5) 5.92, Fe^{3+} (d^5) 5.92, Fe^{2+} (d^6) 4.90, Co^{2+} (d^7) 3.87, Ni^{2+} (d^8) 2.83, Cu^{2+} (d^9) 1.73, Zn^{2+} (d^{10}) 0 BM.
 - **Table 4.8 (p. 103)** — Configurations and colours of 3d M^{n+} ions in aqueous solution; Sc^{3+} (d^0) and Zn^{2+} (d^{10}) colourless; Ti^{3+} purple, V^{3+} green, Cr^{3+} violet, Mn^{2+} pink, Fe^{3+} yellow, Fe^{2+} green, Co^{2+} pink, Ni^{2+} green, Cu^{2+} blue.
 - **Fig. 4.6 (p. 109)** — Trends in ionic radii of lanthanoids: Ln^{3+} decreases regularly from La^{3+} 103 pm to Lu^{3+} 86 pm — total contraction ~17 pm across 14 elements (~1 pm per element).
 - **Fig. 4.7 (p. 111)** — Chemical reactions of lanthanoids with H_2 , halogens, O_2 , N_2 , C, H_2O , S — all produce expected binary compounds ($LnH_{2/3}$, LnX_3 , Ln_2O_3 , LnN , Ln_2C_3/LnC_2 , $Ln(OH)_3 + H_2$, Ln_2S_3).
 - **Structures of CrO_4^{2-} (tetrahedral) and $Cr_2O_7^{2-}$ (two corner-sharing tetrahedra, $Cr-O-Cr \approx 126^\circ$) (p. 106)** — single Cr^{6+} centre with 4 equivalent O in CrO_4^{2-} ; in $Cr_2O_7^{2-}$, two CrO_3 tetrahedra share one O at the corner; bridging Cr-O bonds are longer than terminal ones.
 - **Born-Haber-like diagram for $KMnO_4$ preparation (implicit, p. 106)** — fusion step $MnO_2 + KOH + O_2 \rightarrow K_2MnO_4 + H_2O$; electrolytic oxidation $2 MnO_4^{2-} \rightarrow 2 MnO_4^- + 2 e^-$ at the anode; the green-to-purple colour change reflects $Mn(VI) \rightarrow Mn(VII)$.
 - **Periodic table block diagram (implicit)** — shows d-block straddling s and p blocks in Groups 3-12 across periods 4-7, with the f-block (lanthanoids in period 6 row, actinoids in period 7 row) inserted as separate strips below.

2.4 Common confusions / NTA trap points

- Zn, Cd, Hg are in the d-block but are NOT transition elements (full d^{10} in atom and common ions); a typical NTA distractor calls them transition.
- Cr is $3d^5 4s^1$ and Cu is $3d^{10} 4s^1$ — not $3d^4 4s^2$ or $3d^9 4s^2$; the half-filled/fully-filled d stability is the trap. Similarly Mo ($4d^5 5s^1$), Ag ($4d^{10} 5s^1$).
- Spin-only μ requires the count of unpaired electrons in the ION, not the neutral atom. For Fe^{2+} ($3d^6$) \rightarrow 4 unpaired $\rightarrow \mu = 4.90$ BM, not the atomic count of Fe (4 unpaired, $3d^6 4s^2$ also gives the same in this case but for other ions it differs).
- Permanganate MnO_4^- is diamagnetic (Mn in +7 has d^0); manganate MnO_4^{2-} (Mn in +6, d^1) is paramagnetic — easy confusion.
- $KMnO_4$ titrations are NOT done in HCl medium because Cl^- gets oxidised to Cl_2 — use H_2SO_4 instead. Dilute HNO_3 also works as it does not interfere.

- Lanthanoid contraction is due to poor shielding of 4f electrons (not relativistic effects); the consequence is the near-identity of Zr and Hf radii, NOT a direct decrease in density.
- Cu has a positive $E^\circ(M^{2+}/M)$ of +0.34 V; hence Cu does NOT liberate H_2 from dilute HCl/ H_2SO_4 (only oxidising acids like HNO_3 or hot conc. H_2SO_4 attack it).
- $Cr_2O_7^{2-}$ in acidic solution is orange and a strong oxidiser; CrO_4^{2-} in alkaline solution is yellow and weakly oxidising — they are interconvertible by pH change without redox.
- The +2 state stability across 3d series increases up to Mn then decreases (Mn^{2+} d^5 is most stable); above Mn the +3 state becomes harder to achieve.
- Actinoid contraction is GREATER than lanthanoid contraction; common trap is to call them "equal".
- Maximum oxidation state in actinoids is +7 (in Np), not +6 (which is U's well-known state UO_2^{2+}); easy MCQ trap.
- For transition metals, ionic radii of $M^{3+} < M^{2+} < M$, and the spin-only μ ignores orbital contribution (valid for 3d but not as accurate for 4d/5d).

Practice MCQs

Q1. The ground-state outer electronic configuration of chromium ($Z = 24$) is:

- A. $3d^4 4s^2$
- B. $3d^5 4s^1$
- C. $3d^6 4s^0$
- D. $3d^3 4s^2 4p^1$

Q2. Which of the following is NOT regarded as a transition element?

- A. Sc ($Z = 21$)
- B. Cu ($Z = 29$)
- C. Zn ($Z = 30$)
- D. Mn ($Z = 25$)

Q3. The spin-only magnetic moment of Mn^{2+} ($Z = 25$) in aqueous solution is closest to:

- A. 1.73 BM
- B. 2.84 BM
- C. 4.90 BM
- D. 5.92 BM

 **12 more MCQs + answer key**

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PYQ Alignment

This chapter is one of the highest-yield inorganic units in CUET Chemistry: based on the 2023–2025 pattern roughly 10–15 MCQs per year touch d/f-block content, most frequently on electronic configurations (Cr, Cu anomalies; $\text{Ln}^{3+} 4f^n$), spin-only magnetic moment calculations for first-row M^{n+} ions, lanthanoid contraction and its consequences, the preparation/oxidising action of $\text{K}_2\text{Cr}_2\text{O}_7$ and KMnO_4 (especially balancing in acidic medium), and comparison of actinoid with lanthanoid chemistry. Assertion-reason and statement-correctness items on Zn-not-a-transition-metal and on KMnO_4 titrations in HCl are recurrent NTA favourites.

CUET 2025 — Actual PYQs from this chapter

Q.12 (CUET 2025) Arrange the following ions in increasing order of number of 3d electrons: (A) Cr^{2+} (B) Cu^+ (C) Ti^{3+} (D) Mn^{2+} Options given.

- A) — B) — C) — D) —

Tests: d-block ions/colours/oxidation Answer: Not in extracted key

Q.13 (CUET 2025) Atomic number of Lanthanum (57). Its electronic configuration will be:

- A) $[\text{Xe}] 5d^1 6s^2$ B) $[\text{Xe}] 4f^1 5d^1 6s^2$ C) $[\text{Xe}] 4f^{14} 5d^1 6s^2$ D) $[\text{Xe}] 4f^{14} 5d^2 6s^2$

Tests: f-block/lanthanoids Answer: Not in extracted key

Q.14 (CUET 2025) Match compounds/elements with their uses: (A) Magnesium based alloy (B) Lanthanoid oxide (C) Mixed oxides of lanthanoids (D) Misch metal Uses: bullets, petroleum cracking, television screen, lighter metal & iron.

- A) — B) — C) — D) —

Tests: f-block/lanthanoids **Answer:** Not in extracted key

Q.15 (CUET 2025) What is the colour of Fe^{3+} (aq) ion?

- A) Yellow B) Violet C) Colourless D) Blue-pink

Tests: d-block ions/colours/oxidation **Answer:** Not in extracted key

Q.17 (CUET 2025) Acidified potassium dichromate oxidizes sulphide (S^{2-}) to:

- A) SO_4^{2-} B) SO_3^{2-} C) Sulphur D) SO_2

Tests: d-block ions/colours/oxidation **Answer:** Not in extracted key

CUET 2023 — Actual PYQs from this chapter

Q.12 (CUET 2023) Which alloy is used for making bullets and lighter flints?

- A) Shell metal B) Misch metal C) Gun metal D) Monel metal

Tests: f-block/lanthanoids **Answer:** Not in extracted key

Q.28 (CUET 2023) Which statement is not correct?

- A) La belongs to transition series rather than lanthanoid series B) $\text{La}(\text{OH})_3$ less basic than $\text{Lu}(\text{OH})_3$ C) Ln^{3+} ionic radius decreases in lanthanoid series D) Atomic radii of Zr and Hf are same due to lanthanoid contraction

Tests: f-block/lanthanoids **Answer:** Not in extracted key

Q.45 (CUET 2023) Match the following ions with their colours. List-I List-II (A) Mn^{2+} (I) Yellow (B) Fe^{3+} (II) Green (C) Ni^{2+} (III) Blue (D) Cu^{2+} (IV) Pink Options:

- A) A-IV, B-III, C-I, D-II B) A-IV, B-I, C-II, D-III C) A-III, B-I, C-IV, D-II D) A-II, B-IV, C-III, D-I

Tests: d-block ions/colours/oxidation **Answer:** Not in extracted key