



CHEMISTRY

BOOKS - ARIHANT PUBLICATION

D-BLOCK ELEMENTS

Part I Question For Practice Multiple Choice Type Questions

1. Among the given options the most dense element is

A. Cu

B. Hg

C. Cd

D. Fe

Answer: B



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2. The 3d- block element that exhibits maximum number of oxidation states is

A. Sc

B. Ti

C. Mn

D. Zn

Answer: C



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3. Spin-only' formula to calculate magnetic moment is expressed as

A. $\mu = n(n + 2)$

B. $\mu = \frac{\sqrt{n + 2}}{n}$

C. $\mu = \sqrt{n(n + 2)}$

D. $\mu = \frac{n + 2}{\sqrt{n}}$

Answer: C



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4. the colour of the transition metal or its ion
is due to

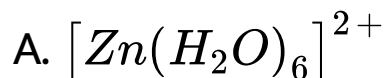
- A. d-d transition
- B. p-p transition
- C. paired electrons
- D. None of these

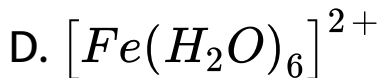
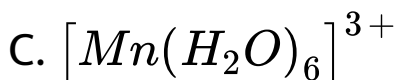
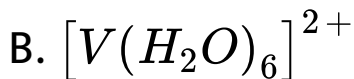
Answer: A



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5. Which of the following is colourless ?





Answer: A



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Part I Question For Practice Very Short Answer Type Questions

1. Define transition element.



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2. What of the following is a transition metal ?

Na, B, Fe, Ca



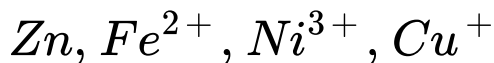
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3. Write the electronic configuration of Fe^{2+} .



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4. Out of the following which one has more number of unpaired electrons ?



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5. Silver atom has completely filled d-orbitals ($4d^{10}$) in its ground state. How can you say that it is a transition element ?



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6. Why chromium has higher boiling point than zinc ?



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7. The second and third rows of transition elements resemble each other much more than they resemble the first row. Why ?



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8. In the series Sc ($Z = 21$) to Zn ($Z = 30$), the enthalpy of atomisation of zinc is lowest, i.e. 126kJ mol^{-1} . Why?



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9. which transition metal of the 3d-series exhibits the largest number of oxidation states and why?



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10. The transition elements are paramagnetic due to the presence of



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11. Why do transition metals form complex salts?



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12. What happens when NH_4OH solution is added dropwise to copper sulphate solution till excess ?



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13. Name two alloys of copper.



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14. What metals are present in bronze ?



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15. What are the metals present in stainless steel ?



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16. What are the metals present in alloy, bell metal ?



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Part I Question For Practice Short Answer Type I Questions

1. Explain why Fe^{3+} ion is more stable than Fe^{2+} ion in aqueous solution.

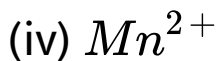


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2. Write down the electronic configuration of

(i) Cr^{3+}

(ii) Cu^{+}



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3. To what extent do the electronic configuration decide the stability of oxidation states in the first series of the transition elements ? Illustrate your answer with examples.



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4. In What way, the electronic configuration of the transition elements is different from that of the non-transition elements ?



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5. How the variability in oxidation states of transition metals differ from that of non transition metals ?



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6. Explain briefly how $+2$ state becomes more and more stable in the first half of the first row transition elements with increasing atomic number ?



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7. Compare the stability of $+2$ oxidation state for the elements of the first transition series.



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8. Which First row transition element exhibits stable +1 oxidation state



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9. Which is a stronger reducing agent, Fe^{2+} or Cr^{2+} and why?



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10. How would you account for the irregular variation of ionisation enthalpies (first and second) in the first series of the transition elements ?



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11. Calculate the 'spin only' magnetic moment of M^{2+} (aq.) ion. ($Z = 27$)



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12. Explain why transition metal ions are usually coloured.



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13. Predict which of the following will be coloured in aqueous solution giving reason.

$(Cu^+, V^{3+}, Zn^{2+}, Sc^{3+}, Fe^{3+}, Co^{2+})$



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14. Calculate the number of unpaired electrons in the following gaseous ions Mn^{3+} , Cr^{3+} , V^{3+} and Ti^{3+} . Which one of these is the most stable in aqueous solution ?



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15. Why do transition metals form complex salts?



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16. What are the interstitial compounds ? Why are such compounds well known for transition metals ?



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17. Explain, why mercury (I) ion exists as Hg_2^{2+} ions, while copper (I) exists as Cu^+ ion.



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18. What are the transition elements?



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19. Define transition elements. Discuss their following characteristic properties (i)
Formation of coloured compounds (ii)
Magnetic property



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Part I Question For Practice Short Answer Type II Questions

1. The halides of transition elements become more covalent with increasing oxidation state of the metal. Why ?



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2. Why are most of the transition metal compounds are paramagnetic ?



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Part I Question For Practice Long Answer Type Questions

1. What are the characteristics of the transition elements and why are they called transition elements ? Which of the d-block elements may not be regarded as the transition elements ?



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2. (i) Explain giving reasons.

(a) Transition metals and many of their compounds show paramagnetic behaviour.

(b) The enthalpies of atomisation of the transition metals are high.

(c) The transition metals generally form coloured compounds.

(d) Transition metals and their many compounds act as good catalyst.

(ii) Compare the general characteristics of the first series of the transition metals with those of the second and third series metals in the

respective vertical columns. Give special emphasis on the following points.

(a) Atomic size

(b) Oxidation states

(c) Ionisation enthalpies



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3. Account of the following.

(i) The enthalpy of atomisation is lowest for Zn in $3d$ -series of the transition elements.

(ii) Identify the metal in MO_3F and justify

your answer.

(iii) Transition metals form a large number of complexes.

(iv) d^1 configuration is very unstable in ions.



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Part I Questions For Assessment Multiple Choice Type Questions

1. Which of the following element does not belong to 4d- series of transition elements ?

A. Titanium

B. Zirconium

C. Molybdenum

D. Technetium

Answer: A



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2. Consider the following statements about transition metals.

I. These are very much hard and have low

volatility.

II. Their melting and boiling points are high.

The correct statement (s) is/are (choose the appropriate option)

A. Only I

B. Only II

C. Both I and II

D. None of these

Answer: C



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3. A transition element X has the configuration $[Ar]d^4$ in its +3 oxidation state. Its atomic number is

A. 25

B. 26

C. 22

D. 19

Answer: A



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4. Which of the following ions has a magnetic moment of 5.93 BM ? (Atomic number of V=23, Cr=24, Mn = 25, Fe = 26)



Answer: A



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Part I Questions For Assessment Very Short Answer Type Questions

1. The number of unpaired electrons in Mn^{3+} is



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2. Write down the general electronic configuration of transition elements.





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3. Define enthalpy of atomisation.



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4. What are the interstitial compounds ? Why are such compounds well known for transition metals ?



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5. What factors led to the appearance of colour in the transition elements ?



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Part I Questions For Assessment Short Answer Type I Questions

1. Name the two transition elements which have abnormal electronic configuration and why ?



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2. Explain, why density of transition elements increases from left to right in a period ?



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3. Explain, why oxidation states of transition elements first increases from Sc to Mn and then decreases ?



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4. Give the occurrence of transition elements



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Part I Questions For Assessment Short Answer Type II Questions

1. Explain the following :

- (i) The paramagnetic character in 3d-transition series increases upto Cr and then decreases.
- (ii) Transition metals are very good catalyst.

(iii) Transition metals form a large number of interstitial compounds.



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Part I Questions For Assessment Long Answer Type Questions

1. (i) Write electronic configuration of nickel and zinc.

(ii) Why are compounds of iron are coloured and paramagnetic.



Part II Question For Practice Multiple Choice Type Questions

1. The bonds present in the structure of dichromate ion are

A. four equivalent Cr-O bonds

B. six equivalent Cr-O bonds and one Cr-O bond

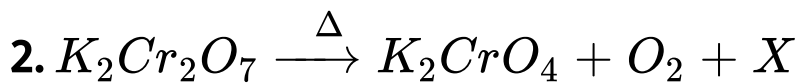
C. six equivalent Cr-O bonds and one Cr-Cr bond

D. eight equivalent Cr-O bonds

Answer: C

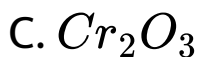
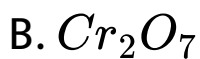


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In the above reaction X is

A. CrO_3



Answer: C



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3. Potassium dichromate is used

A. in electroplating

B. as a reducing agent

C. oxidise ferrous ions into ferric ions in acidic medium as an oxidising agent

D. as an insecticide

Answer: C



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4. When manganese dioxide is fused with KOH in air, it gives

A. potassium permanganate

B. potassium manganate

C. manganese hydroxide

D. Hn_3O_4

Answer: B



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**Part Ii Question For Practice Very Short Answer
Type Questions**

1. What happens when dichromate ion is dissolved in alkali ?



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2. Draw the structure of chromate and dichromate ions.



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3. What is the oxidation number of Mn in K_2MnO_4 ?



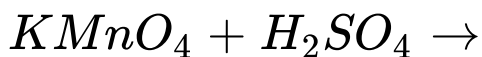
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4. What is the oxidation number of Mn in MnO_4^- ?



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5. Complete the reaction



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6. What happened when $KMnO_4$ is treated with KI ?



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Part II Question For Practice Short Answer Type I
Questions

1. What happens when potassium dichromate is treated with ferrous sulphate solution in the presence of dilute sulphuric acid ?



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2. Describe the oxidising action of potassium dichromate and write the ionic equations for its reaction with

(i) iodide

(ii) iron (II) solution and

(iii) H_2S .



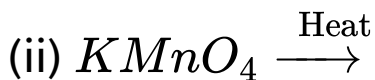
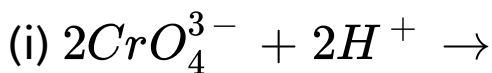
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3. Explain why does colour of $KMnO_4$ disappear when oxalic acid is added to its solution in acidic medium ?



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4. Complete the following equations.



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Part II Question For Practice Short Answer Type II Questions

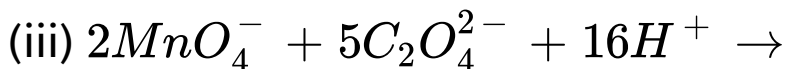
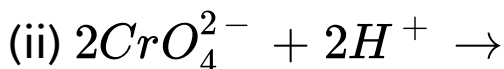
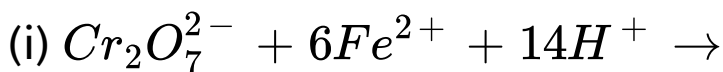
1. When orange solution containing $Cr_2O_7^{2-}$ ion is treated with an alkali, a yellow solution is formed and when H^+ ions are added to

yellow solution, an orange solution is obtained. Explain, why does this happen ?



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2. Complete the following chemical equations.



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3. A violet compound of manganese 'A' decomposes on heating to liberate oxygen and compounds B and C of manganese are formed. Compound C reacts with KOH in the presence of potassium nitrate to give a compound B. On heating compound C with conc.

H_2SO_4 and NaCl, chlorine gas is liberated and compound D of manganese alongwith other products is formed. Identify compounds A to D and also explain the reactions involved.



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Part II Question For Practice Long Answer Type Questions

1. Describe the preparation of potassium permanganate. How does the acidified permanganate solution react with

(i) iron (II) ions

(ii) SO_2 and

(iii) oxalic acid?

Write the ionic equations for the reactions.



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Part II Questions For Assessment Multiple Choice Type Questions

1. $K_2Cr_2O_7 / H^+$ changes to green by



C. Both (a) and (b)

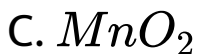
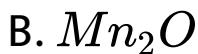
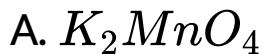
D. None of the above

Answer: C



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2. On heating $KMnO_4$ which of the following is not formed ?



Answer: B



3. $KMnO_4$ in basic medium is used as

- A. strong oxidising agent
- B. strong reducing agent
- C. strong hydrogenating agent
- D. poor reducing agent

Answer: D



4. MnO_4^{2-} can be converted to MnO_4^-

A. by oxidation with Cl_2

B. by electrochemical oxidation at anode

C. Both (a) and (b)

D. None of the above

Answer: B



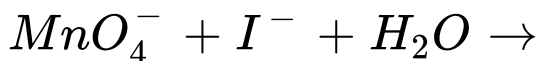
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Part II Questions For Assessment Very Short Answer Type Questions

1. Write the formula of compound in which transition metal is in +6 oxidation state.

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2. Complete the reaction



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3. Draw the structures of manganate ion and permanganate ion.



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4. Cr^{2+} is a strong reducing agent whereas Mn^{3+} with the same d^4 configuration is an oxidising agent. Explain.



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Part II Questions For Assessment Short Answer

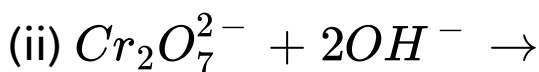
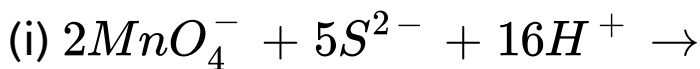
Type I Questions

1. Write the oxidation reaction of iodide to iodate ion by potassium permanganate.



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2. Complete the following equations.



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3. An accident would occur if a student dissolves $KMnO_4$ in conc. H_2SO_4 instead of dil. H_2SO_4 . Explain.



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4. Explain why $Cr_2O_7^{2-}$ ion is a powerful oxidant in acidic medium but weak oxidant in basic medium ?



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Part II Questions For Assessment Short Answer

Type II Questions

1. What happens when $K_2Cr_2O_7$ reacts with H_2O ?

(i) In strong acidic medium

(ii) In less acidic medium

(iii) In alkaline medium



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2. Chromium is used extensively in steel alloys.

It is extracted from its ore chromite

($FeCr_2O_4$), Which contains chromium in +3

oxidation state.

(i) Give the electronic configuration of the elements iron and chromium.

(ii) What is the oxidation state of iron in chromite ?



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3. (i) Name a compound of

(a) transition metal which is used in the manufacture of sulphuric acid.

(b) transition metal that is used in Haber's process for the manufacture of ammonia.

(c) transition metal that have light sensitive properties and act as valuable source in photographic industry.

(ii) Write the equations which are involved in the oxidation of hydrogen sulphide to sulphur by potassium permanganate solution.



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Odisha Burea A Textbook Solutions Multiple Choice Type Questions

1. Which of the following is a transition element ?

A. Ca

B. Al

C. Co

D. Na

Answer: C



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2. The d-block elements form alloys among themselves, because

A. their atomic sizes are nearly same

B. they have unpaired electrons

C. their ionisation enthalpies are similar

D. they are all metals

Answer: A

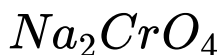


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3. Which of the following statement (s) is/are correct ? When a mixture of NaCl and $K_2Cr_2O_7$ is gently warmed with conc. H_2SO_4 .

A. A deep red vapour is evolved

B. The vapour when passed into NaOH solution gives a yellow solution of



C. Chlorine gas is use evolved

D. Chromyl chloride is formed

Answer: A::B::D



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4. Out of the following indentify the d-block element.

A. Ca

B. U

C. Mn

D. Al

Answer: C



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5. Which of the following statements about transition metals is wrong ?

A. They form coloured compounds

B. All their compounds are diamagnetic

C. They exhibit variable valency.

D. They contain partially filled d-orbitals.

Answer: B



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6. Acidified potassium permanganate solution is decolourised by

A. bleaching powder

B. white vitriol

C. Mohr's salt

D. microcosmic salt

Answer: C



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7. Which one of the metals does not form amalgam ?

A. Zn

B. Ag

C. Cu

D. Fe

Answer: D



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8. Which ion is not coloured ?

A. Cu^{+}

B. Cr^{2+}

C. Co^{2+}

D. Cr^{3+}

Answer: A



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9. Paramagnetic behaviour in transition metal is due to the presence of

- A. lone pair of electrons
- B. even number of electrons
- C. unpaired electrons

D. odd number of electrons

Answer: C



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10. The general electronic configuration of transition elements is

A. $(n - 1)d^{1-5}$

B. $(n - 1)d^{1-10}ns^1$

C. $(n - 1)d^{1-10}ns^{1\text{or}2}$

D. None of these

Answer: C



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Odisha Burea A Textbook Solutions Very Short Answer Type Questions

1. Define transition element.



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2. Name two characteristic features of transition elements.



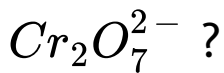
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3. What is the oxidation number of Mn in MnO_4^- ?



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4. What is the oxidation number of Cr in



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5. What is the reason of paramagnetism in transition metals ?



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6. What is the magnetic property of dipositive zinc ?



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7. What is the general electronic configuration of d-block elements ?



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8. What is the highest oxidation state of manganese ?



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9. Name a transition element, which is not a solid ?



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10. What happens when acid is added to the yellow coloured potassium chromate solution ?



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Odisha Burea A Textbook Solutions Short Answer Type I Questions

1. Transition elements form alloys easily. Give reasons.



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2. Why are most of the transition metal compounds are paramagnetic ?



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3. Why are Zn salts colourless ?



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4. Why Cu^{+} salts are colourless ?



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5. Draw the structure of chromate and dichromate ions.



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6. What happens when potassium dichromate is heated ?



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7. Mention two uses of potassium dichromate.



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8. Draw the structures of manganate ion and permanganate ion.



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9. Explain, Why conversion of chromate ion to dichromate ion is not a redox reaction ?





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10. Mention two important uses of potassium permanganate.



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Odisha Burea A Textbook Solutions Short Answer Type Ii Questions

1. Explain Why $CuSO_4$ is paramagnetic while $ZnSO_4$ is diamagnetic ?



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2. Why do transition metals form complex salts?



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3. Transition metals and their compounds act as catalysts. Explain.



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4. What happens when $KMnO_4$ is heated alone and with alkali ?



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5. Why are most of the transition metal compounds are paramagnetic ?



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6. What happens when H_2S gas is passed through acidified $K_2Cr_2O_7$ solution ?



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7. What is the equivalent mass of $KMnO_4$ in alkaline solution ? Explain.



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8. Mention two important uses of potassium permanganate.



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Odisha Burea A Textbook Solutions Long Answer Type Questions

1. What are transition elements ? Describe any four characteristic properties of transition elements.



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2. How does acidified potassium permanganate solution react with

(i) KI

(ii) H_2S



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3. Discuss the oxidising action of $KMnO_4$ in acidic, alkaline and neutral solutions with suitable examples.



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4. Describe the preparation of potassium dichromate from iron chromite ore.



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5. Describe the oxidising action of potassium dichromate and write the ionic equations for its reaction with

(i) iodide

(ii) iron (II) solution and

(iii) H_2S .



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Chapter Practice Multiple Choice Type Questions

1. Which of the following is not a characteristic of transition elements ?

A. Variable oxidation states

B. Formation of coloured compounds

C. Formation of interstitial compounds

D. Natural radioactivity

Answer: D



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2. Which of the following pair of transition metal ions, have the same calculated values of magnetic moment ?

A. Ti^{2+} and V^{2+}

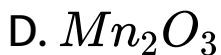
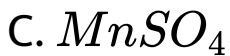
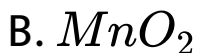
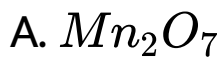


Answer: C



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3. An explosion takes place when conc. H_2SO_4 is added to $KMnO_4$. Which of the following is formed ?



Answer: A



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**Chapter Practice Very Short Answer Type
Questions**

1. $(n - 1)d^{10}ns^2$ is electronic configuration of

.....



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2. Why does the transition element scandium ($Z = 21$) not exhibit variable oxidation states ?



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3. Calculate the 'spin only' magnetic moment of M^{2+} (aq.) ion. ($Z = 27$)



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4. Explain the large difference in melting point of $Cr(1920^{\circ}C)$ and $Zn(420^{\circ}C)$



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5. The atomic size of Fe, Co and Ni are nearly same. Explain with reason.



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6. Why Zn^{2+} salts are white while Ni^{2+} salts are blue ?



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7. Out of $[Sc(H_2O)_6]^{3+}$ and $[Ti(H_2O)_6]^{3+}$ ions, which is coloured and why? Give reason.



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Chapter Practice Short Answer Type I Questions

1. Chromium is a typical hard metal while mercury is a liquid. Why?



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2. Reactivity of transition elements decreases almost regularly from Sc to Cu. Why ?



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3. Why there is striking similarities (horizontal and vertical) among successive members of the transition series ?



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4. What happens when

(i) $KMnO_4$ is heated ?

(ii) $K_2Cr_2O_7$ is heated ?



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5. Why Cu^+ salts are colourless, while Cu^{2+} salts are coloured ?



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6. (i) In the titration of Fe^{2+} ions with $KMnO_4$ in acidic medium, dil. H_2SO_4 is used but not the dil. HCl. Why?

(ii) Transition metals and their compounds act as catalyst explain.



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Chapter Practice Short Answer Type Ii Questions

1. How would you account for the following ?

(i) Copper (I) is diamagnetic, whereas copper

(II) is paramagnetic.

(ii) What is the common oxidation state of Cu,

Ag Au ?

(iii) The d^1 configuration is very unstable in ions.



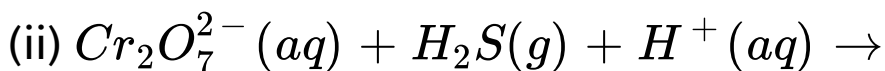
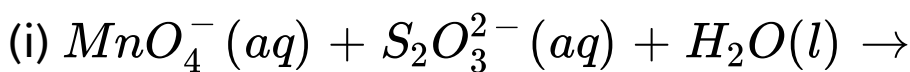
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2. Although Cu^+ does not exist in solution state, but $CuCl(s)$ is formed in the presence of Cl^- ions in aqueous solution of $Cu(s)$ and Cu^{2+} . Explain



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3. Complete the following reactions .



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4. Write the chemical equations for the following reactions.

(i) Oxidation of nitrite ion by MnO_4^- in acidic medium.

(ii) Disproportionation of Mn(VI) in acidic solution.



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5. (i) How K_2MnO_4 can be obtained from MnO_2 , KOH and KNO_3 ?

(ii) K_2PtCl_6 is a well known compound whereas corresponding Ni compound is not known. State the reason for it .



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Chapter Practice Long Answer Type Questions

1. (iii) Distinguish between alloy and amalgam.



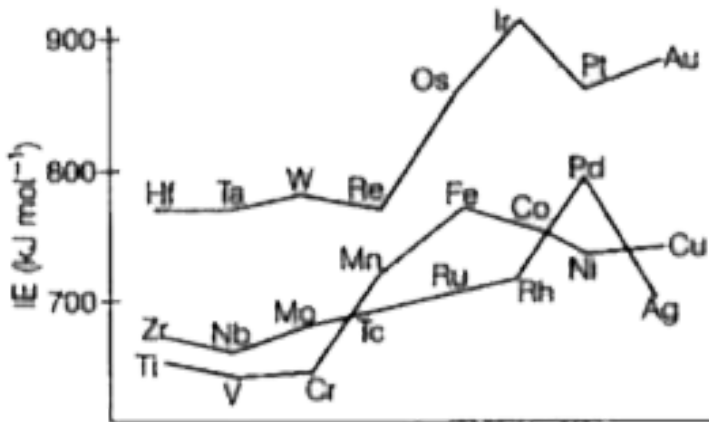
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2. (i) Write the balanced equations to represent what happens when

(a) acidified potassium permanganates reacts with hydrogen sulphide ?

(b) acidified potassium dichromate solution reacts with iron (II) solution (ionic equation) ?

(ii) The figure given below illustrates the first ionisation enthalpies of first, second and third series of transition elements.



(a) Which series amongst the first, second and third series of transition elements have the highest first ionisation enthalpy and Why ?

(b) Why there is a fall in IE_2 from Cr to Mn and from Cu to Zn ? Explain.



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