EdLoop

EdLoop JEE

CHEMISTRY · JEE MAIN

d- and f-Block Elements

Previous Year Questions with answers

249 questions · **161** papers · **2002–2026** · newest paper first

Step-by-step solutions for every question: free in the EdLoop JEE app (Google Play) · pyq.edloop.in

What is in this PDF: every d- and f-Block Elements question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

Step-by-step solutions for every question are free in the EdLoop JEE app (Google Play) and on app.edloop.in. More chapters: pyq.edloop.in/free-pdfs/

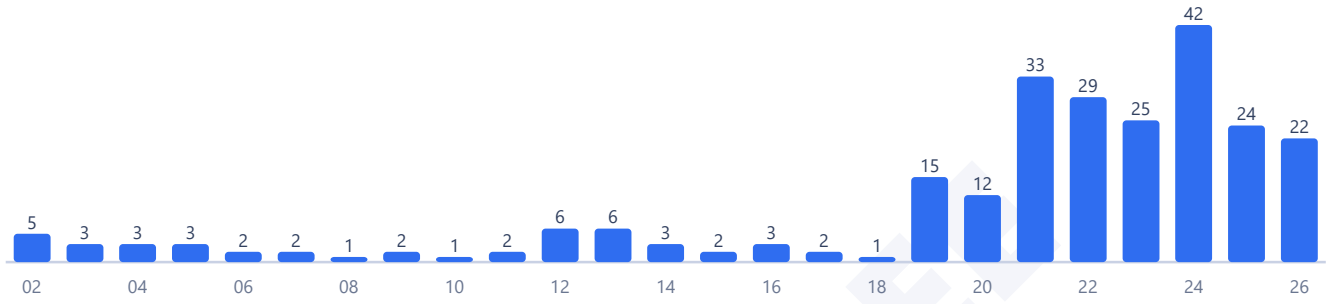
EdLoop

Chapter at a glance

4.4%	249	133 of 162	204 / 45
of Chemistry questions, 2019–2026	questions, 2002–2026	papers asked it, 2019–2026	MCQ / numerical, 2002–2026

Trend. Rising: 1.5 questions per paper in 2024–2026 against 1.1 in 2019–2023.

Questions per year



Counts are the questions we hold: 249 in 161 papers. No question in this chapter was found repeated across papers.

Most-asked topics in this chapter (2002–2026)



How often it comes up

The d- and f-block elements covers transition metals and lanthanoid contraction under Unit 11: d- and f-Block Elements in the Class 12 curriculum, achieving rank 8 of 31 chapters with a 4.4% share of the chemistry section. In the 2019 to 2026 testing timeframe, d- and f-Block Elements produced 202 questions across 162 exam papers, making up 4.4% of the chemistry section and achieving rank 8 of 31 chapters. During the 2002 to 2018 era, it contributed 47 questions across 38 papers with a 3.5% share. In the recent 2024 to 2026 testing phase, question volume grew to 88 questions across 58 papers, accounting for a 5.7% share. The chapter's frequency has trended up across recent sessions.

Questions have appeared every year from 2019 to 2026. Across 2019 to 2026, students met an average of 1.2 questions per paper, rising to 1.5 questions per paper during 2024 to 2026. Numerical value problems feature regularly, with 45 numerical answer questions set between 2019 and 2026, frequently asking for magnetic moments or counts of unpaired d electrons.

Most-asked topics

The chapter divides into three core topics:

- Transition Elements: Accounts for the highest share with 128 total questions (109 in 2019 to 2026), examined consistently through 2026. Core concepts test electronic configurations of transition ions, spin-only magnetic moments via the formula involving unpaired electrons, irregular trends in ionisation enthalpies across chromium and manganese, standard reduction potentials, and interstitial hydride formation.
- Important Compounds: Contributed 61 total questions (52 in 2019 to 2026), tested through 2026. Centers on the preparation, structural geometries, and oxidation reactions of potassium permanganate ($KMnO_4$) and potassium dichromate ($K_2Cr_2O_7$), along with the chromyl chloride confirmation test.

- Lanthanoids & Actinoids: Generated 60 total questions (41 in 2019 to 2026), continuing through 2026. Focus areas involve lanthanoid contraction and its consequences on 4d and 5d atomic radii (such as zirconium and hafnium pairing), characteristic oxidation states (trivalent baseline with stable tetravalent cerium and divalent europium), and actinoid electronic arrangements.

What the questions look like

Examiners test both mathematical calculations and descriptive reactions. A very standard numerical question gives a list of transition metal ions and asks candidates to compute spin-only magnetic moments or sum unpaired electrons.

Descriptive problems often require evaluating redox reactions of potassium dichromate or permanganate in acidic, neutral, or alkaline solutions. In f-block chemistry, questions regularly ask for common oxidation states and the atomic basis for identical radii between corresponding second and third transition row congeners.

How to practise it

Thorough preparation requires mastering electron bookkeeping alongside industrial chemical equations:

1. Memorize 3d electron configurations: Be completely fluent writing ground state and ionic configurations for scandium through zinc, noting anomalies at chromium and copper. 2. Master spin-only magnetic calculations: Be quick at deriving unpaired electrons (n) from oxidation states and calculating the resulting spin moment in Bohr magnetons. 3. Balance permanganate and dichromate half-reactions: Know electron transfers for MnO_4^- yielding Mn^{2+} in acid, MnO_2 in neutral solution, and MnO_4^{2-} in strong base. 4. Understand consequences of lanthanoid contraction: Remember that poor shielding by 4f electrons causes almost identical atomic radii for Zr/Hf and Nb/Ta. 5. Review chromyl chloride test steps: Understand the formation of red vapor chromyl chloride and its conversion to yellow lead chromate precipitate.

EdLoop JEE

Q1 JEE Main 2026 · 8 Apr · Shift 2 MCQ

Given below are two statements :

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

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

In the light of the above statements, choose the **correct** 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

Answer: (A) Both **Statement I** and **Statement II** are correct · Official NTA final key

Q2 JEE Main 2026 · 8 Apr · Shift 2 MCQ

Given below are two statements for catalytic properties of transition metals.

Statement I : First row transition metals which act as catalyst utilise their 3d electrons only for formation of bonds between reactant molecules and atoms on the surface of catalyst.

Statement II : There is increase in the concentration of reactants on the surface of catalyst which strengthens the bonds in reacting molecules.

In the light of the above statements, choose the **correct** 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

Answer: (B) Both **Statement I** and **Statement II** are incorrect · Official NTA final key

Q3 JEE Main 2026 · 6 Apr · Shift 1 MCQ

The **correct** statements among the following are.

A. Basic vanadium oxide is used in the manufacture of H_2SO_4.

B. The spin-only magnetic moment value of the transition metal halide employed in Ziegler-Natta polymerization is 2.84 BM.

C. The p-block metal compound employed in Ziegler-Natta polymerization has the metal in +3 oxidation state.

D. The number of electrons present in the outer most 'd' orbital of metal halide employed in Wacker process is 8.

Choose the correct answer from the options given below:

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

Answer: (C) C and D Only · Official NTA final key

Q4 JEE Main 2026 · 6 Apr · Shift 2 MCQ

The correct order of first ($\Delta_i H_1$) and second ($\Delta_i H_2$) ionisation enthalpy values of Cr and Mn are :

A. $\Delta_i H_1$: Cr > Mn

B. $\Delta_i H_2$: Cr > Mn

C. $\Delta_i H_1$: Mn > Cr

D. $\Delta_i H_2$: Mn > Cr

Choose the **correct** answer from the options given below :

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

Answer: (B) B and C only · Official NTA final key

Q5 JEE Main 2026 · 5 Apr · Shift 1 MCQ

Which of the following is **NOT** a physical or chemical characteristics of interstitial compounds?

(A) They have high melting points, higher than those of pure metals.
(B) They are very soft and ionic in nature.
(C) They retain metallic conductivity.
(D) They are chemically inert and usually non-stoichiometric.

Answer: (B) They are very soft and ionic in nature. · Official NTA final key

---

Q6 JEE Main 2026 · 5 Apr · Shift 2 MCQ

Given below are two statements :

Statement I : Presence of large number of unpaired electrons in transition metal atoms results in higher enthalpies of their atomisation.

Statement II : $d_{xy} = d_{xz} = d_{yz} < d_{x^2-y^2} = d_{z^2}$ and $d_{x^2-y^2} = d_{z^2} < d_{xy} = d_{xz} = d_{yz}$ are the d-orbital splittings in $[\mathrm{Fe(H_2O)_6}]^{3+}$ and $[\mathrm{Ni(Cl)_4}]^{2-}$ complex ions respectively.

In the light of the above statements, choose the **correct** 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

Answer: (A) Both **Statement I** and **Statement II** are correct · Official NTA final key

---

Q7 JEE Main 2026 · 4 Apr · Shift 1 MCQ

The **correct** statements among the following are,

A. Mo(VI) and W(VI) are less stable than Cr(VI).

B. Ce^{4+} and Tb^{4+} are oxidant while Eu^{2+} and Yb^{2+} are reductant.

C. Cm and Am have seven unpaired electrons.

D. Actinoid contraction is greater from element to element than lanthanoid contraction.

Choose the correct answer from the options given below:

(A) A and B Only
(B) C and D Only
(C) B and D Only
(D) A and C Only

Answer: (C) B and D Only · Official NTA final key

Q8 JEE Main 2026 · 4 Apr · Shift 1 MCQ

Correct statements from the following are

A. Potassium dichromate is an oxidising agent and it oxidises $FeSO_4$ to $Fe_2(SO_4)_3$ in acidic medium.

B. Sodium dichromate can be used as primary standard in volumetric estimation.

C. CrO_4^{2-} and $Cr_2O_7^{2-}$ are interconvertible in aqueous solution by varying the pH of the solution.

D. Cr-O-Cr bond angle in $Cr_2O_7^{2-}$ is 126°.

Choose the correct answer from the options given below:

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

Answer: (B) A, C and D Only · Official NTA final key

Q9 JEE Main 2026 · 4 Apr · Shift 2 MCQ

Pairs of elements with the same number of electrons in their respective 4f orbital are

[Atomic number. Eu-63, Gd-64, Dy-66, Ho-67, Tm-69, Yb-70, Lu-71, Hf-72]

A. (Eu and Gd)

B. (Dy and Ho)

C. (Yb and Hf)

D. (Lu and Tm)

Choose the correct answer from the options given below:

(A) B and C Only
(B) A and B Only
(C) A and D Only
(D) A and C Only

Answer: (D) A and C Only · Official NTA final key

Q10 JEE Main 2026 · 4 Apr · Shift 2 MCQ

Consider $|x|$ is the difference in oxidation states of Mn in highest manganese fluoride and highest manganese oxide. The ions with $|x|$ number of unpaired electrons from the following are:

A. Sc^{3+}

B. Zn^{2+}

C. V^{2+}

D. Fe^{2+}

E. Co^{2+}

Choose the correct answer from the options given below:

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

Answer: (C) C and E Only · Official NTA final key

Q11 JEE Main 2026 · 2 Apr · Shift 1 MCQ

Which of the following sets includes all the species that will change the orange colour of $K_2Cr_2O_7$ in acidic medium ?

(A) Fe^{2+}, Sn^{2+}, I^-, S^{2-}
(B) S^{2-}, Fe^{3+}, I^-, $C_2O_4^{2-}$
(C) Fe^{2+}, NO_2^-, SO_2, Sn^{4+}
(D) Fe^{3+}, SO_4^{2-}, S^{2-}, Sn^{4+}

Answer: (A) Fe^{2+}, Sn^{2+}, I^-, S^{2-} · Official NTA final key

EdLoop JEE

Q12 JEE Main 2026 · 2 Apr · Shift 2 Numerical

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)

Numerical value type: the answer is a number.

Answer: 3. · Official NTA final key

Q13 JEE Main 2026 · 28 Jan · Shift 1 MCQ

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.

$[Sc^{3+}, Ti^{3+}]$, $[Mn^{2+}, Cr^{2+}]$, $[Cu^{2+}, Zn^{2+}]$ and $[Ni^{2+}, Ti^{4+}]$

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

(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

Answer: (C) Both Statement I and Statement II are false · Official NTA final key

Q14 JEE Main 2026 · 28 Jan · Shift 2 MCQ

Consider the following statements about manganate and permanganate ions. Identify the **correct** statements.

A. The geometry of both manganate and permanganate ions is tetrahedral.

B. The oxidation states of Mn in manganate and permanganate are $+7$ and $+6$, respectively.

C. Oxidation of Mn(II) salt by peroxodisulphate gives manganate ion as the final product.

D. Manganate ion is paramagnetic and permanganate ions is diamagnetic.

E. Acidified permanganate ion reduces oxalate, nitrite and iodide ions.

Choose the **correct** answer from the options given below :

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

Answer: (B) A and D Only · Official NTA final key

Q15 JEE Main 2026 · 24 Jan · Shift 2 MCQ

"X" is an oxoanion of the lightest element of group 7 (in the periodic table). The metal is in +6 oxidation state in "X". The color of the potassium salt of X is

(A) purple
(B) green
(C) orange
(D) yellow

Answer: (B) green · Official NTA final key

Q16 JEE Main 2026 · 23 Jan · Shift 2 MCQ

The oxidation state of chromium in the final product formed in the reaction between KI and acidified $K_2Cr_2O_7$ solution is:

(A) $+3$
(B) $+6$
(C) $+2$
(D) $+4$

Answer: (A) $+3$ · Official NTA final key

Q17 JEE Main 2026 · 22 Jan · Shift 2 MCQ

Given below are two statements :

Statement I : The first ionization enthalpy of Cr is lower than that of Mn.

Statement II : The second and third ionization enthalpies of Cr are higher than those of Mn.

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

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

Answer: (B) Statement I is true but **Statement II** is false · Official NTA final key

Q18 JEE Main 2026 · 22 Jan · Shift 2 Numerical

Among the following oxides of 3d elements, the number of mixed oxides are _____.

Ti_2O_3, V_2O_4, Cr_2O_3, Mn_3O_4, Fe_3O_4, Fe_2O_3, Co_3O_4

Numerical value type: the answer is a number.

Answer: 3. · Official NTA final key

Q19 JEE Main 2026 · 21 Jan · Shift 1 MCQ

MnO_4^{2-}, in acidic medium, disproportionates to :

(A) Mn_2O_7 and MnO

(B) Mn_2O_7 and MnO_2

(C) MnO_4^- and MnO

(D) MnO_4^- and MnO_2

Answer: (D) MnO_4^- and MnO_2 · Official NTA final key

Q20 JEE Main 2026 · 21 Jan · Shift 1 Numerical

Consider the following reactions :

$NaCl + K_2Cr_2O_7 + H_2SO_4 \rightarrow A + KHSO_4 + NaHSO_4 + H_2O$

$A + NaOH \rightarrow B + NaCl + H_2O$

$B + H_2SO_4 + H_2O_2 \rightarrow C + Na_2SO_4 + H_2O$

In the product 'C', 'X' is the number of O_2^{2-} units, 'Y' is the total number oxygen atoms present and 'Z' is the oxidation state of Cr. The value of X + Y + Z is _____.

Numerical value type: the answer is a number.

Answer: 13. · Official NTA final key

Q21 JEE Main 2026 · 21 Jan · Shift 2 MCQ

Given below are some of the statements about Mn and Mn_2O_7. Identify the correct statements.

A. Mn forms the oxide Mn_2O_7, in which Mn is in its highest oxidation state.

B. Oxygen stabilizes the Mn in higher oxidation states by forming multiple bonds with Mn.

C. Mn_2O_7 is an ionic oxide.

D. The structure of Mn_2O_7 consists of one bridged oxygen.

Choose the **correct** answer from the options given below :

(A) A, B and D Only

(B) A, C and D Only

(C) A, B and C Only

(D) A, B, C and D

Answer: (A) A, B and D Only · Official NTA final key

Q22 JEE Main 2026 · 21 Jan · Shift 2 Numerical

Identify the metal ions among Co^{2+}, Ni^{2+}, Fe^{2+}, V^{3+} and Ti^{2+} having a spin-only magnetic moment value more than 3.0 BM. The sum of unpaired electrons present in the high spin octahedral complexes formed by those metal ions is _____.

Numerical value type: the answer is a number.

Answer: 7. · Official NTA final key

Q23 JEE Main 2025 · 8 Apr · Shift 2 MCQ

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

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

Answer: (A) $Cr^{2+} > Cr^{3+} > Cu^{2+} > Cu^{+}$ · Key from source paper

---

Q24 JEE Main 2025 · 7 Apr · Shift 1 MCQ

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

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

Answer: (D) 6 · Key from source paper

Q25 JEE Main 2025 · 7 Apr · Shift 1 MCQ

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

Answer: (C) basic · Key from source paper

Q26 JEE Main 2025 · 7 Apr · Shift 2 MCQ

'X' is the number of acidic oxides among $VO_2, V_2O_3, CrO_3, V_2O_5$ and Mn_2O_7. The primary valency of cobalt in $[Co(H_2NCH_2CH_2NH_2)_3]_2(SO_4)_3$ is Y. The value of $X + Y$ is _____ .

(A) 2
(B) 4
(C) 3
(D) 5

Answer: (D) 5 · Key from source paper

Q27 JEE Main 2025 · 4 Apr · Shift 1 MCQ

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

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

Answer: (B) V^{2+}, Co^{2+} · Key from source paper

Q28 JEE Main 2025 · 4 Apr · Shift 1 Numerical

$KMnO_4$ acts as an oxidising agent in acidic medium. 'X' is the difference between the oxidation states of Mn in reactant and product. 'Y' is the number of 'd' electrons present in the brown red precipitate formed at the end of the acetate ion test with neutral ferric chloride. The value of $X + Y$ is

_____

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q29 JEE Main 2025 · 4 Apr · Shift 2 MCQ

The incorrect relationship in the following pairs in relation to ionisation enthalpies is :

(A) $Mn^{2+} < Fe^{2+}$
(B) $Mn^{+} < Cr^{+}$
(C) $Fe^{2+} < Fe^{3+}$
(D) $Mn^{+} < Mn^{2+}$

Answer: (A) $Mn^{2+} < Fe^{2+}$ · Key from source paper

Q30 JEE Main 2025 · 3 Apr · Shift 1 MCQ

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

Answer: (C) A, B and E Only · Key from source paper

Q31 JEE Main 2025 · 3 Apr · Shift 1 Numerical

Consider the following reactions

$A + NaCl + H_2SO_4 \rightarrow CrO_2Cl_2 + Side\ Products$ (A is written with the words 'Little amount' beneath it)

$CrO_2Cl_2\ (Vapour) + NaOH \rightarrow B + NaCl + H_2O$

$B + H^+ \rightarrow C + H_2O$

The number of terminal 'O' present in compound 'C' is _____

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q32 JEE Main 2025 · 3 Apr · Shift 2 MCQ

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) 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

Answer: (B) Statement I is true but Statement II is false · Key from source paper

Q33 JEE Main 2025 · 3 Apr · Shift 2 Numerical

Among, Sc, Mn, Co and Cu , identify the element with highest enthalpy of atomisation. The spin only magnetic moment value of that element in its +2 oxidation state is _____ BM (in nearest integer).

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q34 JEE Main 2025 · 29 Jan · Shift 1 MCQ

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

(A) Fe < Mn, Ru < Tc and Re < Os
(B) Mn < Fe, Tc < Ru and Os < Re
(C) Mn < Fe, Tc < Ru and Re < Os
(D) Fe < Mn, Ru < Tc and Os < Re

Answer: (B) Mn < Fe, Tc < Ru and Os < Re · Key from source paper

---

Q35 JEE Main 2025 · 29 Jan · Shift 1 Numerical

The molar mass of the water insoluble product formed from the fusion of chromite ore ($FeCr_2O_4$) with Na_2CO_3 in presence of O_2 is _____ $gmol^{-1}$.

Numerical value type: the answer is a number.

Answer: 160. · Key from source paper

Q36 JEE Main 2025 · 28 Jan · Shift 1 MCQ

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

Answer: (D) A, B and C Only · Key from source paper

Q37 JEE Main 2025 · 28 Jan · Shift 2 MCQ

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

Answer: (D) +5 · Key from source paper

Q38 JEE Main 2025 · 28 Jan · Shift 2 Numerical

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 value type: the answer is a number.

Answer: 5. · Key from source paper

EdLoop JEE

Q39 JEE Main 2025 · 24 Jan · Shift 1 MCQ

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) $K_4[Mn(OH)_6]$
(C) $KMnO_4$
(D) K_2MnO_4

Answer: (D) K_2MnO_4 · Key from source paper

Q40 JEE Main 2025 · 24 Jan · Shift 1 MCQ

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

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

Answer: (B) Tb^{4+} · Key from source paper

Q41 JEE Main 2025 · 24 Jan · Shift 2 MCQ

Match List - I with List - II.

List - I (Transition metal ion)	List - II (Spin only magnetic moment (B.M.))
(A) Ti^{3+}	(I) 3.87
(B) V^{2+}	(II) 0.00
(C) Ni^{2+}	(III) 1.73
(D) Sc^{3+}	(IV) 2.84

Choose the correct answer from the options given below :

(A) (A) – (III), (B) – (I), (C) – (IV), (D) – (II)
(B) (A) – (III), (B) – (I), (C) – (II), (D) – (IV)
(C) (A) – (IV), (B) – (II), (C) – (III), (D) – (I)
(D) (A) – (II), (B) – (IV), (C) – (I), (D) – (III)

Answer: (A) (A) – (III), (B) – (I), (C) – (IV), (D) – (II) · Key from source paper

Q42 JEE Main 2025 · 23 Jan · Shift 1 MCQ

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

EdLoop JEE

(A) Sc^{3+}, Ti^{3+}, Cr^{2+}
(B) V^{2+}, Cr^{3+}, Mn^{3+}
(C) Ti^{4+}, V^{4+}, Mn^{2+}
(D) Zn^{2+}, V^{3+}, Fe^{3+}

Answer: (B) V^{2+}, Cr^{3+}, Mn^{3+} · Key from source paper

Q43 JEE Main 2025 · 23 Jan · Shift 2 MCQ

Consider the following reactions $K_2Cr_2O_7 \xrightarrow[-H_2O]{KOH} [A] \xrightarrow[-H_2O]{H_2SO_4} [B] + K_2SO_4$ The products $[A]$ and $[B]$, respectively are :

(A) K_2CrO_4 and CrO
(B) K_2CrO_4 and Cr_2O_3
(C) K_2CrO_4 and $K_2Cr_2O_7$
(D) $K_2Cr(OH)_6$ and Cr_2O_3

Answer: (C) K_2CrO_4 and $K_2Cr_2O_7$ · Key from source paper

---

Q44 JEE Main 2025 · 23 Jan · Shift 2 MCQ

Match List - I with List - II.

List – I	List – II
(A) Bronze	(I) Cu, Ni
(B) Brass	(II) Fe, Cr, Ni, C
(C) UKsilvercoin	(III) Cu, Zn
(D) Stainlesssteel	(IV) Cu, Sn

Choose the correct answer from the options given below :

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

Answer: (B) (A)-(IV), (B)-(III), (C)-(I), (D)-(II) · Key from source paper

---

Q45 JEE Main 2025 · 22 Jan · Shift 1 MCQ

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 :

EdLoop JEE

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

Answer: (C) (A) and (B) only · Key from source paper

Q46 JEE Main 2025 · 22 Jan · Shift 2 Numerical

Niobium (Nb) and ruthenium (Ru) have " x " and " y " number of electrons in their respective 4 d orbitals. The value of $x + y$ is _____ -.

Numerical value type: the answer is a number.

Answer: 11. · Key from source paper

Q47 JEE Main 2024 · 9 Apr · Shift 1 MCQ

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

(A) Stability of Cu(I) and Cu(II) depends on nature of copper salts
(B) Cu(II) is more stable
(C) Cu(I) and Cu(II) are equally stable
(D) Cu (II) is less stable

Answer: (B) Cu(II) is more stable · Key from source paper

Q48 JEE Main 2024 · 9 Apr · Shift 1 Numerical

Number of colourless lanthanoid ions among the following is _____ $Eu^{3+}, Lu^{3+}, Nd^{3+}, La^{3+}, Sm^{3+}$

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q49 JEE Main 2024 · 9 Apr · Shift 2 MCQ

The electronic configuration of Einsteinium is : (Given atomic number of Einsteinium = 99)

(A) $[Rn]5f^{10}6\,d^{\circ}7\,s^2$
(B) $[Rn]5f^{13}6\,d^{\circ}7\,s^2$
(C) $[Rn]5f^{11}6\,d^{\circ}7\,s^2$
(D) $[Rn]5f^{12}6\,d^{\circ}7\,s^2$

Answer: (C) $[Rn]5f^{11}6\,d^{\circ}7\,s^2$ · Key from source paper

Q50 JEE Main 2024 · 9 Apr · Shift 2 MCQ

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

Answer: (A) Both Statement I and Statement II are true · Key from source paper

Q51 JEE Main 2024 · 9 Apr · Shift 2 Numerical

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 value type: the answer is a number.

Answer: 6. · Key from source paper

Q52 JEE Main 2024 · 8 Apr · Shift 1 MCQ

Iron (III) catalyses the reaction between iodide and persulphate ions, in which A. Fe^{3+} oxidises the iodide ion B. Fe^{3+} oxidises the persulphate ion C. Fe^{2+} reduces the iodide ion D. Fe^{2+} reduces the persulphate ion Choose the most appropriate answer from the options given below:

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

Answer: (D) A and D only · Key from source paper

Q53 JEE Main 2024 · 8 Apr · Shift 1 Numerical

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 value type: the answer is a number.

Answer: 0. · Key from source paper

Q54 JEE Main 2024 · 8 Apr · Shift 2 MCQ

The equilibrium $Cr_2O_7^{2-} \rightleftharpoons 2CrO_4^{2-}$ is shifted to the right in :

(A) an acidic medium
(B) a basic medium
(C) a neutral medium
(D) a weakly acidic medium

Answer: (B) a basic medium · Key from source paper

Q55 JEE Main 2024 · 8 Apr · Shift 2 MCQ

Given below are two statements : Statement (I) : Fusion of $\mathrm{MnO_2}$ with KOH and an oxidising agent gives dark green $\mathrm{K_2MnO_4}$. 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 true but Statement II is false
(B) Both Statement I and Statement II are false
(C) Statement I is false but Statement II is true
(D) Both Statement I and Statement II are true

Answer: (D) Both Statement I and Statement II are true · Key from source paper

---

Q56 JEE Main 2024 · 6 Apr · Shift 1 MCQ

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

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

Answer: (C) 1 · Key from source paper

Q57 JEE Main 2024 · 6 Apr · Shift 1 Numerical

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 value type: the answer is a number.

Answer: 877. · Key from source paper

Q58 JEE Main 2024 · 6 Apr · Shift 1 Numerical

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 value type: the answer is a number.

Answer: 6. · Key from source paper

Q59 JEE Main 2024 · 6 Apr · Shift 2 MCQ

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

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

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

Answer: (C) (A) < (D) < (C) < (E) < (B) · Key from source paper

---

Q60 JEE Main 2024 · 6 Apr · Shift 2 Numerical

Among VO_2^+, MnO_4^- and $Cr_2O_7^{2-}$, 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 value type: the answer is a number.

Answer: 0. · Key from source paper

Q61 JEE Main 2024 · 5 Apr · Shift 1 MCQ

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

(A) Fe

(B) Mn

(C) Co

(D) Ti

Answer: (B) Mn · Key from source paper

Q62 JEE Main 2024 · 5 Apr · Shift 1 Numerical

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 value type: the answer is a number.

Answer: 5. · Key from source paper

Q63 JEE Main 2024 · 5 Apr · Shift 2 MCQ

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) 2
(B) 3
(C) 1
(D) 0

Answer: (B) 3 · Key from source paper

Q64 JEE Main 2024 · 5 Apr · Shift 2 Numerical

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 value type: the answer is a number.

Answer: 6. · Key from source paper

Q65 JEE Main 2024 · 4 Apr · Shift 1 MCQ

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

(A) Cobalt
(B) Titanium
(C) Nickel
(D) Scandium

Answer: (D) Scandium · Key from source paper

Q66 JEE Main 2024 · 4 Apr · Shift 1 Numerical

Consider the following reaction $MnO_2 + KOH + O_2 \rightarrow A + H_2O$. 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 value type: the answer is a number.

Answer: 4. · Key from source paper

Q67 JEE Main 2024 · 4 Apr · Shift 2 MCQ

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) 26
(B) 25
(C) 23
(D) 22

Answer: (C) 23 · Key from source paper

Q68 JEE Main 2024 · 4 Apr · Shift 2 Numerical

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 value type: the answer is a number.

Answer: 0. · Key from source paper

Q69 JEE Main 2024 · 1 Feb · Shift 2 MCQ

The transition metal having highest 3rd ionisation enthalpy is:

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

Answer: (B) Mn · Key from source paper

Q70 JEE Main 2024 · 1 Feb · Shift 2 MCQ

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

(A) $CuSO_4 \cdot 5H_2O$
(B) $K_2Cr_2O_7$
(C) K_2CrO_4
(D) $KMnO_4$

Answer: (A) $CuSO_4 \cdot 5H_2O$ · Key from source paper

Q71 JEE Main 2024 · 1 Feb · Shift 2 MCQ

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 statement, choose the most appropriate 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 false but R is true
(D) A is true but R is false

Answer: (A) Both A and R are true and R is the correct explanation of A · Key from source paper

Q72 JEE Main 2024 · 31 Jan · Shift 1 MCQ

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

Answer: (D) B, D, E only · Key from source paper

Q73 JEE Main 2024 · 31 Jan · Shift 2 MCQ

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

Answer: (B) A and C only · Key from source paper

Q74 JEE Main 2024 · 30 Jan · Shift 1 MCQ

Diamagnetic Lanthanoid ions are:

(A) Nd^{3+} and Eu^{3+}

(B) La^{3+} and Ce^{4+}

(C) Nd^{3+} and Ce^{4+}

(D) Lu^{3+} and Eu^{3+}

Answer: (B) La^{3+} and Ce^{4+} · Key from source paper

Q75 JEE Main 2024 · 30 Jan · Shift 1 MCQ

Match List-I with List-II

List I (Species)	List II (Electronic distribution)
A. Cr^{+2}	i. $3d^8$
B. Mn^{+}	ii. $3d^3 4s^1$
C. Ni^{+2}	iii. $.3d^4$
D. V^{+}	iv. $3d^5 4s^1$

Choose the correct answer from the options given below:

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

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

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

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

Answer: (B) (A)-III, (B) - IV, (C) - I, (D)-II · Key from source paper

Q76 JEE Main 2024 · 30 Jan · Shift 2 MCQ

The orange colour of $K_2Cr_2O_7$ and purple colour of $KMnO_4$ is due to

(A) Charge transfer transition in both.

(B) d → d transition in $KMnO_4$ and charge transfer transitions in $K_2Cr_2O_7$.

(C) d → d transition in $K_2Cr_2O_7$ and charge transfer transitions in $KMnO_4$.

(D) d → d transition in both.

Answer: (A) Charge transfer transition in both. · Key from source paper

Q77 JEE Main 2024 · 30 Jan · Shift 2 MCQ

A and B formed in the following reactions are:

$$CrO_2Cl_2 + 4NaOH \rightarrow A + 2NaCl + 2H_2O$$

$$A + 2HCl + 2H_2O_2 \rightarrow B + 3H_2O$$

EdLoop JEE

(A) $A = Na_2CrO_4$, $B = CrO_5$
(B) $A = Na_2Cr_2O_4$, $B = CrO_4$
(C) $A = Na_2Cr_2O_7$, $B = CrO_3$
(D) $A = Na_2Cr_2O_7$, $B = CrO_5$

Answer: (A) $A = Na_2CrO_4$, $B = CrO_5$ · Key from source paper

Q78 JEE Main 2024 · 30 Jan · Shift 2 MCQ

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_7 and MnO_4^-
(B) MnO_4^{2-} and MnO_4^-
(C) Mn_2O_3 and MnO_4^{2-}
(D) MnO_4^{2-} and Mn_2O_7

Answer: (B) MnO_4^{2-} and MnO_4^- · Key from source paper

Q79 JEE Main 2024 · 29 Jan · Shift 1 MCQ

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

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

Answer: (D) K_2MnO_4 & MnO_2 · Key from source paper

Q80 JEE Main 2024 · 29 Jan · Shift 1 MCQ

In chromyl chloride test for confirmation of Cl^- ion, a yellow solution is obtained. Acidification of the solution and addition of amyl alcohol and 10% H_2O_2 turns organic layer blue indicating formation of chromium pentoxide. The oxidation state of chromium in that is

(A) +6
(B) +5
(C) +10
(D) +3

Answer: (A) +6 · Key from source paper

Q81 JEE Main 2024 · 29 Jan · Shift 1 MCQ

In alkaline medium. MnO_4^- oxidises I^- to

(A) IO_4^-
(B) IO^-
(C) I_2
(D) IO_3^-

Answer: (D) IO_3^- · Key from source paper

Q82 JEE Main 2024 · 29 Jan · Shift 2 MCQ

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

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

Answer: (C) Eu^{2+} · Key from source paper

Q83 JEE Main 2024 · 29 Jan · Shift 2 MCQ

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

Answer: (A) B, D only · Key from source paper

Q84 JEE Main 2024 · 27 Jan · Shift 1 MCQ

The electronic configuration for Neodymium is:

[Atomic Number for Neodymium 60]

(A) $[\mathrm{Xe}]\ 4f^4\ 6s^2$
(B) $[\mathrm{Xe}]\ 5f^4 7s^2$
(C) $[\mathrm{Xe}]\ 4f^6\ 6s^2$
(D) $[\mathrm{Xe}]\ 4f^1 5d^1 6s^2$

Answer: (A) $[\mathrm{Xe}]\ 4f^4\ 6s^2$ · Key from source paper

---

Q85 JEE Main 2024 · 27 Jan · Shift 1 MCQ

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

(A) $[\mathrm{Ar}]\ 3d^7$
(B) $[\mathrm{Ar}]\ 3d^8$
(C) $[\mathrm{Ar}]\ 3d^3$
(D) $[\mathrm{Ar}]\ 3d^6$

Answer: (D) $[\mathrm{Ar}]\ 3d^6$ · Key from source paper

Q86 JEE Main 2024 · 27 Jan · Shift 2 MCQ

Choose the correct option having all the elements with d^{10} electronic configuration from the following:

(A) $^{27}\mathrm{Co}$, $^{28}\mathrm{Ni}$, $^{26}\mathrm{Fe}$, $^{24}\mathrm{Cr}$
(B) $^{29}\mathrm{Cu}$, $^{30}\mathrm{Zn}$, $^{48}\mathrm{Cd}$, $^{47}\mathrm{Ag}$
(C) $^{46}\mathrm{Pd}$, $^{28}\mathrm{Ni}$, $^{26}\mathrm{Fe}$, $^{24}\mathrm{Cr}$
(D) $^{28}\mathrm{Ni}$, $^{24}\mathrm{Cr}$, $^{26}\mathrm{Fe}$, $^{29}\mathrm{Cu}$

Answer: (B) $^{29}\mathrm{Cu}$, $^{30}\mathrm{Zn}$, $^{48}\mathrm{Cd}$, $^{47}\mathrm{Ag}$ · Key from source paper

---

Q87 JEE Main 2024 · 27 Jan · Shift 2 MCQ

Given below are two statements:

Statement (I) : In the Lanthanoids, the formation of 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) Statement I is false but Statement II is true
(B) Both Statement I and Statement II are true
(C) Statement I is true but Statement II is false
(D) Both Statement I and Statement II are false

Answer: (B) Both Statement I and Statement II are true · Key from source paper

Q88 JEE Main 2024 · 27 Jan · Shift 2 MCQ

Identity the incorrect pair from the following:

(A) Photography - $AgBr$
(B) Polythene preparation - $TiCl_4$, $AlCH_{33}$
(C) Haber process - Iron
(D) Wacker process - $PtCl_2$

Answer: (D) Wacker process - $PtCl_2$ · Key from source paper

Q89 JEE Main 2023 · 15 Apr · Shift 1 Numerical

In Chromyl chloride, the oxidation state of chromium is (+) _____.

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q90 JEE Main 2023 · 13 Apr · Shift 1 MCQ

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

Answer: (C) Eu, Yb · Key from source paper

Q91 JEE Main 2023 · 12 Apr · Shift 1 MCQ

Given below are two statement : one is labelled as Assertion A and the other is labelled as Reason R
Assertion A : 5f electron 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) A is false but R is true
(B) Both A and R are true and R is the correct explanation of A
(C) A is true but R is false
(D) Both A and R are true but R is NOT the correct explanation of A

Answer: (B) Both A and R are true and R is the correct explanation of A · Key from source paper

Q92 JEE Main 2023 · 10 Apr · Shift 1 MCQ

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:

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

Answer: (C) Statement I is true but Statement II is false · Key from source paper

---

Q93 JEE Main 2023 · 10 Apr · Shift 1 MCQ

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

Answer: (A) B, C only · Key from source paper

Q94 JEE Main 2023 · 10 Apr · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q95 JEE Main 2023 · 10 Apr · Shift 2 Numerical

In alkaline medium, the reduction of permanganate anion involves a gain of _____ electrons.

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q96 JEE Main 2023 · 8 Apr · Shift 1 MCQ

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)

(A) V (IV)
(B) Mn (VII)
(C) Fe (III)
(D) Ti (III)

Answer: (B) Mn (VII) · Key from source paper

Q97 JEE Main 2023 · 8 Apr · Shift 2 · Numerical

The sum of oxidation state of the metals in $Fe(CO)_5$, VO^{2+} and WO_3 is

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q98 JEE Main 2023 · 6 Apr · Shift 1 · MCQ

Strong reducing and oxidizing agents among the following , respectively, are

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

Answer: (D) Eu^{2+} and Ce^{4+} · Key from source paper

Q99 JEE Main 2023 · 6 Apr · Shift 2 · MCQ

During the reaction of permanganate with thiosulphate, the change in oxidation of manganese occurs by value of 3. Identify which of the below medium will favour the reaction.

(A) Both aqueous acidic and neutral
(B) Aqueous neutral
(C) Both aqueous acidic and faintly alkaline
(D) Aqueous acidic

Answer: (B) Aqueous neutral · Key from source paper

Q100 JEE Main 2023 · 1 Feb · Shift 1 · MCQ

Highest oxidation state of Mn is exhibited in Mn_2O_7. The correct statements about Mn_2O_7 are
(A) Mn is tetrahedrally surrounded by oxygen atoms
(B) Mn is octahedrally surrounded by oxygen atoms
(C) Contains Mn - O - Mn bridge
(D) Contains Mn - Mn bond.
Choose the correct answer from the options given below

EdLoop JEE

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

Answer: (A) A and C only · Key from source paper

Q101 JEE Main 2023 · 1 Feb · Shift 2 MCQ

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

Answer: (A) Both (A) and (R) are correct and (R) is the correct explanation of (A). · Key from source paper

---

Q102 JEE Main 2023 · 31 Jan · Shift 1 MCQ

Nd^{2+} = _____

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

Answer: (B) $4f^4$ · Key from source paper

Q103 JEE Main 2023 · 31 Jan · Shift 2 MCQ

Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): The first ionization enthalpy of 3d series elements is more than that of group 2 metals
Reason (R): In 3d series of elements successive filling of d-orbitals takes place.
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) (A) is true but (R) is false
(C) (A) is false but (R) is true
(D) Both (A) and (R) are true but (R) is not the correct explanation of (A)

Answer: (A) Both (A) and (R) are true and (R) is the correct explanation of (A) · Key from source paper

Q104 JEE Main 2023 · 31 Jan · Shift 2 MCQ

Which of the following elements have half-filled f-orbitals in their ground state ?
(Given : atomic number Sm = 62; Eu = 63; Tb = 65; Gd = 64, Pm = 61)
A. Sm
B. Eu
C. Tb
D. Gd
E. Pm
Choose the correct answer from the options given below :

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

Answer: (C) B and D only · Key from source paper

Q105 JEE Main 2023 · 30 Jan · Shift 2 MCQ

$KMnO_4$ oxidises I^- in acidic and neutral/faintly alkaline solution, respectively to

(A) I_2 and IO_3^-
(B) IO_3^- and I_2
(C) IO_3^- and IO_3^-
(D) I_2 and I_2

Answer: (A) I_2 and IO_3^- · Key from source paper

Q106 JEE Main 2023 · 29 Jan · Shift 1 MCQ

The standard electrode potential (M^{3+}/M^{2+}) for V, Cr, Mn & Co are -0.26 V, -0.41 V, $+1.57$ V and $+1.97$ V, respectively. The metal ions which can liberate H_2 from a dilute acid are

(A) V^{2+} and Mn^{2+}
(B) Cr^{2+} and Co^{2+}
(C) V^{2+} and Cr^{2+}
(D) Mn^{2+} and Co^{2+}

Answer: (C) V^{2+} and Cr^{2+} · Key from source paper

Q107 JEE Main 2023 · 29 Jan · Shift 2 MCQ

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

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

Answer: (D) Blue · Key from source paper

Q108 JEE Main 2023 · 29 Jan · Shift 2 MCQ

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

Answer: (B) (i), (ii) and (iv) · Key from source paper

Q109 JEE Main 2023 · 25 Jan · Shift 1 Numerical

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)
V^{3+}, Cr^{3+}, Fe^{2+}, Ni^{3+}

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q110 JEE Main 2023 · 25 Jan · Shift 2 MCQ

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

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

Answer: (B) $+6$ to $+3$ · Key from source paper

Q111 JEE Main 2023 · 24 Jan · Shift 1 MCQ

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

(A) Cr^{2+}
(B) Mn^{2+}
(C) V^{2+}
(D) Ti^{2+}

Answer: (C) V^{2+} · Key from source paper

Q112 JEE Main 2023 · 24 Jan · Shift 2 MCQ

Which one amongst the following are good oxidising 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 only
(B) D only
(C) A and B only
(D) C and D only

Answer: (D) C and D only · Key from source paper

Q113 JEE Main 2023 · 24 Jan · Shift 2 MCQ

$K_2Cr_2O_7$ paper acidified with dilute H_2SO_4 turns green when exposed to

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

Answer: (D) Sulphur dioxide · Key from source paper

Q114 JEE Main 2022 · 29 Jul · Shift 1 MCQ

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

(A) Sc^{3+}, Zn^{2+}
(B) Ti^{4+}, Cu^{2+}
(C) V^{2+}, Ti^{3+}
(D) Zn^{2+}, Mn^{2+}

Answer: (A) Sc^{3+}, Zn^{2+} · Key from source paper

Q115 JEE Main 2022 · 29 Jul · Shift 1 MCQ

In neutral or faintly alkaline medium, $KMnO_4$ being a powerful oxidant can oxidise, 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

Answer: (D) 3 · Key from source paper

Q116 JEE Main 2022 · 29 Jul · Shift 2 MCQ

Which of the following 3d - metal ion will give the lowest enthalpy of hydration $\Delta_{hyd}H$ when dissolved in water?

(A) Cr^{2+}
(B) Mn^{2+}
(C) Fe^{2+}
(D) Co^{2+}

Answer: (B) Mn^{2+} · Key from source paper

Q117 JEE Main 2022 · 28 Jul · Shift 1 MCQ

Which of the following has least tendency to liberate H_2 from mineral acids?

(A) Cu
(B) Mn
(C) Ni
(D) Zn

Answer: (A) Cu · Key from source paper

Q118 JEE Main 2022 · 28 Jul · Shift 1 Numerical

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 value type: the answer is a number.

Answer: 4. · Key from source paper

Q119 JEE Main 2022 · 28 Jul · Shift 2 MCQ

Which of the following pair is not isoelectronic species?
(Atomic numbers $\mathrm{Sm} = 62$; $\mathrm{Er} = 68$; $\mathrm{Yb} = 70$; $\mathrm{Lu} = 71$; $\mathrm{Eu} = 63$; $\mathrm{Tb} = 65$; $\mathrm{Tm} = 69$)

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

Options (4) or (1) were accepted. More than one answer was accepted. · Key from source paper

Q120 JEE Main 2022 · 27 Jul · Shift 1 MCQ

Given below are two statements:
Statement I : Iron (III) catalyst, acidified $\mathrm{K_2\ Cr_2\ O_7}$ and neutral $\mathrm{KMnO_4}$ have the ability to oxidise $\mathrm{I^-}$ to $\mathrm{I_2}$ independently.
Statement II: Manganate ion is paramagnetic in nature and involves $\mathrm{p}\pi - \mathrm{p}\pi$ bonding.
In the light of the above statements, choose the correct answer from the options.

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

Answer: (B) Both statement I and Statement II are false · Key from source paper

Q121 JEE Main 2022 · 27 Jul · Shift 1 MCQ

The total number of Mn = O bonds in $\mathrm{Mn_2\ O_7}$ is

(A) 4
(B) 5
(C) 6
(D) 3

Answer: (C) 6 · Key from source paper

Q122 JEE Main 2022 · 27 Jul · Shift 2 MCQ

In neutral or alkaline solution, $\mathrm{MnO_4^-}$ oxidises thiosulphate to

(A) $S_2O_7^{2-}$
(B) $S_2O_8^{2-}$
(C) SO_3^{2-}
(D) SO_4^{2-}

Answer: (D) SO_4^{2-} · Key from source paper

Q123 JEE Main 2022 · 27 Jul · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q124 JEE Main 2022 · 26 Jul · Shift 2 MCQ

The products obtained from a reaction of hydrogen peroxide and acidified potassium permanganate are

(A) Mn^{4+}, H_2O only
(B) Mn^{2+}, H_2O only
(C) Mn^{4+}, H_2O, O_2 only
(D) Mn^{2+}, H_2O, O_2 only

Answer: (D) Mn^{2+}, H_2O, O_2 **only** · Key from source paper

---

Q125 JEE Main 2022 · 26 Jul · Shift 2 Numerical

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 value type: the answer is a number.

Answer: 5. · Key from source paper

Q126 JEE Main 2022 · 25 Jul · Shift 1 MCQ

The reaction of H_2O_2 with potassium permanganate in acidic medium leads to the formation of mainly

(A) Mn^{2+}
(B) Mn^{4+}
(C) Mn^{3+}
(D) Mn^{6+}

Answer: (A) Mn^{2+} · Key from source paper

Q127 JEE Main 2022 · 25 Jul · Shift 1 Numerical

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 value type: the answer is a number.

Answer: 5. · Key from source paper

Q128 JEE Main 2022 · 25 Jul · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q129 JEE Main 2022 · 29 Jun · Shift 1 MCQ

The electronic configuration of Pt (atomic number 78) is

(A) $[Kr]4f^{14}5d^{10}$
(B) $[Xe]4f^{14}5d^{10}$
(C) $[Xe]4f^{14}5d^{8}6s^{2}$
(D) $[Xe]\,4f^{14}5d^{9}6s^{1}$

Answer: (D) $[Xe]\,4f^{14}5d^{9}6s^{1}$ · Key from source paper

Q130 JEE Main 2022 · 29 Jun · Shift 1 Numerical

The number of terminal oxygen atoms present in the product B obtained from the following reaction is

$$FeCr_2O_4 + Na_2CO_3 + O_2 \rightarrow A + Fe_2O_3 + CO_2$$
$$A + H^+ \rightarrow B + H_2O + Na^+$$

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q131 JEE Main 2022 · 29 Jun · Shift 1 Numerical

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 value type: the answer is a number.

Answer: 0. · Key from source paper

EdLoop JEE

Q132 JEE Main 2022 · 28 Jun · Shift 1 MCQ

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

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

Answer: (C) Eu (Atomic Number 63) · Key from source paper

Q133 JEE Main 2022 · 27 Jun · Shift 1 Numerical

The number of statement(s) correct from the following for Copper 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 value type: the answer is a number.

Answer: 3. · Key from source paper

Q134 JEE Main 2022 · 27 Jun · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q135 JEE Main 2022 · 27 Jun · Shift 2 MCQ

In 3 d series, the metal having the highest M^{2+}/M standard electrode potential is

(A) Cr
(B) Fe
(C) Cu
(D) Zn

Answer: (C) Cu · Key from source paper

Q136 JEE Main 2022 · 27 Jun · Shift 2 MCQ

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+}

Answer: (C) Tb^{4+} **and** Yb^{2+} · Key from source paper

Q137 JEE Main 2022 · 26 Jun · Shift 1 Numerical

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 value type: the answer is a number.

Answer: 3. · Key from source paper

Q138 JEE Main 2022 · 26 Jun · Shift 2 MCQ

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) $Gd(At.\ No, 64)$

Answer: (A) $Ce(At.\ No, 58)$ · Key from source paper

Q139 JEE Main 2022 · 25 Jun · Shift 1 MCQ

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

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

Answer: (A) It will prefer to gain electron and act as an oxidizing agent · Key from source paper

---

Q140 JEE Main 2022 · 25 Jun · Shift 1 MCQ

Among the following, which is the strongest oxidizing agent?

(A) Mn^{3+}
(B) Ti^{3+}
(C) Fe^{3+}
(D) Cr^{3+}

Answer: (A) Mn^{3+} · Key from source paper

Q141 JEE Main 2022 · 25 Jun · Shift 2 MCQ

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+}

Answer: (B) Ni^{2+} · Key from source paper

Q142 JEE Main 2022 · 24 Jun · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 0. · Key from source paper

Q143 JEE Main 2021 · 1 Sep · Shift 2 MCQ

In the given chemical reaction, colors of the Fe^{2+} and Fe^{3+} ions, are respectively :

$$5Fe^{2+} + MnO_4^- + 8H^+ \rightarrow Mn^{2+} + 4H_2O + 5Fe^{3+}$$

(A) Yellow, Green
(B) Yellow, Orange
(C) Green, Orange
(D) Green, Yellow

Answer: (D) Green, Yellow · Key from source paper

Q144 JEE Main 2021 · 1 Sep · Shift 2 MCQ

Identify the element for which electronic configuration in $+3$ oxidation state is $[Ar]3\,d^5$:

(A) Ru
(B) Mn
(C) Co
(D) Fe

Answer: (D) Fe · Key from source paper

Q145 JEE Main 2021 · 31 Aug · Shift 1 MCQ

In the structure of the dichromate ion, there is a :

(A) linear symmetrical $\mathrm{Cr-O-Cr}$ bond.
(B) non-linear unsymmetrical $\mathrm{Cr-O-Cr}$ bond.
(C) non-linear symmetrical $\mathrm{Cr-O-Cr}$ bond.
(D) linear unsymmetrical $\mathrm{Cr-O-Cr}$ bond.

Answer: (C) non-linear symmetrical $\mathrm{Cr-O-Cr}$ bond. · Key from source paper

---

Q146 JEE Main 2021 · 31 Aug · Shift 1 MCQ

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) Ce
(D) La

Answer: (B) Yb · Key from source paper

Q147 JEE Main 2021 · 31 Aug · Shift 2 MCQ

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

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

Answer: (B) $4f^7$ · Key from source paper

Q148 JEE Main 2021 · 27 Aug · Shift 1 MCQ

The nature of oxides $\mathrm{V_2O_3}$ and CrO is indexed as 'X' and 'Y' type respectively. The correct set of X and Y is:

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

Answer: (C) X = basic Y = basic · Key from source paper

Q149 JEE Main 2021 · 27 Aug · Shift 2 MCQ

Potassium permanganate on heating at $513\ \mathrm{K}$ gives a product which is :

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

Answer: (D) paramagnetic and green · Key from source paper

Q150 JEE Main 2021 · 27 Aug · Shift 2 MCQ

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

(A) a solution of $[\mathrm{Cr(OH)_4}]^-$
(B) precipitate of $[\mathrm{Cr(OH)_6}]^{3-}$
(C) precipitate of $\mathrm{Cr_2\,O_3(H_2O)_n}$
(D) precipitate of $\mathrm{Cr(OH)_3}$

Options (3) or (4) were accepted. More than one answer was accepted. · Key from source paper

Q151 JEE Main 2021 · 26 Aug · Shift 1 MCQ

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

(A) $\mathrm{Cu_2Cl_2}$
(B) $\mathrm{ZnCl_2}$
(C) $\mathrm{CuCl_2}$
(D) AgCl

Answer: (C) $\mathrm{CuCl_2}$ · Key from source paper

Q152 JEE Main 2021 · 26 Aug · Shift 1 Numerical

These are physical properties of an element
(A) Sublimation enthalpy
(B) Ionisation enthalpy
(C) Hydration enthalpy
(D) Electron gain enthalpy
The total number of above properties that affect the reduction potential is (Integer answer)

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q153 JEE Main 2021 · 26 Aug · Shift 1 Numerical

The number of 4f electrons in the ground state electronic configuration of Gd^{2+} is [Atomic number of $\mathrm{Gd} = 64$]

Numerical value type: the answer is a number.

Answer: 7. · Key from source paper

Q154 JEE Main 2021 · 25 Jul · Shift 1 MCQ

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)

Answer: (C) (a) > (d) > (c) > (b) > (e) · Key from source paper

Q155 JEE Main 2021 · 25 Jul · Shift 2 MCQ

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) $0, 3.87, 1.73$

Answer: (B) $1.73, 3.87, 0$ · Key from source paper

Q156 JEE Main 2021 · 25 Jul · Shift 2 Numerical

Number of electrons present in 4f orbital of Ho^{3+} ion is _____ (Given Atomic No. of Ho $= 67$)

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q157 JEE Main 2021 · 22 Jul · Shift 1 MCQ

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

(A) Cu^{2+}, Cr^{3+}, Sc^{+}
(B) $Cu^{2+}, Zn^{2+}, Mn^{4+}$
(C) Sc^{3+}, V^{5+}, Ti^{4+}
(D) $Ni^{2+}, Mn^{7+}, Hg^{2+}$

Answer: (A) Cu^{2+}, Cr^{3+}, Sc^{+} · Key from source paper

Q158 JEE Main 2021 · 20 Jul · Shift 2 MCQ

Cu^{2+} salt reacts with potassium iodide to give

(A) Cu_2I_2
(B) Cu_2I_3
(C) CuI
(D) $Cu(I_3)_2$

Options (1) or (3) were accepted. More than one answer was accepted. · Key from source paper

Q159 JEE Main 2021 · 17 Mar · Shift 1 MCQ

Given below are two statements:
Statement I: Potassium permanganate on heating at 573 K 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) Both statement I and statement II are true
(C) Statement I is false but statement II is true
(D) Both statement I and statement II are false

Answer: (A) Statement I is true but statement II is false · Key from source paper

Q160 JEE Main 2021 · 17 Mar · Shift 1 MCQ

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

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

Answer: (A) 5.92 · Key from source paper

Q161 JEE Main 2021 · 17 Mar · Shift 2 MCQ

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

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

Answer: (A) $+2$ to $+6$ · Key from source paper

Q162 JEE Main 2021 · 16 Mar · Shift 1 MCQ

Given below are two statements :
Statement I : The E° value of Ce^{4+}/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) Both statement I and statement II are correct
(B) Statement I is incorrect but statement II is correct
(C) Both statement I and statement II are incorrect
(D) Statement I is correct but statement II is incorrect

Answer: (D) Statement I is correct but statement II is incorrect · Key from source paper

Q163 JEE Main 2021 · 16 Mar · Shift 1 MCQ

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

(A) A is false but R is true
(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) Both A and R are true and R is the correct explanation of A

Answer: (C) A is true but R is false · Key from source paper

Q164 JEE Main 2021 · 16 Mar · Shift 2 MCQ

FeX_2 and FeY_3 are known when x and y are :

(A) x = F, Cl, Br, I and y = F, Cl, Br
(B) x = F, Cl, Br and y = F, Cl, Br, I
(C) x = Cl, Br, I and y = F, Cl, Br, I
(D) x = F, Cl, Br, I and y = F, Cl, Br, I

Answer: (A) x = F, Cl, Br, I and y = F, Cl, Br · Key from source paper

---

Q165 JEE Main 2021 · 16 Mar · Shift 2 MCQ

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

Answer: (D) (a) < (c) < (b) · Key from source paper

Q166 JEE Main 2021 · 26 Feb · Shift 1 MCQ

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

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

Answer: (A) Yb · Key from source paper

Q167 JEE Main 2021 · 26 Feb · Shift 1 Numerical

Dichromate ion is treated with base, the oxidation number of Cr in the product formed is _____

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q168 JEE Main 2021 · 26 Feb · Shift 2 Numerical

In mildly alkaline medium, thiosulphate ion is oxidized by MnO_4^- to "A". The oxidation state of sulphur in "A" is _____

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q169 JEE Main 2021 · 25 Feb · Shift 1 MCQ

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

Answer: (A) Both Statement I and Statement II are true · Key from source paper

---

Q170 JEE Main 2021 · 25 Feb · Shift 2 MCQ

The major components of German Silver are :

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

Answer: (B) Cu, Zn and Ni · Key from source paper

Q171 JEE Main 2021 · 25 Feb · Shift 2 Numerical

The spin only magnetic moment of a divalent ion in aqueous solution (atomic number 29) is _____ BM.

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q172 JEE Main 2021 · 24 Feb · Shift 1 MCQ

The major components in "Gun Metal" are:

(A) Cu, Sn and Zn
(B) Al, Cu, Mg and Mn
(C) Cu, Ni and Fe
(D) Cu, Zn and Ni

Answer: (A) Cu, Sn and Zn · Key from source paper

Q173 JEE Main 2021 · 24 Feb · Shift 1 MCQ

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

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

Answer: (D) Cu · Key from source paper

Q174 JEE Main 2021 · 24 Feb · Shift 2 MCQ

The incorrect statement among the following is:

(A) Cr_2O_3 is an amphoteric oxide
(B) $VOSO_4$ is a reducing agent
(C) RuO_4 is an oxidizing agent
(D) Red colour of ruby is due to the presence of Co^{3+}

Answer: (D) Red colour of ruby is due to the presence of Co^{3+} · Key from source paper

Q175 JEE Main 2021 · 24 Feb · Shift 2 MCQ

What is the correct order of the following elements with respect to their density?

(A) $Zn < Cu < Co < Fe < Cr$
(B) $Cr < Zn < Co < Cu < Fe$
(C) $Zn < Cr < Fe < Co < Cu$
(D) $Cr < Fe < Co < Cu < Zn$

Answer: (C) $Zn < Cr < Fe < Co < Cu$ · Key from source paper

Q176 JEE Main 2020 · 6 Sep · Shift 1 MCQ

The INCORRECT statement is :

(A) bronze is an alloy of copper and tin.
(B) cast iron is used to manufacture wrought iron.
(C) german silver is an alloy of zinc, copper and nickel.
(D) brass is an alloy of copper and nickel.

Answer: (D) brass is an alloy of copper and nickel. · Key from source paper

Q177 JEE Main 2020 · 6 Sep · Shift 1 MCQ

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

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

Answer: (C) Eu · Key from source paper

Q178 JEE Main 2020 · 6 Sep · Shift 2 MCQ

Mischmetal is an alloy consisting mainly of :

(A) Lanthanoid metals
(B) actinoid and transition metals
(C) lanthanoid and actinoid metals
(D) actinoid metals

Answer: (A) Lanthanoid metals · Key from source paper

Q179 JEE Main 2020 · 5 Sep · Shift 1 MCQ

The correct electronic configuration and spin-only magnetic moment (BM) of Gd^{3+} (Z = 64), respectively, are :

(A) $[Xe]4f^7$ and 8. 9
(B) $[Xe]4f^7$ and 7. 9
(C) $[Xe]5f^7$ and 8. 9
(D) $[Xe]5f^7$ and 7. 9

Answer: (B) $[Xe]4f^7$ **and 7. 9** · Key from source paper

Q180 JEE Main 2020 · 4 Sep · Shift 2 MCQ

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

Answer: (C) (b) only · Key from source paper

Q181 JEE Main 2020 · 3 Sep · Shift 2 MCQ

The incorrect statement is:

(A) Manganate and permanganate ions are tetrahedral
(B) In manganate and permanganate ions, the π-bonding takes place by overlap of p-orbitals of oxygen and d-orbitals of maganese
(C) Manganate and permanganate ions are paramagnetic
(D) Manganate ion is green in colour and permanganate ion is purple in colour

Answer: (C) Manganate and permanganate ions are paramagnetic · Key from source paper

---

Q182 JEE Main 2020 · 2 Sep · Shift 2 Numerical

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 value type: the answer is a number.

Answer: 19. · Key from source paper

Q183 JEE Main 2020 · 9 Jan · Shift 1 MCQ

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

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

Answer: (B) $[Xe]4f^7$ **and** $[Xe]4f^1$ · Key from source paper

---

Q184 JEE Main 2020 · 9 Jan · Shift 2 Numerical

The sum of the total number of bonds between chromium and oxygen atoms in chromate and dichromate ions is _____.

Numerical value type: the answer is a number.

Answer: 12. · Key from source paper

Q185 JEE Main 2020 · 8 Jan · Shift 1 MCQ

The third ionization enthalpy is minimum for:

(A) Co
(B) Fe
(C) Ni
(D) Mn

Answer: (B) Fe · Key from source paper

EdLoop JEE

Q186 JEE Main 2020 · 7 Jan · Shift 1 MCQ

The atomic radius of Ag is closest to

(A) Au
(B) Ni
(C) Cu
(D) Hg

Answer: (A) Au · Key from source paper

Q187 JEE Main 2020 · 7 Jan · Shift 2 Numerical

Consider the following reactions:
$NaCl + K_2Cr_2O_7 + H_2SO_4 \rightarrow$ (A)+ side products
(Conc.)
(A) $+NaOH \rightarrow$ (B)+ side products
(B) $+H_2SO_4 + H_2O_2 \rightarrow$ (C)+ side products
(dilute)
The sum of the total number of atoms in one molecule each of (A), (B) and (C) is _____

Numerical value type: the answer is a number.

Answer: 18. · Key from source paper

Q188 JEE Main 2019 · 12 Apr · Shift 2 MCQ

The pair that has similar atomic radii is:

(A) Mo and W
(B) Sc and Ni
(C) Mn and Re
(D) Ti and Hf

Answer: (A) Mo and W · Key from source paper

Q189 JEE Main 2019 · 12 Apr · Shift 2 MCQ

Thermal decomposition of a Mn compound (X) at 513 K results in compound Y, MnO_2 and a gaseous product. MnO_2 reacts with NaCl and concentrated H_2SO_4 to give a pungent gasZ . X, Y and Z, respectively, are:

(A) K_3MnO_4, K_3MnO_4 and Cl_2
(B) $K_2MnO_4, KMnO_4$ and Cl_2
(C) $K_2MnO_4, KMnO_4$ and SO_2
(D) $KMnO_4, K_2MnO_4$ and Cl_2

Answer: (D) $KMnO_4, K_2MnO_4$ **and** Cl_2 · Key from source paper

Q190 JEE Main 2019 · 10 Apr · Shift 1 MCQ

Consider the hydrated ions of Ti^{2+}, V^{2+}, Ti^{3+} and Sc^{3+}. The correct order of their spin-only magnetic moments is:

(A) $Sc^{3+} < Ti^{3+} < V^{2+} < Ti^{2+}$
(B) $Ti^{3+} < Ti^{2+} < Sc^{3+} < V^{2+}$
(C) $Sc^{3+} < Ti^{3+} < Ti^{2+} < V^{2+}$
(D) $V^{2+} < Ti^{2+} < Ti^{3+} < Sc^{3+}$

Answer: (C) $Sc^{3+} < Ti^{3+} < Ti^{2+} < V^{2+}$ · Key from source paper

Q191 JEE Main 2019 · 10 Apr · Shift 2 MCQ

The correct order of the first ionization enthalpies is:

(A) $Ti < Mn < Zn < Ni$
(B) $Ti < Mn < Ni < Zn$
(C) $Mn < Ti < Zn < Ni$
(D) $Zn < Ni < Mn < Ti$

Answer: (B) $Ti < Mn < Ni < Zn$ · Key from source paper

Q192 JEE Main 2019 · 10 Apr · Shift 2 MCQ

The highest possible oxidation states of uranium and plutonium, respectively, are

(A) 4 and 6
(B) 7 and 6
(C) 6 and 4
(D) 6 and 7

Answer: (D) 6 and 7 · Key from source paper

Q193 JEE Main 2019 · 9 Apr · Shift 2 MCQ

The maximum number of possible oxidation states of actinoids are shown by:

(A) nobelium (No) and lawrencium (Lr)
(B) berkelium (Bk) and californium (Cf)
(C) actinium (Ac) and thorium (Th)
(D) neptunium (Np) and plutonium (Pu)

Answer: (D) neptunium (Np) and plutonium (Pu) · Key from source paper

Q194 JEE Main 2019 · 8 Apr · Shift 1 MCQ

The lanthanide ion that would show colour is:

(A) Lu^{3+}
(B) La^{3+}
(C) Gd^{3+}
(D) Sm^{3+}

Answer: (D) Sm^{3+} · Key from source paper

Q195 JEE Main 2019 · 8 Apr · Shift 2 MCQ

The statement that is INCORRECT about the interstitial compounds is:

(A) They have high melting points.
(B) They are very hard.
(C) They are chemically reactive.
(D) They have metallic conductivity.

Answer: (C) They are chemically reactive. · Key from source paper

---

Q196 JEE Main 2019 · 12 Jan · Shift 1 MCQ

The pair of metal ions that can give a spin only magnetic moment of 3.9 BM for the complex $[M(H_2O)_6]Cl_2$, is:

(A) Co^{2+} and Fe^{2+}
(B) V^{2+} and Fe^{2+}
(C) Cr^{2+} and Mn^{2+}
(D) V^{2+} and Co^{2+}

Answer: (D) V^{2+} and Co^{2+} · Key from source paper

Q197 JEE Main 2019 · 12 Jan · Shift 2 MCQ

The correct order of atomic radii is:

(A) Ce>Eu>Ho>N
(B) N>Ce>Eu>Ho
(C) Ho>N>Eu>Ce
(D) Eu>Ce>Ho>N

Answer: (D) Eu>Ce>Ho>N · Key from source paper

Q198 JEE Main 2019 · 11 Jan · Shift 1 MCQ

The element that usually does NOT show variable oxidation states is:

(A) Cu
(B) Ti
(C) Sc
(D) V

Answer: (C) Sc · Key from source paper

Q199 JEE Main 2019 · 11 Jan · Shift 2 MCQ

A $\xrightarrow{4KOH,O_2}$ 2 B (Green) + $2H_2O$ B $\xrightarrow{4HCl}$ 2C (Purple) + MnO_2 + $2H_2O$ 2C $\xrightarrow{H_2O,KI}$ 2 A + KOH + D In the above sequence of reactions, A and D, respectively, are:

(A) KI and $KMnO_4$
(B) MnO_2 and KIO_3
(C) KIO_3 and MnO_2
(D) KI and K_2MnO_4

Answer: (B) MnO_2 and KIO_3 · Key from source paper

Q200 JEE Main 2019 · 10 Jan · Shift 1 MCQ

The effect of lanthanoid contraction in the lanthanoid series of elements by and large means

(A) increase in atomic radii and decrease in ionic radii,
(B) decrease in atomic radii and increase in ionic radii.
(C) increase in both atomic and ionic radii.
(D) decrease in both atomic and ionic radii.

Answer: (D) decrease in both atomic and ionic radii. · Key from source paper

---

Q201 JEE Main 2019 · 9 Jan · Shift 1 MCQ

The highest value of the calculated spin only magnetic moment (in BM) among all the transition metal complexes is

(A) $4.90\ \mathrm{BM}$
(B) $3.87\ \mathrm{BM}$
(C) $6.93\ \mathrm{BM}$
(D) $5.92\ \mathrm{BM}$

Answer: (D) $5.92\ \mathrm{BM}$ · Key from source paper

Q202 JEE Main 2019 · 9 Jan · Shift 2 MCQ

The transition elements that has the lowest enthalpy of atomisation is:

(A) V
(B) Fe
(C) Zn
(D) Cu

Answer: (C) Zn · Key from source paper

Q203 JEE Main 2018 · 16 Apr · Online MCQ

When XO_2 is fused with an alkali metal hydroxide in presence of an oxidizing agent such as KNO_3; a dark green product is formed which disproportionate in acidic solution to afford a dark purple solution. X is:

(A) Mn
(B) Cr
(C) V
(D) Ti

Answer: (A) Mn · Key from source paper

Q204 JEE Main 2017 · 9 Apr · Online MCQ

Which of the following ions does not liberate hydrogen gas on reaction with dilute acids?

(A) V^{2+}
(B) Ti^{2+}
(C) Mn^{2+}
(D) Cr^{2+}

Answer: (C) Mn^{2+} · Key from source paper

Q205 JEE Main 2017 · 8 Apr · Online MCQ

The pair of compounds having metals in their highest oxidation state is

(A) Mn_2O_7 and CrO_2Cl_2
(B) $[Fe(CN)_6]^{3-}$ and $[Cu(CN)_4]^{2-}$
(C) $[NiCl_4]^{2-}$ and $[CoCl_4]^{2-}$
(D) $[FeCl_4]^{-}$ and Co_2O_3

Answer: (A) Mn_2O_7 and CrO_2Cl_2 · Key from source paper

Q206 JEE Main 2016 · 10 Apr · Online MCQ

Which of the following are the transition metal ions responsible for colour in ruby and emerald respectively?

(A) Co^{3+} and Cr^{3+}
(B) Co^{3+} and Co^{3+}
(C) Cr^{3+} and Cr^{3+}
(D) Cr^{3+} and Ag^{+}

Answer: (C) Cr^{3+} and Cr^{3+} · Key from source paper

Q207 JEE Main 2016 · 9 Apr · Online MCQ

Which one of the following species is stable in aqueous solution?

(A) Cr^{2+}
(B) MnO_4^{2-}
(C) MnO_4^{3-}
(D) Cu^{+}

Answer: (B) MnO_4^{2-} · Key from source paper

Q208 JEE Main 2016 · 3 Apr · Offline MCQ

Find the metallic and ferromagnetic substance.

(A) VO_2
(B) MnO_2
(C) TiO_2
(D) CrO_2

Answer: (D) CrO_2 · Key from source paper

Q209 JEE Main 2015 · 11 Apr · Online MCQ

Which of the following statements is/are false?

(A) $Na_2Cr_2O_7$ is more soluble than $K_2Cr_2O_7$.
(B) CrO_4^{2-} is tetrahedral in shape.
(C) $Na_2Cr_2O_7$ is the primary standard in volumetry.
(D) $Cr_2O_7^{2-}$ has a $Cr - O - Cr$ bond.

Answer: (C) $Na_2Cr_2O_7$ **is the primary standard in volumetry.** · Key from source paper

Q210 JEE Main 2015 · 4 Apr · Offline MCQ

The colour of $KMnO_4$ is due to: [where $M \rightarrow$ metal, $L \rightarrow$ ligand]

(A) $\sigma - \sigma^*$ transition
(B) $\mathrm{M} \rightarrow \mathrm{L}$ charge transfer transition
(C) $\mathrm{d} - \mathrm{d}$ transition
(D) $\mathrm{L} \rightarrow \mathrm{M}$ charge transfer transition

Answer: (D) $\mathrm{L} \rightarrow \mathrm{M}$ **charge transfer transition** · Key from source paper

---

Q211 JEE Main 2014 · 12 Apr · Online MCQ

Which one of the following exhibits the large number of oxidation states?

(A) $\mathrm{Ti}(22)$
(B) $\mathrm{V}(23)$
(C) $\mathrm{Cr}(24)$
(D) $\mathrm{Mn}(25)$

Answer: (D) $\mathrm{Mn}(25)$ · Key from source paper

Q212 JEE Main 2014 · 9 Apr · Online MCQ

Which of the following is not formed when $\mathrm{H_2S}$ reacts with acidic $\mathrm{K_2Cr_2O_7}$ solution ?

(A) $\mathrm{K_2SO_4}$
(B) $\mathrm{Cr_2(SO_4)_3}$
(C) S
(D) $\mathrm{CrSO_4}$

Answer: (D) $\mathrm{CrSO_4}$ · Key from source paper

Q213 JEE Main 2014 · 9 Apr · Online MCQ

A compound of vanadium chloride has spin only magnetic moment of 1.73 BM. Its formula is

(A) $\mathrm{VCl_2}$
(B) $\mathrm{VCl_5}$
(C) $\mathrm{VCl_4}$
(D) $\mathrm{VCl_3}$

Answer: (C) $\mathrm{VCl_4}$ · Key from source paper

Q214 JEE Main 2013 · 23 Apr · Online MCQ

When a small amount of $\mathrm{KMnO_4}$ is added to concentrated $\mathrm{H_2SO_4}$, a green oily compound is obtained which is highly explosive in nature. Compound may be :

(A) $MnSO_4$
(B) Mn_2O_7
(C) MnO_2
(D) Mn_2O_3

Answer: (B) Mn_2O_7 · Key from source paper

Q215 JEE Main 2013 · 23 Apr · Online MCQ

Identify incorrect statement :

(A) Cu_2O is colourless.
(B) Copper (I) compounds are colourless except when colour results from charge transfer.
(C) Copper (I) compounds are diamagnetic.
(D) Cu_2 S is black.

Answer: (A) Cu_2O **is colourless.** · Key from source paper

Q216 JEE Main 2013 · 9 Apr · Online MCQ

Potassium dichromate when heated with concentrated sulphuric acid and a soluble chloride, gives brown-red vapours of :

(A) CrO_3
(B) $CrCl_3$
(C) CrO_2Cl_2
(D) Cr_2O_3

Answer: (C) CrO_2Cl_2 · Key from source paper

Q217 JEE Main 2013 · 9 Apr · Online MCQ

The element with which of the following outer electron configuration may exhibit the largest number of oxidation states in its compounds :

(A) $3d^5 4s^2$
(B) $3d^8 4s^2$
(C) $3d^7 4s^2$
(D) $3d^6 4s^2$

Answer: (A) $3d^5 4s^2$ · Key from source paper

Q218 JEE Main 2013 · 7 Apr · Offline MCQ

Four successive members of the first row of transition elements are listed below with atomic numbers. Which one of them is expected to have the highest $E^{o}_{M^{3+}/M^{2+}}$ value?

(A) Fe (Z = 26)
(B) Co (Z = 27)
(C) Cr (Z = 24)
(D) Mn (Z = 25)

Answer: (B) Co (Z = 27) · Key from source paper

Q219 JEE Main 2013 · 7 Apr · Offline MCQ

Which of the following arrangements does **not** represent the correct order of the property stated against it?

(A) $Co^{3+} < Fe^{3+} < Cr^{3+} < Sc^{3+}$: Stability in aqueous solution
(B) Sc < Ti < Cr < Mn : Number of oxidation states
(C) $V^{2+} < Cr^{2+} < Mn^{2+} < Fe^{2+}$: Paramagnetic behaviour
(D) $Ni^{2+} < Co^{2+} < Fe^{2+} < Mn^{2+}$: Ionic size

Answer: (C) $V^{2+} < Cr^{2+} < Mn^{2+} < Fe^{2+}$: Paramagnetic behaviour · Key from source paper

---

Q220 AIEEE 2012 · 26 May · Online MCQ

Which of the following forms stable +4 oxidation state?

(A) $La(Z = 57)$
(B) $Eu(Z = 63)$
(C) $Ce(Z = 58)$
(D) $Gd(Z = 64)$

Answer: (C) $Ce(Z = 58)$ · Key from source paper

Q221 AIEEE 2012 · 19 May · Online MCQ

Which of the following paramagnetic ions would exhibit a magnetic moment (spin only) of the order of 5BM ?
(At. Nos. $Mn = 25, Cr = 24, V = 23, Ti = 22$)

(A) Mn^{2+}
(B) Ti^{2+}
(C) V^{2+}
(D) Cr^{2+}

Answer: (D) Cr^{2+} · Key from source paper

Q222 AIEEE 2012 · 19 May · Online MCQ

Which pair of elements with the given atomic numbers is expected to have similar properties?

(A) 40,72
(B) 20,36
(C) 10,28
(D) 11,12

Answer: (A) 40,72 · Key from source paper

Q223 AIEEE 2012 · 12 May · Online MCQ

Magnetic moment of Gd^{3+} ion $(Z = 64)$ is

(A) 3.62 BM
(B) 9.72BM
(C) 7.9 BM
(D) 10.60BM

Answer: (C) 7.9 BM · Key from source paper

Q224 AIEEE 2012 · 7 May · Online MCQ

Which is not the correct Statement? (At. nos. Ce = 58, Lu = 71, La = 57, Yb = 70)

(A) Colour of Yb^{3+} ion is pink.
(B) La^{3+} is diamagnetic.
(C) Ce^{4+} has f^0 configuration.
(D) Lu^{3+} had f^{14} configuration.

Answer: (A) Colour of Yb^{3+} ion is pink. · Key from source paper

Q225 AIEEE 2012 · Offline MCQ

Iron exhibits $+2$ and $+3$ oxidation states. Which of the following statements about iron is incorrect?

(A) Ferrous oxide is more basic in nature than the ferric oxide.
(B) Ferrous compounds are relatively more ionic than the corresponding ferric compounds
(C) Ferrous compounds are less volatile than the corresponding ferric compounds.
(D) Ferrous compounds are more easily hydrolysed than the corresponding ferric compounds.

Answer: (D) Ferrous compounds are more easily hydrolysed than the corresponding ferric compounds. · Key from source paper

Q226 AIEEE 2011 MCQ

In context of the lanthanoids, which of the following statements is not correct ?

(A) All the members exhibit $+3$ oxidation state

(B) Because of similar properties the separation of lanthanoids is not easy.

(C) Availability of 4f electrons results in the formation of compounds in $+4$ state for all the members of the series.

(D) There is a gradual decrease in the radii of the members with increasing atomic number in the series.

Answer: (C) Availability of 4f electrons results in the formation of compounds in $+4$ state for all the members of the series. · Key from source paper

---

Q227 AIEEE 2011 MCQ

The outer electron configuration of Gd (Atomic No : 64 is :

(A) $4f^8 5d^0 6s^2$

(B) $4f^4 5d^4 6s^2$

(C) $4f^7 5d^1 6s^2$

(D) $4f^3 4d^5 6s^2$

Answer: (C) $4f^7 5d^1 6s^2$ · Key from source paper

Q228 AIEEE 2010 MCQ

The correct order of $E^0_{SR^2/M}$ values with negative sign for the four successive elements Cr, Mn, Fe and Co is

(A) Mn > Cr > Fe > Co

(B) Cr > Fe > Mn > Co

(C) Fe > Mn > Cr > Co

(D) Cr > Mn > Fe > Co

Answer: (A) Mn > Cr > Fe > Co · Key from source paper

Q229 AIEEE 2009 MCQ

Knowing that the Chemistry of lanthanoids (Ln) is dominated by its +3 oxidation state, which of the following statements in incorrect?

(A) Because of the large size of the Ln (III) ions the bonding in its compounds is predominantly ionic in character.

(B) The ionic sizes of Ln (III) decrease in general with increasing atomic number.

(C) Ln (III) compounds are generally colourless.

(D) Ln (III) hydroxides are mainly basic in character.

Answer: (C) Ln (III) compounds are generally colourless. · Key from source paper

Q230 AIEEE 2009 MCQ

In context with the transition elements, which of the following statements is incorrect?

(A) In addition to the normal oxidation states, the zero oxidation state is also shown by these elements in complexes.

(B) In the highest oxidation states, the transition metal show basic character and form cationic complexes.

(C) In the highest oxidation states of the first five transition elements (Sc to Mn), all the $4s$ and $3d$ electrons are used for bonding.

(D) Once the d^5 configuration is exceeded, the tendency to involve all the 3d electrons in bonding decreases.

Answer: (B) In the highest oxidation states, the transition metal show basic character and form cationic complexes. · Key from source paper

Q231 AIEEE 2008 MCQ

Larger number of oxidation states are exhibited by the actinoids than those by the lanthanoids, the main reason being

(A) 4 f orbitals more diffused than the $5f$ orbitals

(B) lesser energy difference between $5f$ and $6d$ than between $4f$ and $5d$ orbitals

(C) more energy difference between $5f$ and $6d$ than between $4f$ and $5d$ orbitals

(D) more reactive nature of the actinoids than the lanthanoids

Answer: (B) lesser energy difference between $5f$ and $6d$ than between $4f$ and $5d$ orbitals · Key from source paper

Q232 AIEEE 2007 MCQ

Identify the incorrect statement among the following

(A) d− Block elements show irregular and erratic chemical properties among themselves

(B) La and Lu have partially filled d orbitals and no other partially filled orbitals

(C) The chemistry of various lanthanoids is very similar

(D) $4f$ and $5f$ orbitals are equally shielded

Answer: (D) $4f$ and $5f$ orbitals are equally shielded · Key from source paper

Q233 AIEEE 2007 MCQ

The actinoids exhibits more number of oxidation states in general than the lanthanoids. This is because

(A) the 5f orbitals are more buried than the 4f orbitals
(B) there is a similarity between 4f and 5f orbitals in their angular part of the wave function
(C) the actinoids are more reactive than the lanthanoids
(D) the $5f$ orbitals extend further from the nucleus than the 4f orbitals

Answer: (D) the $5f$ orbitals extend further from the nucleus than the 4f orbitals · Key from source paper

Q234 AIEEE 2006 MCQ

The "spin-only" magnetic moment [in units of Bohr magneton, (μ_B)] of Ni^{2+} in aqueous solution would be (Atomic number of Ni = 28)

(A) 2.84
(B) 4.90
(C) 0
(D) 1.73

Answer: (A) 2.84 · Key from source paper

Q235 AIEEE 2006 MCQ

Lanthanoid contraction is caused due to

(A) the appreciable shielding on outer electrons by 4f electrons from the nuclear charge
(B) the appreciable shielding on outer electrons by 5d electrons from the nuclear charge
(C) the same effective nuclear charge from Ce to Lu
(D) the imperfect shielding on outer electrons by 4f electrons from the nuclear charge

Answer: (D) the imperfect shielding on outer electrons by 4f electrons from the nuclear charge · Key from source paper

Q236 AIEEE 2005 MCQ

The oxidation state of chromium in the final product formed by the reaction between KI and acidified potassium dichromate solution is

(A) +4
(B) +6
(C) +2
(D) +3

Answer: (D) +3 · Key from source paper

Q237 AIEEE 2005 MCQ

The lanthanide contraction is responsible for the fact that

(A) Zr and Y have about the same radius
(B) Zr and Nb have similar oxidation state
(C) Zr and Hf have about the same radius
(D) Zr and Zn have the same oxidation

Answer: (C) Zr and Hf have about the same radius · Key from source paper

---

Q238 AIEEE 2005 MCQ

Which of the following factors may be regarded as the main cause of lanthanide contraction?

(A) Poor shielding of one of 4f electron by another in the subshell
(B) Effective shielding of one of 4f electrons by another in the subshell
(C) Poorer shielding of 5d electrons by 4f electrons
(D) Greater shielding of 5d electrons by 4f electrons

Answer: (A) Poor shielding of one of 4f electron by another in the subshell · Key from source paper

---

Q239 AIEEE 2004 MCQ

The $E^{\circ}_{M^{+3}/M^{2+}}$ values for Cr, Mn, Fe and Co are $-0.41, +1.57, +0.77$ and $+1.97$ V respectively. For which one of these metals the change in oxidation state form $+2$ to $+3$ is easiest?

(A) Cr
(B) Co
(C) Fe
(D) Mn

Answer: (A) Cr · Key from source paper

Q240 AIEEE 2004 MCQ

Of the following outer electronic configurations of atoms, the highest oxidation state is achieved by which one of them?

(A) $(n-1)d^8ns^2$
(B) $(n-1)d^5ns^2$
(C) $(n-1)d^3ns^2$
(D) $(n-1)d^5\ ns^{-1}$

Answer: (B) $(n-1)d^5ns^2$ · Key from source paper

Q241 AIEEE 2004 MCQ

Cerium $(Z = 58)$ is an important member of the lanthanoids. Which of the following statements about cerium is incorrect?

EdLoop JEE

(A) The common oxidation states of cerium are $+3$ and $+4$
(B) Cerium (IV) acts as an oxidizing agent
(C) The $+4$ oxidation state of cerium is not known in solutions
(D) The $+3$ oxidation state of cerium is more stable than the $+4$ oxidation state

Answer: (C) The $+4$ oxidation state of cerium is not known in solutions · Key from source paper

Q242 AIEEE 2003 MCQ

The radius of La^{3+} (Atomic number of La = 57) is 1.06Å. Which one of the following given values will be closest to the radius of Lu^{3+} (Atomic number of Lu = 71)?

(A) 1.40Å
(B) 1.06Å
(C) 0.85Å
(D) 1.60Å

Answer: (C) 0.85Å · Key from source paper

Q243 AIEEE 2003 MCQ

A reduction in atomic size with increase in atomic number is a characteristic of element of

(A) d-block
(B) f-block
(C) radioactive series
(D) high atomic masses

Answer: (B) f-block · Key from source paper

Q244 AIEEE 2003 MCQ

What would happen when a solution of potassium chromate is treated with an excess of dilute nitric acid?

(A) $Cr_2O_7^{2-}$ and H_2O are formed
(B) CrO_4^{2-} is reduced to $+3$ state of Cr
(C) CrO_4^{2-} is oxidized to $+7$ state of Cr
(D) Cr^{3+} and $Cr_2O_7^{2-}$ are formed

Answer: (A) $Cr_2O_7^{2-}$ and H_2O are formed · Key from source paper

Q245 AIEEE 2002 MCQ

Most common oxidation states of Ce (cerium) are

(A) +2, +3
(B) +2, +4
(C) +3, +4
(D) +3, +5

Answer: (C) +3, +4 · Key from source paper

Q246 AIEEE 2002 MCQ

Arrange $Ce^{+3}, La^{+3}, Pm^{+3}$ and Yb^{+3} in increasing order of their ionic radii

(A) $Yb^{+3} < Pm^{+3} < Ce^{+3} < La^{+3}$
(B) $Ce^{+3} < Yb^{+3} < Pm^{+3} < La^{+3}$
(C) $Yb^{+3} < Pm^{+3} < La^{+3} < Ce^{+3}$
(D) $Pm^{+3} < La^{+3} < Ce^{+3} < Yb^{+3}$

Answer: (A) $Yb^{+3} < Pm^{+3} < Ce^{+3} < La^{+3}$ · Key from source paper

Q247 AIEEE 2002 MCQ

Which of the following ions has the maximum magnetic moment ?

(A) Mn^{+2}
(B) Fe^{+2}
(C) Ti^{+2}
(D) Cr^{+2}

Answer: (A) Mn^{+2} · Key from source paper

Q248 AIEEE 2002 MCQ

Which is the correct order of ionic sizes ? (Atomic Number : Ce = 58, Sn = 50, Yb = 70 and Lu = 71)

(A) Ce > Sn > Yb > Lu
(B) Sn > Ce > Lu > Yb
(C) Lu > Yb > Sn > Ce
(D) Sn > Yb > Ce > Lu

Answer: (A) Ce > Sn > Yb > Lu · Key from source paper

Q249 AIEEE 2002 MCQ

When $KMnO_4$ acts as an oxidising agent and ultimately forms $[MnO_4]^{-1}$, MnO_2, Mn_2O_3, Mn^{+2} then the number of electrons transferred in each case respectively is

(A) 4, 3, 1, 5
(B) 1, 5, 3, 7
(C) 1, 3, 4, 5
(D) 3, 5, 7, 1

Answer: (C) 1, 3, 4, 5 · Key from source paper

EdLoop JEE