



Name :

Time : 6 hr

Total Marks = 145

Date: 23/10/2017

- Q1. Write down the electronic configuration of Pm^{3+} (61), Lu^{2+} (71). 1**
- Q2. Write down the electronic configuration of Cr^{3+} (24), Ce^{4+} (63). 1**
- Q3. Write down the electronic configuration of Tn^{4+} (90), La^{2+} (57). 1**
- Q4. Write the electronic configurations of the elements with the atomic numbers 61 and 91. 1**
- Q5. Write the electronic configurations of the elements with the atomic numbers 70 and 63. 1**
- Q6. Which of the following has maximum unpaired electron ${}_{22}\text{Ti}^{3\oplus}$, ${}_{23}\text{V}^{3\oplus}$, ${}_{26}\text{Fe}^{2\oplus}$. 1**
- Q7. Give the number of unpaired electrons 1**
(a) La^{3+} (Z = 57) (b) Ce^{2+} (Z = 63)
- Q8. Why does Mn (II) show maximum paramagnetic character amongst the bivalent ions of the first transition series? Calculate the theoretical value of magnetic moment. 1**
- Q9. Calculate the spin only magnetic moment of M^{2+} (Z = 27). 1**
- Q10. Use Hund's rule to derive the electronic configuration Ce^{3+} ion and calculate its magnetic moment on the basis of 'spin-only' formula. 1**
- Q11. Ti^{4+} complexes are diamagnetic or paramagnetic and why? 1**
- Q12. Of the ions CO^{2+} , Sc^{3+} and Cr^{3+} , which ones will give coloured aqueous solutions and how will each of the respond to a magnetic field and why? 1**
- Q13. Giving reasons indicate which one of the following would be coloured? 1**
 Cu^+ , VO^{2+} , Sc^{3+} , Ni^{2+} , (At. no. of Cu = 29, V = 23, Sc = 21, Ni = 28)
- Q14. Which of the two ferrous or ferric ion has larger magnetic moment and why? 1**
- Q15. Scandium (Z = 21) is a transition element but zinc (Z = 30) is not. Explain. 1**
- Q16. 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. 1**
- Q17. Which of the 3d series of the transition metals exhibits the largest number of oxidation states and why? 1**
- Q18. Why is the highest oxidation state of a metal exhibited in its oxide or fluoride only? 1**
- Q19. What may be stable oxidation state of the transition element with the following d-electron configuration in the ground state of their atoms : $3d^3$, $3d^5$, $3d^8$, and $3d^4$? 1**
- Q20. To what extent do the electronic configurations decide the stability of oxidation states in the first series of the transition elements? Illustrate your answer with examples. 1**

- Q21. Name the oxo metal anions of the first series of the transition metals in which the metal exhibits the oxidation state equal to its group number. 1
- Q22. Which is more basic $\text{La}(\text{OH})_3$ or $\text{Lu}(\text{OH})_3$? Why? 1
- Q23. Why do Zr and Hf exhibit similar properties? 1
- Q24. Why is that orange solution of $\text{K}_2\text{Cr}_2\text{O}_7$ turns yellow on adding NaOH to it? 1
- Q25. Why is $\text{K}_2\text{Cr}_2\text{O}_7$ generally preferred over $\text{Na}_2\text{Cr}_2\text{O}_7$ in volumetric analysis though both are oxidising agents? 1
- Q26. Why does V_2O_5 act as catalyst? 1
- Q27. Write the ionic equation representing the oxidising property of acidified KMnO_4 solution. 1
- Q28. Why is KMnO_4 kept in dark bottles? 1
- Q29. What are interstitial compounds? Mention their two important properties. 1
- Q30. What happens when KMnO_4 is heated? Give chemical equation. 1
- Q31. What are the different oxidation states exhibited by the lanthanoids? 1
- Q32. A transition element has a configuration $[\text{Ar}]3d^4$ is its +3 oxidation state. What is its atomic number? 1
- Q33. Write the highest oxidation state of the element with atomic number 23. 1
- Q34. What is the highest oxidation state of transition elements? 1
- Q35. Why are Mn^{2+} compounds more stable than Fe^{2+} towards oxidation to their +3 state? 1
- Q36. Which metal in the first transition series exhibits +1 oxidation state most frequently and why? 1
- Q37. Name a transition element which does not exhibit Variable oxidation states. 1
- Q38. Fe^{3+} is more stable than Fe^{2+} . Explain. 1
- Q39. How would you account for the irregular variation of ionisation enthalpies (first and second) in the first series of transition elements? 1
- Q40. Explain briefly how +2 state becomes more and more stable in the first half of the first row transition elements with increasing atomic number? 1
- Q41. The first ionization energy of Zn is considerably high than the other members of first transition series. 1
- Q42. Why is first ionization energy of Cu higher than that of sodium? 1
- Q43. Why is the third ionization energy of manganese (At. no. = 25) unexpectedly high? 1
- Q44. In the transition series, with an increase in atomic number the atomic radius does not change very much. Why is it so? 1
- Q45. Why is radius of Fe^{2+} less than that of Mn^{2+} ? 1
- Q46. The electronic configuration of Co^{2+} and Cu^{2+} is d^7 and d^9 respectively, which of these ions is expected to be more paramagnetic? 1

- Q47. In the series Se(Z = 21) to Zn (Z = 30), the enthalpy of zinc atomization is the lowest (126 kJ mol⁻¹). Why? 1
- Q48. Why do transition elements exhibit higher enthalpies of atomization? 1
- Q49. The E^{⊖1.0}(M²⁺ | M) value for copper is positive (+0.34V). What is possible reason for this? 1
- Q50. Which is a stronger reducing agent Cr²⁺ or Fe²⁺ and why? 1
- Q51. Explain why Cu⁺ ion is not stable in aqueous solution? 1
- Q52. What are the alloys? Name an important alloy, which contains some of the lanthanoid metals. Mention its uses. 1
- Q53. The Chemistry of the actinoid elements is not so smooth as that of the lanthanoids. Justify this statement by giving some examples from the oxidation state of these elements. 1
- Q54. Why are transition elements known as d-block element? 1
- Q55. What is chromic acid? 1
- Q56. Give one example of any compound in which the oxidation state of Ni is zero. 1
- Q57. Which transition metal has highest density? 1
- Q58. Why the melting point of transition elements are high? 1
- Q59. Why Zn, Cd and Hg are not regarded as transition element? 1
- Q60. Write the names of three coloured compounds of Ag. 1
- Q61. Explain as to why the E⁻ value for the Mn³⁺/Mn²⁺ with Fe³⁺/Fe²⁺ or Cr³⁺/Cr²⁺. 1
- Q62. (a) Of the ions Ag⁺, CO²⁺ and Ti⁴⁺, which one will be coloured in aqueous solutions. 1
(b) If each one of above species is in turn placed in a magnetic field, how will it respond and why? 1
- Q63. Copper is regarded as transition metal though it has completely filled d-orbitals (d¹⁰). Explain. 1
- Q64. Name the following: 1
(a) Divalent ion of first transition series having maximum magnetic moment.
(b) Coloured ion out of Cu⁺ or Cu²⁺.
(c) Two ions of first transition series having dipole moment.
- Q65. The melting and boiling points of Zn, Cd and Hg are low. Why? 1
- Q66. What may be the stable oxidation state of the transition elements with the following d-electron configuration the ground state of their atoms? 1
3d³, 3d⁵, 3d⁸, and 3d⁴
- Q67. Chromium is a typical hard metal while mercury is a liquid. Why? 1
- Q68. Silver is a transition metal but zinc is not. Why? 1
- Q69. Why transition form complexes? What types of bond is present in these compounds? 1
- Q70. What is the effect of pH on the colour of the solution of potassium dichromate? 1

- Q71. Transition metals of 3d-series do not react readily with dilute acids to liberate hydrogen although they have high negative reduction potential values. Explain. 1
- Q72. Why the transition elements act as catalysts? Give an examples of the reactions catalysed by them. 1
- Q73. Actinoid contraction is greater from element to element than lanthanoid contraction. Why? 1
- Q74. How many water molecules are involved in coordination in $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$? 1
- Q75. Why is KMnO_4 solution used to clean surgical instruments in hospitals? 1
- Q76. In moist air, copper corrodes to produce a green layer on its surface. Explain. 1
- Q77. What is the most common form of chromium in basic solution? What ion forms when a basic solution of chromium is acidified? 1
- Q78. What happens when potassium dichromate is heated with sodium chloride and conc. H_2SO_4 ? 1
- Q79. Explain how the colour of $\text{K}_2\text{Cr}_2\text{O}_7$ solution depends on pH of the solution. 1
- Q80. What happens when $\text{K}_2\text{Cr}_2\text{O}_7$ is treated with $\text{Pb}(\text{NO}_3)_2$? 1
- Q81. What happens when SO_2 gas is passed through acidified $\text{K}_2\text{Cr}_2\text{O}_7$ solution? 1
- Q82. Write the complete chemical equation for the following: An alkaline solution of KMnO_4 reacts with an potassium iodide. 1
- Q83. Why is that orange solution of $\text{K}_2\text{Cr}_2\text{O}_7$ turns yellow on adding NaOH to it? 1
- Q84. On the basis of the standard electrode potential values stated for acid solutions, predict whether $\text{Ti}^{4\oplus}$ species may be used to oxidise Fe^{II} to Fe^{III} . 1
- | Reaction | E^-/V |
|--|----------------|
| $\text{Ti}^{\text{IV}} + e^- \longrightarrow \text{Ti}^{3+}$: | + 0.01 |
| $\text{Fe}^{3+} + e^- \longrightarrow \text{Fe}^{2+}$: | +0.77 |
- Q85. How is the magnetic moment of a species related to the number of unpaired electrons? 1
- Q86. Though both Cr^{2+} and Mn^{3+} have d^4 configuration, yet Cr^{2+} is reducing while Mn^{3+} is oxidising. Explain why? 1
- Q87. Copper is soluble in dil. HNO_3 but not in dil. HCl . 1
- Q88. Why is $\text{K}_2\text{Cr}_2\text{O}_7$ generally preferred over $\text{Na}_2\text{Cr}_2\text{O}_7$ in volumetric analysis although both are oxidising agents? 1
- Q89. The properties of lanthanides are fairly similar, while the properties of actinides are considerably different from each other. Explain. 1
- Q90. What is the most characteristic oxidation state of lanthanoids ? 1
- Q91. CrO_3 is an acid hydride. Explain. 1
- Q92. What happens when zinc oxide is dissolved in NaOH ? 1
- Q93. What is the most common oxidation state exhibited by Scandium, manganese, chromium. 1

- Q94.** 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. 1
- Q95.** Give KMnO_4 oxidising reaction in acidic medium with Fe^{2+} . 1
- Q96.** Give KMnO_4 oxidising reaction in acidic medium with oxalate ion. 1
- Q97.** Give KMnO_4 oxidising reaction in acidic medium with I^- . 1
- Q98.** Give KMnO_4 oxidising reaction in acidic medium with SO_3^{2-} . 1
- Q99.** Give KMnO_4 oxidising reaction in acidic medium with NO_2^- . 1
- Q100.** Give KMnO_4 oxidising reaction in neutral or faintly alkaline solutions with I^- . 1
- Q101.** Give KMnO_4 oxidising reaction in neutral or faintly alkaline solutions with $\text{S}_2\text{O}_3^{2-}$. 1
- Q102.** Give oxidising action of $\text{K}_2\text{Cr}_2\text{O}_7$ in acidic medium with I^- . 1
- Q103.** Give oxidising action of $\text{K}_2\text{Cr}_2\text{O}_7$ in acidic medium with H_2S . 1
- Q104.** Give oxidising action of $\text{K}_2\text{Cr}_2\text{O}_7$ in acidic medium with Fe^{2+} . 1
- Q105.** Give oxidising action of $\text{K}_2\text{Cr}_2\text{O}_7$ in acidic medium with Sn^{2+} . 1
- Q106.** Give preparation reaction of Potassium dichromate, $\text{K}_2\text{Cr}_2\text{O}_7$ 2
- Q107.** Give preparation reaction of Potassium permanganate, KMnO_4 . 2
- Q108.** Complete the following reaction equations: 2
- (a) $\text{Cr}_2\text{O}_7^{2-} + \text{Sn}^{2+} + \text{H}^+ \longrightarrow$
- (b) $\text{MnO}_4^- + \text{Fe}^{2+} + \text{H}^+ \longrightarrow$
- Q109.**(a) Write a metal oxide compound for manganese in each of the following oxidation states: +2, +3, +4, +6, +7. 2
- (b) List these metal oxides in the decreasing acidic character.
- Q110.** Complete the following chemical equation: 2
- (a) $\text{MnO}_4^- (\text{aq}) + \text{S}_2\text{O}_3^{2-} (\text{aq}) + \text{H}_2\text{O}(\text{l}) \longrightarrow$
- (b) $\text{Cr}_2\text{O}_7^{2-} (\text{aq}) + \text{Fe}^{2+} (\text{aq}) + \text{H}^+ (\text{aq}) \longrightarrow$
- Q111.** What happens when 2
- (a) Potassium dichromate reacts with sulphur dioxide in acidic medium?
- (b) Potassium dichromate reacts with Mohr's salt in presence of dil. H_2SO_4 ?
- Q112.** Draw the structure of chromate and dichromate ions. 2
- Q113.** Why are Ni^{2+} compounds thermodynamically more stable than Pt^{2+} compounds, whilst Pt^{4+} compounds are relatively more stable than Ni^{4+} compounds? 2
- Q114.** Write balanced ionic equation for what happens when: 2
- (a) Acidified potassium permanganate solution is treated with an oxalate ion in solution.
- (b) An iodide ion is treated with an acidified dichromate ion in solution.

Q115 The sum of first and second ionisation energies and those of third and fourth ionisation energies of nickel and platinum are given below: 2

	$IE_1 + IE_2$ (kJ mol ⁻¹)	$IE_3 + IE_4$ (kJ mol ⁻¹)
Ni	2.49	8.80
Pt	2.66	6.70

Taking these values into account write:

- The most common oxidation state for Ni and Pt and its reason.
- The name of this metal (Ni or Pt) which can form compounds in +4 oxidation state more easily and why?

Q116 What is meant by 'disproportion'? Give two examples of disproportionation reaction in aqueous solution? 2

Q117 Discuss the chromyl chloride test. 2

Q118 The atomic radii of the elements in a transition series do not vary much while they do vary in the case of s and p-block elements. Explain. 2

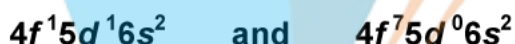
Q119 The second and third members in each group of the transition elements have similar atomic radii. Explain. 2

- Q120** (a) Of the ions Ag^+ , Co^{2+} and Ti^{4+} which ones will be coloured in aqueous solution? 2
(b) If each one of the above ionic species is in turn placed in a magnetic field, how will it respond and why?

Q121 Predict which of the following will be coloured in aqueous solution Ti^{3+} , V^{3+} , Cu^+ , Sc^{3+} , Mn^{2+} , Fe^{3+} and Co^{2+} . Give reason for each. 2

Q122 (a) Actinide contraction is greater from element to element than lanthanide contraction. Why? 2

- (b) The outer electronic configuration of two members of the lanthanide series are as follows:



What are their atomic numbers? Predict the oxidation states exhibited by these elements in their compounds.

Q123 How would you account for the following : 2

- Of the d^4 species, Cr^{2+} is strongly reducing while $Mn(III)$ is strongly oxidising.
- Cobalt (II) is stable in aqueous solution but in the presence of complexing reagents it is easily oxidised.
- The d^1 configuration is very unstable in ions.

Q124 Why Transition elements form (a) Interstitial compounds (b) Alloys? 2

Q125 Which of the following give coloured aqueous solutions: Co^{2+} , Sc^{3+} , Cr^{3+} ? How will each of these respond to magnetic field and why? (Atomic no. Co = 27, Sc = 21 and Cr = 24). 2