CHEMISTRY

BOOKS - KALYANI CHEMISTRY (ENGLISH)

d- AND- f- BLOCK ELEMENTS

Exercise Part I Objective Questions

1. d-block elements are called

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2. The general electronic configuration of d-block elements is

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3. A diamagnetic substance is that which has.....electrons.

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4. Zn, Cd and.....have.....melting points.

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5. f-Block are also called.....elements.

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6. Zn^{2+} ions are..... and.....

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7. Most of the transition metal ions are ..... and..... in nature.

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8. The most common oxidation state exhibited by lanthanoids and actinoids is .....

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9. The lanthanoids show a regular decrease in atomic and ionic radii but this decrease in very small due .....

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10. The colour of transition metal ions is due to ..... in d-subshell and ..... transition.

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11. The bonds formed by transition metals in lower oxidation states are ..... while those formed in higher oxidation states are .....

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12. Paramagnetism in lanthanoids is due to both ..... And.....

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13. Alkaline $KMnO_4$ used for the detection of unsaturation in organic compounds is called.....

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14. Potassium dichromate on heating with conc. H_2SO_4 and NaCl gives yellow coloured gas known as ..... which is used for the detection of ..... ions.

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15. The basicity of hydroxides of lanthanides ..... with increase in atomic member due to ..... .

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Exercise Part I Objective Questions The Correct Alternative From The Choices Given

1. d-block elements are called inner-transition elements.

A. representative elements

B. normal elements

C. inner-transition elements

D. transition elements.

Answer: D

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2. In transition elements, the last electron enters in the

A. s-orbital of the outermost shell

B. p-orbital of penultimate shell

C. d-orbital of penultimate shell

D. f-orbital of penultimate shell

Answer: C

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3. The general electronic configuration of d-block elements is

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

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

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

D. $(n-1)d^{0-10}s^{0-2}$

Answer: B

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4. The incorrect statement regarding transition elements is

A. They have low tensile strength

B. Their melting and boiling points are very high

C. They are good conductors of heat

D. Their density is very high.

Answer: A

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5. The element which does not show +4 oxidation state is:

A. Zr

B. Pt

C. La

D. Ti

Answer: C

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6. The more paramagnetic in the following is

A. Mn

B. Cr

C. Fe^{2+}

D. Fe^{3+}

Answer: B

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7. Electronic configuration of a transition element X in + 3 oxidation state is $[Ar]3d^5$ What is its atomic number?

A. 25

B. 26

C. 27

D. 24

Answer: B

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

A. Cu(II) is more stable

B. Cu(II) is less stable

C. Cu(I) and Cu(II) are equally stable

D. Stability of Cu(I) and Cu(II) depends on nature of copper salts

Answer: A

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9. Metallic radii of some transition elements are given below. Which of these elements will have highest density ?

Element	Fe	Co	Ni	Cu
Metallic radii/pm	126	125	125	128

A. Fe

B. Ni

C. Co

D. Cu

Answer: D

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10. Generally transition elements form coloured salts due to the presence of unpaired electrons. Which of the following compounds will be coloured in the solid state ?

A. Ag_2SO_4

B. CuF_2

C. ZnF_2

D. Cu_2Cl_2

Answer: B

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11. On addition of small amount of $KMnO_4$ to concentrated H_2SO_4, a green oily compound is obtained which is highly explosive in nature. Identify the compound from the following

A. Mn_2O_7

B. MnO_7

C. $MnSO_4$

D. Mn_2O_3

Answer: A

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12. The magnetic nature of elements depends on the presence of unpaired electrons. Identify

the configuration of transition element which shows highest magnetic moment.

A. $3d^7$

B. $3d^5$

C. $3d^8$

D. $3d^2$

Answer: B

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13. Which of the listed oxidation states is common for all lanthanoids ?

A. $+2$

B. $+3$

C. $+4$

D. $+5$

Answer: B

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14. Which of the following reactions are disproportionation reactions ?

(I) $Cu^{+} \rightarrow Cu^{2+} + Cu$

(II)

$3MnO_4^{-} + 4H^{+} \rightarrow 2MnO_4^{-} + MnO_2 + 2H_2O$

(III) $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$

(IV)

$2MnO_4^{-} + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H^{+}$

A. (i),(ii)

B. (i),(ii),(iii)

C. (ii),(iii),(iv)

D. (i),(iv)

Answer: A

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15. When $KMnO_4$ solution is added to oxalic acid solution, the decolourisation is slow in the beginning but becomes instantaneous after some time because

A. CO_2 is formed as the product

B. Reaction is exothermic .

C. MnO_4^-

D. Mn^{2+} acts as autocatalyst.

Answer: D

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16. There are 14 elements in actinoid series. Which of the following elements does not belong to this series?

A. U

B. Np

C. Tm

D. Fm

Answer: C

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17. $KMnO_4$ acts as an oxidising agent in acidic medium. The number of moles of

$KMnO_4$ that will be needed to react with one mole of sulphide ions in acidic solution is

A. $2/5$

B. $3/5$

C. $4/5$

D. $1/5$

Answer: A

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18. Which of the following is amphoteric oxide?

$Mn_2O_7, CrO_3, Cr_2O_3, CrO, V_2O_5, V_2O_4$

A. V_2O_5, Cr_2O_3

B. Mn_2O_7, CrO_3

C. CrO, V_2O_5

D. V_2O_5, V_2O_4

Answer: A

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19. Gadolinium belongs to 4f series. It's atomic number is 64. Which of the following is the correct electronic configuration of gadolinium ?

A. $[Xe]4f^7 5d^1 6s^2$

B. $[Xe]4f^6 5d^2 6s^2$

C. $[Xe]4f^8 6d^2$

D. $[Xe]4f^9 5s^1$

Answer: A

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20. Interstitial compounds are formed when small atoms are trapped inside the crystal lattice of metals. Which of the following is not the characteristic property of interstitial compounds ?

A. They have high melting points in comparison to pure metals.

B. They are very hard.

C. They retain metallic conductivity.

D. They are chemically very reactive

Answer: D

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21. The magnetic moment is associated with its spin angular momentum and orbital angular momentum. Spin only magnetic moment value of Cr^{3+} ion is

A. 2.87 B.M

B. 3.87 B.M

C. 3.47 B.M

D. 3.57 B.M

Answer: B

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22. $KMnO_4$ acts as an oxidising agent in alkaline medium. When alkaline $KMnO_4$ is treated with KI, iodide ion is oxidised to..... .

A. I_2

B. IO^-

C. IO_3^-

D. IO_4^-

Answer: C

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23. Which of the following statements is not correct ?

A. Copper liberates hydrogen from acids

B. In its higher oxidation states, manganese forms stable compounds with oxygen and fluorine.

C. Mn^{3+} and Co^{3+} are oxidising agents in aqueous solution.

D. Ti^{2+} and Cr^{2+} are reducing agents in aqueous solution

Answer: A

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24. When acidified $K_2Cr_2O_7$ solution is added to Sn^{2+} salts, then Sn^{2+} changes to

A. Sn

B. Sn^{3+}

C. Sn^{4+}

D. Sn^{+}

Answer: C

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25. Highest oxidation state of manganese in fluorides is $+4(MnF_4)$ but highest oxidation state in oxides is $+7(Mn_2O_7)$ because

A. fluorine is more electronegative than oxygen

B. fluorine does not possess d-orbitals

C. fluorine stabilises lower oxidation state

D. In covalent compounds, fluorine can form single bond only while oxygen forms double bond

Answer: D

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26. Although Zirconium belongs to 4d transition series and Hafnium to 5d transition series even then they show similar physical and chemical properties because

A. both belong to d-block.

B. both have same number of electrons.

C. both have similar atomic radii.

D. both belong to the same group of the periodic table

Answer: C

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27. Why is HCl not used to make the medium acidic in oxidation reactions of $KMNO_4$ in acidic medium?

A. Both HCl and $KMnO_4$ act as oxidising agents.

B. $KMnO_4$ oxidises HCl into Cl_2 which is also an oxidising agent.

C. $KMnO_4$ is a warker oxidising agent than HCl.

D. $KMnO_4$ acts as a reducing agent in the presence of HCl.

Answer: B

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Exercise Part I Correct The Following Statements By Changing The Underline Part Of The Sentence

1. d-block elements are called inner-transition elements.

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2. In d-block elements, $(n-2)$d-subshell is incomplete

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3. Brass is an alloy of copper and tin

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4. Paramagnetism is the property of paired electrons.

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5. Paramagnetism is common in p-block elements.

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6. Outer electronic configuration of Cu is $3d^9 4s^2$.

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7. Most common oxidation state of lanthanoids is $+5$

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8. The transition element iron belongs to 4d-series of transition elements.

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9. Transition elements are more electropositive than group 1 elements

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10. Substances in which all the electron spins are paired are termed as paramagnetic.

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11. Potassium permanganate is used as a reducing agent in acidic medium.

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12. The equivalent mass of $KMnO_4$ in alkaline and neutral mediums is one-fifth of its molecular mass.

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13. The tendency to form complexes of the lanthanoids is more than that of actinoids.

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14. In presence of alkali, purple colour of $KMnO_4$ changes to yellow.

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15. Due to lanthanoid contraction, basic strength of oxides and hydroxides of lanthanoids increases with increase in atomic number.

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Exercise Part I Match And Followings

1. Match and followings

(*i*) Platinum catalyst	(*a*) $(Ph_3P)_3RhCl$
(*ii*) Wilkinson's catalyst	(*b*) Polymerization of alkenes
(*iii*) Potassium permanganate	(*c*) Contact process for manufacture of H_2SO_4
(*iv*) Ziegler-Natta catalyst	(*d*) Volumetric titrations
(*v*) MnO_4^-	(*e*) Hexammine cobalt (III) ion
(*vi*) Cr^{3+} (*aq*)	(*f*) Green
(*vii*) Low spin complex, d^2sp^3	(*g*) Purple

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Exercise Part Ii Descriptive Questions Very Short Answer Questions

1. Why are transition elements so named ?

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2. Why are transition elements known as d-block elements?

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3. General electronic configuration of transition metals is

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4. How many transition series of elements are there in the periodic table.

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5. How many elements are present in the d-block of the periodic table?

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6. Though copper, silver and gold atoms have completely filled sets of d-orbitals, yet they are

considered as transition metals. Why?

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7. What are the two important oxidation states of group 6 elements of the periodic table ?

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8. Which is the most stable oxidation state of titanium (Z=22) in aqueous solution ?

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9. The electronic configuration of an element is $3d^5 4s^1$. Write its (i) most stable oxidation state (ii) most oxidising state.

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10. Write the highest oxidation state shown by an element with atomic number

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11. Why are compounds of transition elements generally coloured ?

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12. Why does vanadium pentoxide acts as a catalyst?

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13. What is the common oxidation state of Cu, Ag and Au?

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14. Name the metal with tripositive ion represented by the configuration :

$1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$

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15. Out of Cr^{2+} and Cr^{3+}, which one is stable in aqueous solution?

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16. What is meant by 'disproportionation'? Give an example of disproportionation reaction in aqueous solution.

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17. Which elements are called ferrous metals ?

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18. What are platinum metals ?

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19. What is the highest oxidation state shown by a transition element.

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20. Name one ore each of manganese and chromium.

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21. What do you mean by 18 carat gold ?

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22. Out of Al, Zn, Mg and Fe which is the densest element?

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23. Which is more stable Fe^{2+} or Fe^{3+} ? Why ?

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24. Why is Pt(IV) more stable than Ni(IV).

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25. K_2PtCl_6 is well known compound while corresponding Ni compound is not known?

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26. Why is electronic configuration $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4 4s^2$ not correct for the ground state of Cr(24) ?

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27. How does the ionic/covalent character of the compounds of a transition metal vary with its oxidation state ?

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28. Why do transition elements have high value of hydration enthalpy?

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29. Why Fe^{2+} has smaller radius than Mn^{2+} ?

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30. Why do most transition metal ions exhibit paramagnetism ?

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31. How is the magnetic moment of a species related to the number of unpaired electrons ?

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32. The electronic configuration of Co^{2+} and $Cu^{2+} is d^7$ and d^9 respectively. Which of these ions will be more paramagnetic ?

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33. Which of the following is paramagnetic ?

$Sc^{3+}(Z=21), Cu^{+}(Z=29)$

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34. Why is Ti^{2+} ion paramagnetic ?

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35. One unpaired electron in an atom contributes a magnetic moment of 1.1 B.M. Calculate the magnetic moment of Cr

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36. Why do transition elements shows variable oxidation states?

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37. Why are complex ions readily formed when water molecules react with the cation but not with the hydronium ions ?

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38. Arrange the following in increasing order of basic character:

MnO, MnO_2, Mn_2O_7

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39. Arrange the following in increasing order of acidic character:

CrO, Cr_2O_3 and CrO_3.

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40. What happens when $KMnO_4$ is heated ?

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41. What is Baeyer's reagent ?

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42. Why is $KMnO_4$ kept in dark bottles ?

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43. Why is HCl not used to acidify a permanganate solution in volumetric estimation of Fe^{2+} or $C_2O_4^{2-}$?

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44. Why is $K_2Cr_2O_7$ generally preferred over $Na_2Cr_2O_7$, in volumetric analysis though both are oxidising agents ?

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45. What happens when chromates are kept in acidic solution and dichromates in the alkaline solution ?

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46. In permanganate ion, all the bonds formed between Mn and oxygen are covalent. Give reasons.

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47. Why lanthanoids and actinoids are called f-block elements?

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48. What is the maximum oxidation state in actinoids?

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49. State the common characteristic of lanthanoids and actanoids which places them in the f-block of elements.

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50. Give the general electronic configuration of actinoids

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51. The size of the trivalent cations in the lanthanoid series decreases steadily as the atomic number increases. What is this known as ?

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52. Out of the following identify (i) the *d' block element (ii) the of block element.

Ca, Mn, U, Al

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53. State a consequence of lanthanoid contraction shown by transition elements.

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54. Write outer electronic configuration of lanthanoids.

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55. Which trivalent cation is largest in lanthanoid series ?

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56. Write any two uses of pyrophoric alloys.

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57. Write are non-stoichimetric oxides ? Give one example.

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58. Give one use each of (i) niobium (ii) tantalum.

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59. Give two properties in which interstitial compounds differ from its elements.

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60. Why is copper-29 considered a transition metal?

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61. Why do Zr and Hf exhibit similar properties?

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62. Assign reasons for the following:

What is lanthanoid contraction ? Explain its any one consequence.

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63. What is the difference between the electronic configuration of lanthanoids and actinoids?

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64. Which is the most common oxidation state of lanthanoids?

65. Why does a transition series contains 10 elements?

66. Write the formula of a compound where transition metal is in +7 oxidation state.

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67. Which divalent metal ion has maximum paramagnetic character among the first series transition metals ?

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68. Write the atomic number of the element in which the filling of 3d-subshell in the atom just starts.

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69. In the transition series, with an increase in atomic number, the atomic radius does not change very much. Why is it so?

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70. Name a lanthanoid element which exhibits +4 oxidation state besides +3 oxidation state.

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71. What is the effect of increasing pH on $K_2Cr_2O_7$ solution?

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72. Which is more basic $La(OH)_3$zor $Lu(OH)_3$? Why?

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73. What is the basic difference between the electronic configurations of transition and inner-transition elements?

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74. Why do transition elements show similarities along the horizontal period ?

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75. Why the third ionization energy of manganese (atomic number 25) unexpectedly high?

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76. Which property of the transition elements makes them good catalysts?

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77. What are coinage metals ?

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78. Write the ionic reaction for the reaction between MnO_4^- ions and oxalate ions at 333

K.

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79. Write one reaction using alkaline $KmnO_4$.

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80. Write the electronic configuration of the element with atomic number 102.

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81. What is the electronic cofiguration of charomium atom (z= 24) Give reason for your answer.

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82. Why are Cd^{2+} salts white ?

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83. Though a transition element, scandium (Z = 21) does not exhibit variable oxidation state.

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84. Account for the following:

There are irregularities in the electronic configuration of actinoids.

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85. The gradual decrease in size (actionoid contraction) is from element to element is greater among the actinoids than that among the lanthanoids (lanthanoid contraction).

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86. (a) Complete the following chemical equations :

(i) $MnO_4^-(aq) + S_2O_3^{2-}(aq) + H_2O(l) \rightarrow$

(ii) $Cr_2O_7^{2-}(aq) + Fe^{2+}(aq) + H^+(aq) \rightarrow$

(b) Explain the following observatons :

(i) $La^{3+}(Z=57)$ and $Lu^{3+}(Z=71)$ do not show any colour in solutions.

(ii) Among the divalent cations in the first series of transition elements, manganese exhibits the maximum paramagnetism.

(iii) Cu^{+} ion is not known in aqueous solutions.

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87. Assign reasons for the following :

(i) Copper (I) ion is not known in aqueous solution.

(ii) Actinoids exhibit greater range of oxidation states than lanthanoids.

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88. Why is Cr^{2+} reducing and Mn^{3+} oxidising when both have d^4 configuration?

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89. How would you accont for the following?

Lanthanoids form primarily + 3 ions, while the actinoids usually have higher oxidation states in their compounds, + 4 or even +6 being typical.

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90. How would you account for the following :

(i) Among lanthanoids , Ln(III) compounds are predominant , However, occasionally in

solutions or in solid compounds , +2 and +4 ions are also obtained .

(ii) The $E^{\circ}_{M2+/M}$ for copper is positive (0.34V) . Copper is the only metal in the first series of transition elements showing this behaviour .

(iii) The metallic radii of the third (5d) series of transition metals are nearly the same as those of the corresponding members of the second series .

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91. Explain the following observations :

(i) Many of the transition elements are known to form interstitial compounds .

(ii) There is a general increase in density from titanium (Z =22) to copper (Z = 29).

(iii) The members of the actinoid series exhibit a larger number of oxidation states than the corresponding members of the lanthanoid series.

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Exercise Part Ii Descriptive Questions Short Answer Questions

1. What are transition elements ? How these differ from representative elements ?

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2. Write the name of elements of first transition series and write their electronic configuration.

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3. Why is it that while going from Hf to Au, the m. pt. first increases upto tungsten and then decreases ?

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4. Ni (II) compounds are thermodynamically more stable than Pt(II) compounds but the order is reverse in case of + 4 oxidation states. Why?

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5. Define paramagnetic and ferromagnetic substances ? Account for the paramagnetic character of transition metal compounds. How does the paramagnetic character of the divalent ions of first transition metal series vary from Ti (Z = 22) to Cu (Z=29) ?

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6. Explain the following

(a) Zr and Hf exhibit similar properties.

(b) Most of the transition elements show large number of oxidation states.

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7. Why do the transition elements exhibit similarity in properties along the period and as well as down the group?

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8. Account for the fact that second ionization energies of both Cr and Cu are higher than those of the next element.

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9. Account for the fact that the third ionization enthalpies of both Mn and Zn are higher than those of next element

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10. Explain that the compounds of tranisition metals are usually coloured both in the solid and aqueous solutions.

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11. Why niobium and tantalum show similar properties?

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12. Why do transition metals exhibit the property to form alloys and complexes ?

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13. What is an alloy ? Name the two types of alloys formed by transition elements. Give one example of solid solution in relation to a smooth alloy.

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14. Transition metals easily form intermetallic alloys. What property of these metals would you consider to be responsible for it?

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15. List one use of $KMnO_4$ under each of the following heads :

(i) as a labortory reagent (ii) in the industry .

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16. State any four uses of $KMnO_4$

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17. State any four uses of $K_2Cr_2O_7$.

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18. Predict with justification the number of moles of KI that would be oxidised by acidified aqueous solutions of (i) one mole of acidified $KMnO_4$ and (ii) acidfied $K_2Cr_2O_7$.

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19. Draw the structure of :

(i) chromate ion and

(ii) dichromate ion.

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20. What is the chemistry of chromyl chloride test?

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21. How can you convert potassium dichromate into chromyl chloride ? Give equations for the reactions involved.

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22. What happens when :

(i) K_2CrO_7 reacts with acidified solution of KI

(ii) SO_2 (g) is passed through a solution of $K_2Cr_2O_7$

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23. Explain the difference between the electronic configuration of gadolinium (Z=64) and terbium (Z=65).

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24. What are lanthanoids? Write the name of the lanthanoids.

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25. What are actinoids ? Write the name of all the actinoids.

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26. $_{57}La$ and $_{71}Lu$ Lu have no partially filled 4f-subshell, yet these are included in lanthanoids. Explain.

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27. Why the elements with at. no. 57 to 71 are called inner transition elements ?

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28. Comment upon the statement that:

(i) The electronic configurations of lanthanoid metals are not known with certainty.

(ii) Strictly speaking, the lanthanoids should include only thirteen elements with atomic number ranging from 58 to 70.

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29. Which is the last element in the series of the actinoids? Write the electronic configuration of this element. Comment on the possible oxidation state of this element.

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30. In what way is the electronic configuration of the transition elements different from that of the non transition elements?

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31. What are different oxidation states exhibit by lanthanoids?

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32. Explain the following terms :

(a) Chemistry of all Lanthanoids is so identical .

(b) Silver atom has completely filled d- orbitals

$(4d^{10})$ in its ground state . How can you say that is a transition elements ?

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33. What is the electronic difference between lanthanoids and actinoids? Why is europium (II) more stable than cerium (II).

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34. Name the elements with atomic number 58 and 59 and write their electronic configuration.

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35. What are inner-transition elements? Write their general electronic configuration.

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36. Define lanthanoids. Give three differences between lanthanoids and actinoids.

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37. What happens when :

(i) Acidified $K_2Cr_2O_7$ reacts with Kl.

(ii) $K_2Cr_2O_7$ is heated with NaCl in presence of conc. H_2SO_4.

(iii) $K_2Cr_2O_7$ is heated.

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38. The sums of first and second ionisation energies and those of third and fourth ionisation energies of nickel and platinum are given below:

	$I.E_1 + I.E_2$ (kJ mol^{-1})	$I.E_3 + I.E_4$ (kJ mol^{-1})
Ni	2.49	8.80
Pt	2.66	6.70

Taking these values into account write

(i) The most common oxidation state for Ni and Pt and its reason.

(ii) The name of the metal (Ni or Pt) which can

form compounds in +4 oxidation state more easily and why?

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39. Of the ions Ag^+, Co^{2+} and Ti^{4+} ,which ones will be coloured in aqueous solutions. (Atomic numbers:)

Ag = 47 , Co = 27, Ti = 22)

(b) If each one of the above ionic species is in turn placed in magnetic field, how will it respond and why?

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40. Among ionic species, Sc^{3+}, Ce^{4+} and Eu^{2+}, which one is a good oxidising agent? Give a suitable reason for your answer. (Atomic nos: Sc = 21, Ce=58, Eu=63).

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41. of the ions Co^{2+}, Sc^{3+} and Cr^{3+} which one will give coloured aqueous solutions and how will each of them respond a magnetic

field and why ?

(Atomic numbers : Co, = 27, Sc= 21 ,Cr = 24)

42. A transition element forms alloys with other transition metals easily. Why?

43. (i) Give the formula which expresses the general electronic configuration of actinoids.

(ii) Which complexes are formed when actinoid halides react with alkali metal halides?

(iii) Why do actinoids get tarnished in air.

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44. $\left[Ti(H_2O)_6\right]^{3+}$ is coloured while $\left[Sc(H_2O)_6\right]^{3+}$ is colourless . Explain.

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45. Represent the reaction of acidified $K_2Cr_2O_7$ with:

(i) KI solution (ii) $FeSO_4$ (ii) H_2S with the help of chemical equations.

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46. Assertion : $KMNO_4$ acts as an oxidising agent in acidic, basic or neutral medium.

$KMnO_4$ oxidises ferrous sulphate to ferric sulphate.

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47. How is that in alkaline solution we have chromate and in acidic solution dichromates ? Give their structures.

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48. Decribe, how potassium dichromate is prepared from chromite. Write the chemical equations for the reactions involved.

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49. Describe how potassium permanganate is prepared from pyrolusite. Write the chemical equations for the reactions involved.

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50. What is lanthanoid contraction? What are the consequences of lanthanoid contraction?

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Exercise Part Ii Descriptive Questions Long Answer Questions

1. What are transition elements ? Explain that transition metal compounds are generally:

(a) coloured

(b) act as catalysts

(c) show variable oxidation states.

(d) form complexes

(e) have high m.pt. and b.pt.

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2. Describe the trend in I.E., electrode potential, atomic radii and oxidation states of elements of first transition series.

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3. Give the preparation and properties (acidic, basic, neutral medium) of $KMnO_4$.

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4. Give the preparation of $K_2Cr_2O_7$, from chromite ore. Give its any five oxidising properties.

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5. What are inner-transition elements ? Give three properties in which actinoids resemble lanthanoids and the three properties in which the two differ from each other.

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6. What is lanthanoid contraction? What are the consequences of lanthanoid contraction?

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7. Potassium dichromate is prepared from

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8. The electron configuration of lanthanoid elements is not known with certainty. Explain.

9. Why do transition elements shows variable oxidation states?

10. Most of the transition metals do not displace hydrogen from dilute acids. Why?

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11. Discuss the difference in the magnetic properties of d and f block elements.

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12. What is lanthanoid contraction? What are the consequences of lanthanoid contraction?

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13. Give plausible reason for the fact that the tran-sition metals have high enthalpy of atomization.

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14. What is the oxidation state of $Niin(Ni(CO))_4$?

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15. A transition element forms alloys with other transition metals easily. Why?

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

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17. How is potassium dichromate prepared from a sample of chromite ore ? Give balanced equations for the chemical reactions involved.

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18. In the transition element series starting from lanthanun $(_{57}La)$, the next element hafnium $(_{72}2Hf)$ has an atom number, 72. Why do we observe this jump in atom number?

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19. Represent by ionic equation, the oxidsing action of MnO_4^- both in acidic and alkaline media. Write the balanced chemical equation of SO_2 and MnO_4^- in acid medium.

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20. Decide giving reasons which one of the following exhibits the property indicated :L

(i) Sc^{3+} and Cr^{3+} exhibit paramanetism (ii) V or Mn exhibits more number of oxidation sates (at. No Sc= 21 , V =23 , Cr = 24 , Mn=25)

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21. What are inner transition elements? Decide which of the following atomic numbers are the atomic numbers of the inner transition elements : 29, 59, 74, 95, 102, 104.

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22. What is the difference between the electronic configurations of transition and inner-transition elements

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23. Complete the reactions :

(i) $Na_2Cr_2O_7 + KCl \rightarrow$

(ii) $2MnO_2 + 4KOH + O_2 \rightarrow$

(iii) $MnO_4^- + C_2O_4^{2-} + H^+ \rightarrow$

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24. Giving reasons indicate which one of the following would be coloured ?

Cu^+, V^{2+}, Sc^{3+}, Ni^{2+} (atomic number : Cu = 29 , V = 23 , Sc=21 , Ni = 28)

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25. Account for the following statements :

(i) Co (ii) is stable in aqueous solution but in the presence of strong ligands and air it can get oxidised to Co (III) (at. No Co=27)

(ii) of the d^4 species Cr (II) is strongly reducing but Mn (III) is strongly oxidising

(at. no Cr= 24 , Mn = 25, Co = 27)

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26. Decide giving reason which one of the following pairs has the property indicated.

(i) Fe or Cu has higher lower magnetic moment.

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27. What is lanthanoid contraction? What are the consequences of lanthanoid contraction?

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28. Why lanthanoids and actinoids are called f-block elements?

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29. Assign reasons for the following:

(a) Ce^{3+} can easily be oxidised to Ce^{4+}

(b) E^{Θ} for $Mn^{3+} \mid Mn^{2+}$ couple is more positive than $Fe^{3+} \mid Fe^{2+}$

Explain the following :

(a) Zr and Hf exhibit similar properties.

(b) The colour of $K_2Cr_2O_7$ solution changes with the change in pH value of the solution .

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30. Assign reasons for the following:

(a) Zn^{2+} salts are white while Cu^{2+} salts are blue.

(b) Separation of lanthanoid elements is difficult. Explain.

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31. Assign reasons for the following :

(a) Co^{2+} has higher magnetic moment than Ni^{2+}

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32. Assign reasons for the following :

(b) The ionization energy of 5d elements are greater than 3d elements.

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33. Assign reasons for the following :

Write equations for the preparation of $K_2Cr_2O_7$ from chromite ore.

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34. Assign reasons for the following:

Sc^{3+} ion is colourless while Cr^{3+} is coloured.

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35. Why are Mn^{2+} compounds more stable than Fe^{2+} towards oxidation to their +3 state?

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36. Assign reasons for the following:

Cu(I) compounds are white and diamagnetic identical ?

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37. Assign reasons for the following:

Why is the chemistry of all lanthanoids indential ?

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38. Assign reasons for the following:

What is lanthanoid contraction ? Explain its any one consequence.

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39. How and you account for the following :

(i) Cabalt (II) is stable in aqueous solution but in the presence of complexing reagents it is easily oxidised.

(ii) The transition elements exhibit high enthalpy of atomization.

(iii) of the d^4 species, Cr^{2+} is strongly reducing while Mn (III) is strongly oxidsing .

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40. Why Sm^{2+}, Eu^{2+} and Yb^{2+} ions are good reducing agents , but and aqueous solution of Ce^{4+} is good oxidsing (Z=64) and Lutetium (Z= 7) are especially, stable . Why ?

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41. Compare the properties of lanthanoids and actinoids.

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42. Given below are the electrode potential values, E^{Θ} for some of the first row of transition elements :

Element	$E^{\Theta}_{M^{2+}/M(V)}$
V(23)	−1.18
Cr(24)	−0.91
Mn(25)	−1.18
Fe(26)	−0.44
Co(27)	−0.28
Ni(28)	−0.25
Cu (29)	+0.34

Explain the irregularities in these values on the basis of electronic structure of atoms.

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43. Complete the following chemical reaction equations :

(i) $Cr_2O_7^{2-} + I^- + H^+ \rightarrow$

(ii) $MnO_4^- + NO_2^- H^+ \rightarrow$

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44. Decribe the general trends in the following properties of the first sereis of the transition elements :

(i) Stability of + 2 Oxidation state

(ii) Formation of oxometal ions.

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45. Assign reasons for each of the following

(i) Trasitiono elements exhibit variable oxidation sates.

(ii) Transition metal ions are usually coloured.

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46. (a) Complete the following chemical reaction equations :

(i) $MnO^{-}_{4\,(aq)} + C_2O^{2-}_{4\,(aq)} + H^{+}_{(aq)} \rightarrow$

(ii) $Cr_2O^{2-}_{7\,(aq)} + Fe^{2+}_{(aq)} + H^{+}_{(aq)} \rightarrow$

(b) Explain the following observations about the transition/inner transition elements :

(i) There is in general an increase in density of element from titanium (Z = 22) to copper (Z= 29).

(ii) There occurs much more frequent metal-metal bonding in compounds of heavy transition elements (3^{rd} series).

(iii) The members in the actinoid series exhibit a larger number of oxidation states than the corresponding members in the lanthanoid series.

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47. Explain the following observations about the transition/ inner-transition elements :

(i) There is in general an increase in density of elements from titanium (Z=22) to copper (Z=29).

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48. Complete the follwing chemical equations for reactions :

(i) $Fe^{\circ+}(aq) + MnO_4^-(aq) + H^+(aq) \rightarrow$

(ii) $Cr_2O_7^{2-}(aq) + I^-(aq) + H^+(aq) \rightarrow .$

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49. Give an explanation for each of the following observations:

(i) The gradual decrease in size (actinoid contraction) from element to element is greater among the actinoids than that among the lanthanoids (lanthanoid contraction).

(ii) The greater number of oxidation states are

exhibited by the members in the middle of a transition series.

(iii) With the same d-orbital $\left(d^4\right)$, Cr^{2+} ion is a reducing agent but Mn^{3+} ion is an oxidising agent.

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50. Complete the follwing chemical equations for reactions :

(i) $Fe^{\circ+}(aq) + MnO_4^-(aq) + H^+(aq) \rightarrow$

(ii) $Cr_2O_7^{2-}(aq) + I^-(aq) + H^+(aq) \rightarrow .$

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51. Explain the following observations:

(i) Transition elements are known to form many interstitial compounds..

(ii) With the same d^4 configuration Cr^{2+} ion is reducing while Mn^{3+} ion is oxidising.

(iii) The enthalpies of atomization of the transition elements are quite high.

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Isc Examination Questions Part Ii Descriptive Questions

1. Account for the following : (a) (i) Copper(I) compounds are white whereas Copper(II) compounds are coloured. (ii) Chromates change their colour when kept in an acidic solution. (iii) Zn,Cd, Hg are considered as d-block elements but not as transition elements. (b) Calculate the spin only moment of Co^{2+} (Z=27) by writing the electronic configuration of Co and Co^{2+}

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2. Iron is ferromagnetic in nature. Explain why.

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3. In a given transition series, there is no significant change in the atomic radii of elements with increse in atomc number. Explain why.

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4. The most common oxidation state exhibited by lanthanoids and actinoids is .....

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5. What is the electronic cofiguration of charomium atom (z= 24) Give reason for your answer.

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6. Give balanced equation for the following reaction :

Acidified potassium permanganate and oxalic acid.

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7. Explain why transition metals form complex compounds.

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8. Give balanced chemical equation for the reaction when potassium iodide is treated with acidified potassium permanganate solution.

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9. Explain why:

(i) Transition elements form coloured compounds. (ii) Cu^{+} is diamagnetic but Cu^{2+} is paramagnetic (Z=29)

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10. Give reasons for the following:

Zn^{2+} salts are white but Cu^{2+} salts are blue.

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11. How is potassium dichromate prepared from a sample of chromite ore ? Give balanced equations for the chemical reactions involved.

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12. The transition metals show ..... character because the presence of unpaired electrons and Cu^+ is .....

because its electronic configuration is $[Ar]3d^{10}$

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13. Explain the following :

(i) Why do transition metal ions possess a greater elements increases upto Mn and then decrease.

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14. Give balanced equation for the following reaction : Potassium dichromate is treated with acidified ferrous sulfate solution.

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15. How will you obtain pure potassium permanganate $(KMnO4_{\square})$ crystals from its

ore, pyrosulfite ? Give the steps involved and the reactions.

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