

QUICK DRILL · CBSE CLASS 12

d- and f-Block Elements

Chemistry · Chapter 4 · 15 MCQs · 20 minutes · PYQ-tagged with time budgets

DATE	TOTAL MARKS	DURATION	MARKING	TARGET
	15	20 min	+1 / 0	≥ 12/15

OBJECTIVES

Reinforce the four core topics of d- and f-Block Elements via 15 PYQ-derived MCQs. Identify weak sub-topics via concept-node IDs (see answer key). Build per-question time budget habit.

INSTRUCTIONS

Attempt all 15. Time budget shown per Q (use it as pacing guide). Mark answers (A/B/C/D) in the margin. Answer key + explanations on the last page. **Don't peek — score yourself honestly.**

SECTION · QUICK DRILL

Q 1-15 · 20 MIN

Q1. The general electronic configuration of d-block elements is:

(A) $(n-1)d^{1-10} ns^0-2$

(B) $ns^1-2 np^1-6$

(C) $(n-2)f^{1-14} (n-1)d^0-1 ns^2$

(D) $ns^2 (n-1)d^{10}$

PYQ 2018 · Delhi · 1 m · 30s

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

(A) Zn

(B) Fe

(C) Cu

(D) Mn

PYQ 2020 · Delhi · 1 m · 35s

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

(A) 5.92 BM

(B) 1.73 BM

(C) 3.87 BM

(D) 4.90 BM

PYQ 2019 · Delhi · 1 m · 50s

Q4. Which ion is colourless in aqueous solution?

(A) Sc^{3+}

(B) Ti^{3+}

(C) Cu^{2+}

(D) Ni^{2+}

PYQ 2021 · Outside Delhi · 1 m · 35s

Q5. Which element shows the maximum number of oxidation states?

(A) Sc

(B) Mn

(C) Ti

(D) Zn

PYQ 2018 · Outside Delhi · 1 m · 35s

Q6. In the reduction of MnO_4^- in acidic medium, Mn changes from:

(A) +7 to +4

(B) +7 to +2

(C) +7 to +6

(D) +6 to +3

PYQ 2020 · Delhi · 1 m · 40s

Q7. Lanthanide contraction is caused by:

(A) Effective shielding by 4f electrons

(B) Poor shielding by 4f electrons

(C) Increasing atomic size

(D) Decreasing nuclear charge

PYQ 2022 · Delhi · 1 m · 35s

Q8. The equivalent weight of $KMnO_4$ in acidic medium (M = molar mass) is:

(A) $M/1$

(B) $M/5$

(C) $M/3$

(D) $M/6$

PYQ 2019 · Outside Delhi · 1 m · 35s

Q9. The spin-only magnetic moment of Ti^{3+} ($Z = 22$) is:

(A) 0 BM

(B) 2.83 BM

(C) 1.73 BM

(D) 3.87 BM

PYQ 2023 · Delhi · 1 m · 45s

Q10. Which catalyst is used in the Contact process for manufacturing sulphuric acid?

- (A) Fe
(C) V₂O₅

- (B) Ni
(D) Pt

PYQ 2021 · Delhi · 1 m · 30s

Q11. The colour of transition metal ions is due to:

- (A) s-s transition
(C) d-d transition

- (B) Charge of the nucleus
(D) Filled d-orbitals

PYQ 2020 · Outside Delhi · 1 m · 30s

Q12. The most common oxidation state of lanthanides is:

- (A) +2
(C) +3

- (B) +4
(D) +6

PYQ 2019 · Delhi · 1 m · 30s

Q13. Interstitial compounds of transition metals are:

- (A) Soft and reactive
(C) Always stoichiometric

- (B) Non-metallic insulators
(D) Hard with high melting points

PYQ 2022 · Outside Delhi · 1 m · 35s

Q14. Which statement about actinides is correct?

- (A) All are non-radioactive
(C) They have no f-electrons

- (B) They show only the +3 state
(D) They are all radioactive and show a wide range of oxidation states

PYQ 2024 · Delhi · 1 m · 40s

Q15. The spin-only magnetic moment of Ni²⁺ (Z = 28) is:

- (A) 1.73 BM
(C) 4.90 BM

- (B) 3.87 BM
(D) 2.83 BM

PYQ 2024 · Outside Delhi · 1 m · 50s

ANSWER KEY & EXPLANATIONS

Q 1-15 · MARK YOUR SCORE

Q1. Answer: A

The differentiating electron of d-block elements enters the (n-1)d orbital, giving (n-1)d¹⁻¹⁰ ns⁰⁻².

Q2. Answer: A

Zn has 3d¹⁰ in both atom and common Zn²⁺ ion (completely filled d), so it lacks a partially filled d and is not a typical transition element.

Q3. Answer: A

Mn²⁺ = [Ar]3d⁵ with 5 unpaired electrons. $\mu = \sqrt{5 \times 7} = \sqrt{35} = 5.92$ BM.

Q4. Answer: A

Sc³⁺ is 3d⁰ (empty d) — no d-d transition is possible, so it is colourless. The others have partially filled d-orbitals and are coloured.

Q5. Answer: B

Mn ([Ar]3d⁵ 4s²) has 7 bondable electrons and exhibits states from +2 to +7, the widest range in the 3d series.

Q6. Answer: B

In acidic medium: $\text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$, a 5-electron change from +7 to +2.

Q7. Answer: B

4f electrons shield outer electrons poorly, so increasing nuclear charge pulls electrons closer, steadily decreasing radius from La to Lu.

Q8. Answer: B

In acidic medium MnO_4^- gains 5 electrons (Mn +7 → +2), so equivalent weight = M/5.

Q9. Answer: C

Ti³⁺ = [Ar]3d¹, one unpaired electron. $\mu = \sqrt{1 \times 3} = \sqrt{3} = 1.73$ BM.

Q10. Answer: C

V₂O₅ catalyses the oxidation of SO₂ to SO₃ in the Contact process. Fe is used in Haber, Ni in hydrogenation.

Q11. Answer: C

Ligands split the d-orbitals; absorption of visible light promotes an electron between them (d-d transition), giving the complementary colour.

Q12. Answer: C

Lanthanides are dominated by the +3 oxidation state; +2 and +4 appear only when they give extra-stable 4f⁰, 4f⁷ or 4f¹⁴ configurations.

Q13. Answer: D

Small atoms (H, C, N, B) fit into the lattice holes, making interstitial compounds hard, high-melting, chemically inert and often non-stoichiometric, while retaining metallic conductivity.

Q14. Answer: D

Actinides are all radioactive and, because 5f, 6d and 7s have comparable energies, they show oxidation states up to +7, unlike lanthanides which are mostly +3.

Q15. Answer: D

Ni²⁺ = [Ar]3d⁸: filling gives 2 unpaired electrons. $\mu = \sqrt{2 \times 4} = \sqrt{8} = 2.83 \text{ BM}$.