

JEE MAIN D- AND F-BLOCK ELEMENTS — MAGNETIC PROPERTIES OF D-BLOCK ELEMENTS AND FORMATION OF COLOURED IONS — PYQS

Max. Marks: 40
Questions: 10

Section A (MCQ) — 7 questions

Q.1 Given below are two statements :

Statement-I: The number of pairs among $[\text{Ti}^{4+}, \text{V}^{2+}]$, $[\text{V}^{2+}, \text{Mn}^{2+}]$, $[\text{Mn}^{2+}, \text{Fe}^{3+}]$ and $[\text{V}^{2+}, \text{Cr}^{2+}]$ in which both ions are coloured is 3.

Statement-II: The number of pairs among $[\text{La}^{3+}, \text{Yb}^{2+}]$, $[\text{Lu}^{3+}, \text{Ce}^{4+}]$ and $[\text{Ac}^{3+}, \text{Lr}^{3+}]$ ions in which both are diamagnetic is 3.

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

[JEE Main 2026 (Online) 8th April Evening Shift]

- (1) Both Statement-I and Statement-II are correct
- (2) Both Statement-I and Statement-II are incorrect
- (3) Statement-I is correct but Statement-II is incorrect
- (4) Statement-I is incorrect but Statement-II is correct

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Q.2 Match the LIST-I with LIST-II

Complex ion		Calculated spin only magnetic moment (BM)	
A.	$[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$	I.	3.87
B.	$[\text{Co}(\text{H}_2\text{O})_6]^{2+}$	II.	5.92
C.	$[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$	III.	4.90
D.	$[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$	IV.	1.73

Choose the correct answer from the options given below : [JEE Main 2026 (Online) 4th April Morning Shift]

- (1) A-I, B-III, C-IV, D-II
- (2) A-II, B-I, C-III, D-IV
- (3) A-IV, B-II, C-I, D-III
- (4) A-III, B-I, C-IV, D-II

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Q.3 Given below are two statements :

Statement-I: The number of pairs, from the following, in which both the ions are coloured in aqueous solution is 3.

 $[\text{Sc}^{3+}, \text{Ti}^{3+}]$, $[\text{Mn}^{2+}, \text{Cr}^{2+}]$, $[\text{Cu}^{2+}, \text{Zn}^{2+}]$ and $[\text{Ni}^{2+}, \text{Ti}^{4+}]$
Statement-II: Th^{4+} is the strongest reducing agent among Th^{4+} , Ce^{4+} , Gd^{3+} and Eu^{2+} .

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

[JEE Main 2026 (Online) 28th January Morning Shift]

- (1) Statement-I is false but Statement-II is true
- (2) Both Statement-I and Statement-II are false
- (3) Both Statement-I and Statement-II are true
- (4) Statement-I is true but Statement-II is false

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Q.4 The correct decreasing order of spin only magnetic moment values (BM) of Cu^+ , Cu^{2+} , Cr^{2+} and Cr^{3+} ions is : [JEE Main 2025 (Online) 8th April Evening Shift]

- (1) $\text{Cr}^{3+} > \text{Cr}^{2+} > \text{Cu}^+ > \text{Cu}^{2+}$
- (2) $\text{Cu}^+ > \text{Cu}^{2+} > \text{Cr}^{3+} > \text{Cr}^{2+}$
- (3) $\text{Cr}^{2+} > \text{Cr}^{3+} > \text{Cu}^{2+} > \text{Cu}^+$
- (4) $\text{Cu}^{2+} > \text{Cu}^+ > \text{Cr}^{2+} > \text{Cr}^{3+}$

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Q.5 Pair of transition metal ions having the same number of unpaired electrons is

[JEE Main 2025 (Online) 4th April Morning Shift]

- (1) Ti^{3+} , Mn^{2+}
- (2) Ti^{2+} , Co^{2+}
- (3) Fe^{3+} , Cr^{2+}
- (4) V^{2+} , Co^{2+}

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Q.6 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 : [JEE Main 2025 (Online) 3rd April Morning Shift]

- (1) A, D and E Only
- (2) A, B and E Only
- (3) A, C and E Only
- (4) B and E Only

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Q.7 Consider 'n' is the number of lone pair of electrons present in the equatorial position of the most stable structure of ClF_3 . The ions from the following with 'n' number of unpaired electrons are

- A. V^{3+}
- B. Ti^{3+}
- C. Cu^{2+}
- D. Ni^{2+}

E. Ti^{2+}

Choose the correct answer from the options given below:

[JEE Main 2025 (Online) 28th January Morning Shift]

- (1) B and D Only (2) A, D and E Only
(3) B and C Only (4) A and C Only

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Section B (Numerical) — 3 questions

Q.8 Number of paramagnetic ions among the following d- and f-block metal ions is _____.

Mn^{2+} , Cu^{2+} , Zn^{2+} , Yb^{2+} , Sc^{3+} , La^{3+} , Gd^{3+} , Lu^{3+} , Ti^{4+} , Ce^{4+}

(Atomic number of Mn = 25, Cu = 29, Zn = 30, Yb = 70, Sc = 21, La = 57, Gd = 64, Lu = 71, Ti = 22, Ce = 58) [JEE Main 2026 (Online) 2nd April Evening Shift]

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Q.9 The spin-only magnetic moment value of M^{n+} ion formed among Ni, Zn, Mn and Cu that has the least enthalpy of atomisation is _____. (in nearest integer) Here n is equal to the number of diamagnetic complexes among $\text{K}_2[\text{NiCl}_4]$, $[\text{Zn}(\text{H}_2\text{O})_6]\text{Cl}_2$, $\text{K}_3[\text{Mn}(\text{CN})_6]$ and $[\text{Cu}(\text{PPh}_3)_3]\text{I}$

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Q.10 The spin only magnetic moment (μ) value (B.M.) of the compound with the strongest oxidising power among Mn_2O_3 , TiO and VO is _____ B.M. (Nearest integer).

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ANSWER KEY

Section A (MCQ) — 7 questions

Ques.	1	2	3	4	5	6	7				
Ans.	1	4	2	3	4	2	2				

Section B (Numerical) — 3 questions

Ques.	8	9	10								
Ans.	3	0	5								