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# CHEMISTRY

## BOOKS - BRILLIANT PUBLICATION

## THE D-AND F-BLOCK ELEMENTS

### Questions Level I

**1.** Which among the following metal is present in misch metal ?

A. La

B. Sc

C. Ni

D. Cr

**Answer: A**

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**2.** Maximum oxidation states of Cr, Mn and Os are respectively

A. $+3,\ +5,\ \text{and}\ +6$

B. $+6,\ +5,\ +7$

C. $+6,\ +7,\ +8$

D. $+6,\ +5,\ +8$

**Answer: C**

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**3.** The atomic radii of the elements are almost same of which series

A. Fe-Co-Ni

B. Na-K-Rb

C. F-Cl-Br

D. Li-Be-B

**Answer: A**

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**4.** Which among the following element has maximum first ionisation potential ?

A. V

B. Ti

C. Cr

D. Mn

**Answer: D**

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**5.** The catalytic activity of transition metals and their compounds is mainly due to: a)their magnetic behaviour b)their unfilled d-orbitals c)their ability to adopt variable oxidation state d)their chemical reactivity

A. Their manetic behaviour

B. Their unfilled d-orbitals

C. their ability to adopt variable oxidation state

D. their chemical reactivity

**Answer: C**

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**6.** Which one of the following nitrates will leave behind a metal on strong heating?

A. Copper nitrate

B. mangnese nitrate

C. Silver nitrate

D. Ferric nitrate

**Answer: C**

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**7.** Cuprous ion is colourless, while cupric ion is coloured because

A. both have half - filled p and d- orbitals

B. Cuprous ion has a completed d- orbital and cupric ion has a incomplete d- orbital

C. Cuprous ion has incomplete d- orbital and cupric ion has a complete d- orbital

D. both have unpaired electrons in d - orbital

**Answer: B**

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**8.** Which of the following trivalent ion has the largest atomic radii in the lanthanide series?

A. Ce

B. Pm

C. La

D. Lu

**Answer: C**

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**9.** Which of the following pair will have effective magnetic moment equal?

A. $ti^{2+}$ and $V^{2+}$

B. $Cr^{2+}$ and $Fe^{2+}$

C. $Cr^{3+}$ and $Mn^{2+}$

D. $v^{2+}$ and $Sc^{3+}$

**Answer: B**

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**10.** Which lanthanoid compound is used as a most powerful liquid lasers after dissolving it in selenium oxychloride? a)Cerium oxide b)Neodymium oxide c)Promethium sulphate d)Ceric sulphate

A. Cerium oxide

B. Neodymium oxide

C. Promethium sulphate

D. Ceric sulphate

**Answer: B**

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**11.** The 3d metal ions are generally paramagnetic in nature because:

A. they form coloured salts

B. they have one or more unpaired d electrons

C. they have one or more paired s electrons

D. they are reducing agents

**Answer: B**

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**12.** Which of the following ores contains both Cu and Fe?

A. Cuprite

B. Azurite

C. Chalcopyrite

D. Malachite

**Answer: C**

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**13.** Heating mixture of $Cu_2O$ and $Cu_2S$ will give:

A. $Cu + SO_2$

B. $Cu + SO_3$

C. $CuO + CuS$

D. $Cu_2SO_3$

**Answer: A**

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**14.** Brass, bronze and german silver have one metal in common.

This is:

A. Ni

B. Fe

C. Cu

D. Sn

**Answer: C**

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**15.** Which of the following pairs of ions is colourless?

A. $Ti^{3+}, Cu^{2+}$

B. $Sc^{3+}, Zn^{2+}$

C. $Co^{2+}, Fe^{3+}$

D. $Ni^{2+}, V^{3+}$

**Answer: B**

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**16.** For successive members of the first row transition elements are listed below with their atomic numbers. Which one of them

is expected to have the highest third ionization enthalpy?

A. Vanadium (Z=23)

B. Manganese (Z=25)

C. Chromium (Z=24)

D. Iron (Z=26)

**Answer: B**

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**17.** Which of the following forms with an excess of CN", a complex having coordination number two?

A. $Cu^{2+}$

B. $Ag^{+}$

C. $Ni^{2+}$

D. $Fe^{2+}$

**Answer: B**

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**18.** In the first transition series, the highest oxidation state is exhibited by:

A. Mn

B. Ni

C. Fe

D. Cr

**Answer: A**

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**19.** How many unpaired electrons are present in the central metal ion of $[CoCl_4]^{2-}$?

A. 5

B. 4

C. 3

D. 2

**Answer: C**

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**20.** Europium is

A. f-block element

B. d-block element

C. p-block element

D. s-block element

**Answer: A**

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**21.** When KI (excess) is added to a.CuSO4 b.HgCl2 c.Pb(NO3)2 1)a white ppt. of CuI in I, an orange ppt. H g I 2 , in II and a yellow ppt. P b I 2 , in III 2)a white ppt. of CuI in I, an orange ppt. dissoloving to H g I 2 − 4 in II, and an yellow ppt. of P b I 2 in III 3)a white ppt. of C u I , H g I 2 and P b I 2 in each case 4)none of the above is correct

A. a white ppt. of CuI in I, an orange ppt. $HgI_2$ in II and a yellow ppt. $PbI_2$ in III

B. a white ppt. of CuI in I, an orange ppt. dissolving to $HgI_4^{2-}$ in II, and an yellow ppt. of $PbI_2$ in II

C. a white ppt. of CuI, $HgI_2$ and $PbI_2$ in each case

D. none of the above is correct

**Answer: B**

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**22.** The yellow colour of chromates changes to orange on acidification due to formation of

A. $Cr^{3+}$

B. $Cr_2O_3$

C. $Cr_2O_7^{3-}$

D. $CrO_4^-$

**Answer: C**

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**23.** What is the magnetic moment of $K_3[FeF_6]$

A. 5.91 B. M

B. 4.89 B. M

C. 3.87 B.M

D. 6.92 B.M

**Answer: A**

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**24.** When copper is placed in the atmosphere for sufficient time, a green crust is formed on its surface. The composition of the green crust is:

A. $Cu(OH)_2$

B. $CuO$

C. $CuSO_3$

D. $CuCO_3, Cu(OH)_2$

**Answer: D**

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**25.** When a cupric salt is heated with metallic copper and conc. HCl, a colourless solution is obtained because of the formation of

A. $CuCl_2$

B. $Cu_2Cl_2$

C. $H[CuCl_2]$

D. $H[CuCl_2]$

**Answer: C**

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**26.** In the reaction between $CuSO_4$" and " ` KI, a white precipitate is obtained. The precipitate has the composition:

A. $Cul_2$

B. $Cu_2l$

C. $KCul_2$

D. $Cu_2I_2$

**Answer: D**

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**27.** From a solution of copper sulphate, the metal used to recover copper, is 1)Na 2)Ag 3)Hg 4)Zn

A. Na

B. Ag

C. Hg

D. Zn

**Answer: D**

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**28.** When NH_4 OH is added to copper sulphate solution, blue colour is obtained due to formation of

A. $Cu^{2+}$

B. $Cu(NH_4CO_4)_2$

C. $\left[Cu(NH_3)_4\right]^{2+}$

D. $Cu(OH)_2$

**Answer: C**

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**29.** The solubility of silver bromide in hypo solution is due to the formation of

A. $Ag_2SO_3$

B. $Ag_2S_2O_3$

C. $[Ag(S_2O_3)]^-$

D. $\left[Ag(S_2O_3)_2\right]^{3-}$

**Answer: D**

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**30.** Identify the statement which is not correct regarding $CuSO_4$:

A. It reacts with KI to give iodine

B. It reacts with NaOH to give $Cu(OH)_2$

C. It reacts with $NH_4OH$ to give $Cu_2O$

D. It gives $CuO$ on strong heating

**Answer: C**

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**31.** Amongst the following, identify the species with an atom in +6 oxidation state:

A. $MnO_4^-$

B. $Cr(CN)_6^{3-}$

C. $NIF_6^{2-}$

D. $CrO_2Cl_2$

**Answer: D**

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**32.** Which one of the following is the correct configuration of $Fe^{3+}(Z = 26)$ ?

A. $[Ar]4s^2 3d^6$

B. $[Ar]4s^2 3d^3$

C. $[Ar]3d^5$

D. $[Ar]4s^2 3d^4$

**Answer: C**

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**33.** Which of the following pairs of ions have same paramagnetic moment?

A. $Mn^{2+}, Cu^{2+}$

B. $Cu^{2+}, Ti^{3+}$

C. $Ti^{4+}, Cu^{2+}$

D. $Ti^{3+}, Ni^{2+}$

**Answer: B**

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**34.** In $K_2Cr_2O_7$ every Cr is linked to:

A. two O-atoms

B. three O-atoms

C. four O-atoms

D. five O-atoms

**Answer: C**

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

A. $(n-1)d^8ns^2$

B. $(n-1)d^5ns^2$

C. $(n-1)d^3ns^2$

D. $(n-1)d^5ns^1$

**Answer: B**

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**36.** A red solid is insoluble in water. However, it becomes soluble if some Kl is added to water. Heating the red solid in a test tube results in liberation of some violet coloured fumes and droplets of a metal appear on the cooler parts of test tube. The red solid is

A. $(NH_4)_2Cr_2O_7$

B. $Hgl_2$

C. $HgO$

D. $+3$

**Answer: B**

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

A. $+4$

B. $+6$

C. $+2$

D. $+3$

**Answer: D**

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**38.** The purple colour of $KMnO_4$, will not be discharged by which of the following reagents? 1)M n S O 4 / Z n 2 + 2)H 2 O 2 / H + 3)K N O 3 4)K 2 S / H +

A. $MnSO_4 / Zn^{2+}$

B. $H_2O_2 / H^+$

C. $KNO_3$

D. $K_2S / H^+$

**Answer: C**

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

A. the 5f orbitals extend farther from the nucles than 4forbitals.

B. the 5f orbitals are more buried than the 4f orbitals.

C. there is similarity between 4f and 5f orbitals in their angular part of the wave function,

D. the actinoids are more reactive than the lanthanoids.

**Answer: A**

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**40.** Knowing that the chemistry of lanthanoids (Ln) is dominated by its +3 oxidation state, which of the following statements is incorrect? a)Because of the large size of the Ln(III) ions, the bonding in its compounds is predominantly

ionic in character. b)The ionic sizes of Ln (III) decrease in general with increasing atomic number. c)Ln(III) compounds are generally colourless. d)Ln(III) hydroxides are mainly basic in character..

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

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

C. Ln(III) compounds are generally colourless.

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

**Answer: C**

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**41.** Which of the following actinoids does not have any electron in 6d orbital in its ground state? 1)Lr 2)Cm 3)Pa 4)Cf

A. $5f^n$

B. $5f^{14-n}$

C. $4f^{14-n}$

D. $4f^{14-(n-1)}$

**Answer: D**

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**42.** Which of the following configurations will have the same number of unpaired electrons as that of a lanthanoid ion

having configuration of $4f^n$: $5f^n$, $5f^{14-n}$, $4f^{14-n}$, $4f^{14-(n+1)}$

,

A. $Lr$

B. $Cm$

C. $Pa$

D. $Cf$

**Answer: C**

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**43.** The colour of light absorbed by an aqueous solution of $CuSO_4$, is

A. orange-red

B. blue-green

C. yellow

D. violet

**Answer: A**

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**44.** The basic character of the transition metal monoxides follows the order (Atomic numbers of Ti, V, Crand Fe are 22, 23, 24 and 26 respectively).

A. $CrO > VO > FeO > TiO$

B. $TiO > FeO > VO > CrO$

C. $TiO > VO > CrO > FeO$

D. $VO > CrO > TiO > FeO$

**Answer: C**

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**45.** Ce (Z-58) and Yb (Z=70) exhibit stable +4 and +2 oxidation states, respectively. This is because

A. $Ce^{4+}$ and $Yb^{2+}$ acquire $f^7$ configurations

B. $Ce^{4+}$ and $Yb^{2+}$ acquire $f^0$ configurations

C. $Ce^{4+}$ and $Yb^{2+}$ aceuire $f^0$ and $f^{14}$ configuations

D. $Ce^{4+}$ and $Yb^{2+}$ acquire $f^7$ and $f^{14}$ configurations

**Answer: C**

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**46.** How many gases are evolved when potassium permaganate and potassium dichromate are heated, respectively?

A. 1,2

B. 2,1

C. 1,1

D. 2,2

**Answer: C**

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**47.** When $Cu^{2+}$ solution reacts with excess KI, which of the following statements is correct?

A. Blue precipitate is obtained.

B. Clear brown solution is obtained.

C. Dark brown appcarance in which precipitatc of $Cu_2l_2$ is invisible.

D. Blue solution is obtained.

**Answer: C**

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**48.** Ionization enthalpy values of lanthanoids are quite comparable to which of the following alkaline earth elements?

A. Barium

B. Strontium

C. Calcium

D. Radium

**Answer: C**

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**49.** Four successive members of the first series of the transition metals are listed below. For which one of them, the standard potential value has a positive sign?

A. $Cu(Z = 29)$

B. $Fe(Z = 26)$

C. $Co(Z = 27)$

D. $Ni(Z = 28)$

**Answer: A**

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**50.** Out of $TiF_6^{2-}$, $CoF_6^{3-}$, Cu_2Cl_2 and NiCl4^(2-)(ZofTi=22, Co=27, cu=29, Ni=28)` the colourless species are

A. $Cu_2Cl_2$ and $NiCl_4^{2-}$

B. $TiF_6^{2-}$ and $Cu_2Cl_2$

C. $CoF_6^{3-}$ and $NiCl_4^{2-}$

D. $TiF_6^{2-}$ and $CoF_6^{3-}$

**Answer: B**

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## Questions Level Ii

**1.** Potassium permanganate acts as an oxidant in neutral, alkaline as well as acidic medium. The final products obtained from it in the three conditions are, respectively

A. $MnO_2, MnO_2, MN^{2+}$

B. $MnO_4^{2-}, Mn^{3+}, Mn^{2+}$

C. $MnO_2, MnO_4^{2-}, Mn^{3+}$

D. $MnO, MnO_4^{2-}, Mn^{2+}$

**Answer: A**

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**2.** Which of the following statements regarding basicity of lanthanide $3^+$ ions is correct? 1)Basicity decreases with increase in ionic radius 2)Basicity decreases with decrease in ionic radius 3)More basic oxo-salt decomposes more readily that the less basic 'oxo-salt 4)More basic ion hydrolyse more readily

A. Basicity decreases with increase in ionic radius

B. Basicity decreases with decrease in jonic radius

C. More basic oxo-salt decomposes more readily that the less basic oxo-salt

D. More basic ion hydrolyse more readily

**Answer: B**

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**3.** The correct order of magnetic moments (spin only values in B.M.) among is

A. $\left[Fe(CN)_6\right]^{4-} > [MnCl_4]^{2-} > [CoCl_4]^{2-}$

B. $[MnCl_4]^{2-} > \left[Fe(CN)_6\right]^{4-} > [CoCl_4]^{2-}$

C. $[MnCl_4]^{2-} > [CoCl_4]^{2-} > \left[Fe(CN)_6\right]^{4-}$

D. $\left[Fe(CN)_6\right]^{4-} > [CoCl_4]^{2-} > [MnCl_4]^{2-}$

**Answer: C**

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**4.** Cerium (Z 58) is an important member of the lanthanoids. Which of the following statements about cerium is incorrect? 1)The common oxidation states of cerium are +3 and 4 2)The

+3 oxidation state of cerium is more stable than +4 oxidation state. 3)The +4 oxidation state of cerium is not known in solutions, 4)Cerium (IV) acts as an oxidizing agent.

A. The common oxidation states of cerium are +3 and +4.

B. The +3 oxidation state of cerium is more stable than +4 oxidation state.

C. The +4 oxidation state of cerium is not known in solutions.

D. Cerium (IV) acts as an oxidizing agent.

**Answer: C**

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**5.** Ammonia forms the complexion $\left[Cu(NH_3)_4\right]^{2+}$ with copper ions in alkaline solutions but not in acidic solutions. What is the reason for it?

A. In acidic solutions protons coordinate with ammonia molecules forming $NH_4^+$ ions and $NH_3$ molecules are not available

B. In alkaline solutions in soluble $Cu(OH)_2$ is precipitated which is soluble in excess of any alkali

C. Copper hydroxide is an amplioteric substance

D. In acidic solutions hydration protects copper ions

**Answer: A**

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**6.** Magnetic moment of $Cr(Z-24), Mn^{+}(Z=25)$ and $Fe^{+}(Z=26)$ are $x, y, z$. They are in order

A. $x < y < z$

B. $x = y < z$

C. $z < x = y$

D. $x = y = z$

**Answer: C**

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**7.** HCl is not used to make the medium acidic in oxidation reactions of $KMnO_4$, in acidic medium. Why?

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 weaker oxidising agent than HCI

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

**Answer: B**

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**8.** 'Which of the following statement is not correct?

A. $La(OH)_3$ is less basic than $Lu(OH)_3$

B. In lanthanide series ionic radius of $\ln^{3+}$ ions decreases

C. Zn, Cd, Hg are colourless and are diamagnetic

D. Mn shows maximum oxidation state +7

**Answer: A**

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**9.** The number of moles of acidified $KMnO_4$ required to convert one mole of sulphite ion into sulphate ionis:

A. $2/5$

B. $3/5$

C. $4/5$

D. $1$

**Answer: A**

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**10.** The correct order of ionic radii of Ce, La, Pm and Yb in+3 oxidation state is:

A. $La^{3+} < Pm^{3+} < Ce^{3+} < Yb^{3+}$

B. $La^{3+} < Ce^{3+} < Pm^{3+} < Yb^{3+}$

C. $Yb^{3+} < ce^{3+} < Pm^{3+} < La^{3+}$

D. $Yb^{3+} < Pm^{3+} < Ce^{3+} < La^{3+}$

**Answer: D**

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**11.** All Cu(II) halides are known except iodide. The reason for this is that

A. iodide ion is a bulky ion

B. $Cu^{2+}$ oxidizes iodide to iodine

C. $Cu^{2+}$ (aq) has much more negative hydration enthalpy

D. $Cu^{2+}$ ion has smaller size

**Answer: B**

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**12.** When $Hg_2Cl_2$, ionizes, the ions produced and the unpaired electrons present on the cation respectively are

A. $2Hg^+$ and $2Cl^-$ two

B. $Hg_2^{2+}$ and $2Cl^-$, two

C. $Hg_2^{2+}$ and $2Cl^-$ one

D. $Hg_2^{2+}$ and $2Cl^-$ zero

**Answer: D**

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**13.** What is the effect of shaking dilute $H_2SO_4$, with a small quantity of anhydrous $CuSO_4$,?.

A. The white soild dissolves to form a colourless solution

B. The white soild dissolves to form a green solution

C. The white soild dissolves to form a blue solution

D. The white soild turns blue but does not dissolve

**Answer: C**

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**14.** Philosopher's wool when heated with Bao at 1100°C gives the compound:

A. $BaCdO_2$

B. $Ba + ZnO_2$

C. $BaO_2 + Zn$

D. $BaZnO_2$

**Answer: D**

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**15.** Which one of the following statements is correct?

A. $Hg_2Cl_2$ is called corrosive sublimate

B. $Hg_2Cl_2$ gives white ppt. with ammonium hydroxide

C. $Hg_2Cl_2$ is used as a purgative .

D. $Hg_2Cl_2$ is soluble in water

**Answer: C**

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**16.** Number of electrons transferred in each case when $KMnO_4$, acts as an oxidising agent to give $MnO_2, Mn_2^{2+}, Mn(OH)_3, MnO_4^{2-}$ are respectively:

A. 3,5,4 and 1

B. 4, 3, 1 and 5

C. 1,3,4 and 5

D. 5,4,3 and 1

**Answer: A**

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**17.** The atomic numbers of vanadium(V), chromium (Cr), manganese (Mn) and iron (Fe) are 23, 24, 25 and 26 respectively. Which one of these may be expected to have the highest second ionisation enthalpy?

A. $V$

B. $Cr$

C. $Mn$

D. $Fe$

**Answer: B**

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**18.** The radius of La^3+. is 1.06 Å, which of the following given values will be closed to the radius of Lu^3+ (At. no. of Lu=71, La=57)?

A. $1.6\text{Å}$

B. $1.4\text{Å}$

C. $1.06\text{Å}$

D. $0.85\text{Å}$

**Answer: D**

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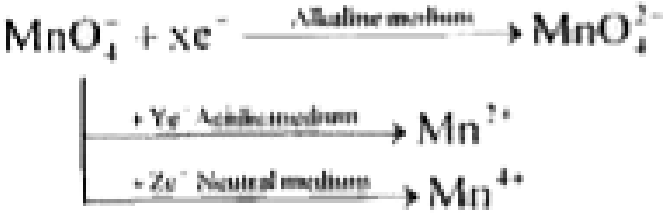


**19.** X, Y and Z are respectively:

X, Y and Z are respectively:

A. 1,2,3

B. 1,5,3

C. 1,3,5

D. 5,3,1

**Answer: B**

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**20.** Zinc gives $H_2$ gas with $H_2SO_4$, and $conc.\ HCl$ but not with conc. HNO_3, because:

A. $NO_3^-$ ion is reduced in preserence to lydronium ion

B. conc. $HNO_3$ is a weaker acid than conc. $H_2SO_4$ and conc. HCI

C. conc. $HNO_3$ acts as a reducing agent

D. Zinc is more reactive than $H_2$

**Answer: A**

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**21.** The highest magnetic moment is shown by the transition metal ion with outer electronic configuration:

A. $3d^2$

B. $3d^7$

C. $3d^9$

D. $3d^5$

**Answer: D**

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**22.** Number of moles of $K_2Cr_2O_7$, reduced by one mole of $Sn^{2+}$ ions is:

A. $1/3$

B. $3$

C. $1/6$

D. 6

**Answer: A**

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**23.** A blue solution of copper sulphate becomes darker when treated with excess of ammonia. This is because

A. ammonia molecules replace water molecules in the solution

B. ammonia is stronger ligand than water

C. ammonia forms a stable complex ion $\left[Cu(NH_3)_4\right]^{2+}$ with $Cu^{2+}$ ions

D. All are correct

**Answer: D**

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**24.** An inorganic compound (A) gave the following reactions:

The compound on heating gave a residue and a gaseous mixture of $Nо_2$ and $O_{2+}$

The aqueous solution of (A) gave a white,precipitate with sodiụm chloride solution. The precipitate dissolves in $NH_4OH$ : The compound (A) is:

A. $Pb(NO_3)_2$

B. $Ba(NO_3)_2$

C. $AgNO_3$

D. $AgCl$

**Answer: C**

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

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

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

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

D. Once the d' configuration is exceeded, the tendency to involve all the 3d electrons in bonding decreases.

**Answer: B**

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

A. Ferrous oxide is more basic in nature than the ferric oxide.

B. Ferrous compounds are relatively more ionic than corresponding ferric compounds.

C. Ferrous compounds are less volatile than the corresponding ferric compounds.

D. Ferrous compounds are more easily hydrolyzed than corresponding ferric compounds.

**Answer: D**

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**27.** Which of the following arrangements does not represent the correct order of the property stated against it? a)N i 2 + < C o 2 + < F e 2 + < M n 2 + : Ionic size b)C o 3 + < F e 3 + < C r 3 + < S c 3 + Stability in aqueous solution c)Sc < Ti < Cr < Mn: Number of oxidation states d)V 2 + < C r 2 + < M n 2 + < Fe^(2+)`: Paramagnetic behaviour

A. $Ni^{2+} < Co^{2+} < Fe^{2+} < Mn^{2+}$ : ionic size

B. $Co^{3+} < Fe^{3+} < Cr^{3+} < Sc^{3+}$ : stability in aqueous solution

C. $Sc < Ti < Cr < Mn$ : number of oxidation states

D. $V^{2+} < Cr^{2+} < Fe^{2+}$ : Paramagnetic behaviour

**Answer: D**

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**28.** Chloro compound of vanadium has only spin magnetic moment of 1.73 BM. This vanadium chloride has the formula: (at.no. of V=23)

A. $VCl_2$

B. $VCl_4$

C. $VCl_3$

D. $VCl_5$

**Answer: B**

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**29.** Which of the following is not formed when $H_2S$ , reacts with acidic $K_2Cr_2O_7$, solution?

A. $CrSO_4$

B. $Cr_2(SO_4)_3$

C. $K_2SO_4$

D. $S$

**Answer: A**

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**30.** Which of the following reaction(s) can be used for the complete conversion of $K_2Mno_4$, to $KMnO_4$,?

A. $3KMnO_4 + 2H_2 \Leftrightarrow 2KMnO_4 + MnO_2 + 4KOH$

B. $2K_2MnO_4 + Cl_2 \rightarrow 2KMnO_4 + 2KCl$

C. $2K_2MnO_4 + O_3 + H_2O \rightarrow 2KMnO_4 + 2KOH + O_2$

D. Both ( B) and (C )

**Answer: D**

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**31.** Consider the following complex ions P, Q and R: $P = [FeF_6]^{3-}, Q = [V(H_2O_6)]^{2+}, R = \left[Fe(H_2O)_6\right]^{2+}$ The correct order of the complex ionis, according to their spin-only magnetic moment values (in BM)is

A. $R < Q < P$

B. $Q < R < P$

C. $R < P < Q$

D. $Q < P < R$

**Answer: B**

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**32.** Which one of the following does not correctly represent the correct order of the property indicated against?

A. $Ti < V < Cr < Mn$: increasing melting points

B. $Ti < V < Mn < Cr$ : increasing 2nd ionization enthalpy

C. $ti < V < Cr < Mn$ increasing number of oxidation states

D. $Ti^{3+} < V^{3+} < Cr^{3+} < Mn^{3+}$ increasing magnetic moment

**Answer: A**

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**33.** Consider the following statements in respect of lanthanides:

The basic strength of hydroxides of lanthanides increases from

$La(OH)_3$, to Lu $(OH)_3$,

The lanthanide ions $Lu^{3+}, Yb(2+)$ and $Ce^{4+}$ are diamagnetic.

Which of the statement(s) given above is/are correct?

A. 1 only

B. 2 only

C. both 1 and 2

D. Neither1 nor 2

**Answer: B**

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**34.** 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(I) and Cu(II) are equally stable

C. Cu(II) is less stable

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

**Answer: A**

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**35.** 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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**36.** 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 radius

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

**Answer: C**

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**37.** Anhydrous cobalt(II) chloride is blue in colour but on dissolving in water it changes to pink in colour because

A. Its oxidation state changes

B. Its magnetic character changes

C. Its coordination number changes

D. In water it shows fluorescence

**Answer: C**

Watch Video Solution

**38.** Which of the following statements is correct when $SO_2$ is passed through acidified $K_2Cr_2O_7$ solution?

A. Green $Cr_2(SO_4)_3$ is formed

B. The solution turns blue

C. The solution is decolourised

D. $SO_2$ is reduced

**Answer: A**

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**39.** The maximum oxidation state shown by, V(Z=23), Cr (Z=24), Co(z=27), Sc(Z=21) are respectively a)+5, +6, +4, +3 b)+3, +4, +5, +2 c)+5, +3, +2, +1 d)+4 in each case

A. $+5,\ +6,\ +4,\ +3$

B. $+3,\ +4,\ +5,\ +2$

C. $+5,\ +3,\ -12,\ +1$

D. +4 in each case

**Answer: A**

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**40.** Which of the following compounds is used as the starting material for the preparation of potassiumi dichromate?

A. $K_2SO_4, Cr_2(SO_4)_3.24H_2O$ ( chrome alum)

B. $PbCrO_4$ ( chome yellow)

C. $FeCr_2O_4$ ( chromite)

D. $PbCrO_4PbO$ ( chrome red)

**Answer: C**

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**41.** An aqueous solution of $FeSO_4.Al_2(SO_4)_3$ and chrome alum is heated with excess of Na2O2 and filtered. The materials obtained are

A. A colourless filtrate and a green residue

B. A yellow filtrate and a green residue

C. A yellow filtrate and a brown residue

D. A green filtrate and a brown residue

**Answer: C**

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**42.** A solution of a metal ion when treated with KI gives a red precipitate which dissolves in excess KI to give a colourless solution. Moreover, the solution of metal ion on treatment with a solution of cobalt(II) thiocyanate gives rise to a deep-blue crystalline precipitate. The metal'ion is

A. $Pb^{2+}$

B. $Hg^{2+}$

C. $cu^{2+}$

D. $co^{2+}$

**Answer: B**

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**43.** Which of the following statements is wrong?

A. An acidified solution of $K_2Cr_2O_7$ liberates iodine from iodides

B. In acidic solution dichromate ions are converted to chromate ions

C. Ammonium dichromate on heating undergo exothermic deomposition to give $Cr_2O_3$

D. Potassium dichromate is used as a titrant for $Fe^{2+}$ ions

**Answer: B**

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**44.** Which of the following statements is incorrect?

A. Basic copper carbonate is $CuCO_3.Cu(OH)_2$

B. On strong heating potassium dichromate decomposes with evolution of oxygen

C. CuS is white in colour

D. $KMnO_4$ exists as dark purple black prismatic crystals

**Answer: C**

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**45.** Which is not true statement about FeO ?

A. It is non-stoichiometric and is metal deficient

B. It is basic oxide

C. Its aqueous solution changes to $Fe(OH)_3$ and then to $Fe_2O_3.(H_2O)_n$ by atmospheric oxygen

D. It gives red colour with KCNS

**Answer: D**

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**46.** Paramagnetism is given by the relation $\mu = 2\sqrt{s(s+1)}$ magnetons where 's' is the total spin. On this basis, the paramagnetism of $Cu^+$ ion is .

A. 3.88 magnetons

B. 2.83 magnetons

C. 1.41 magnetons

D. zero

**Answer: D**

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**47.** The oxygen carrying pigment, oxy-hảemocyanin, containing two copper ions is diamagnetic, because

A. the two copper ions are in +1 oxidation state

B. one of the copper ions is in+1 oxidation state and the other is in +2 oxidation state

C. there are strong anti-ferromagnetic interactions between the two copper ions

D. there are ferromagnetic interactions between the two copper ions

**Answer: A**

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**48.** Which one of the following statements is not correct?

A. Zinc dissolves in sodium hydroxide solution

B. Carbon monoxide reduces iron (III) oxide to iron

C. Mercury(II) iodide dissolves in excess of polassium iodide solution

D. Tin (IV)chloride is made by dissolving tin solution in concentrated hydrochloric acid

**Answer: D**

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**49.** Consider a titration of potassium dichromate solution with acidified Mohr's salt solution using diphenylamine as indicator. The number of moles of Mohr's salt required per mole of dichromate' is

A. 3

B. 4

C. 5

D. 6

**Answer: D**

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**50.** `K_3 [Fe(CN)_6] is used as an external indicator in the dichromate estimation of Fe. Following change is observed

A. colourless to blue

B. blue to red

C. colourless to red

D. blue to colourless

**Answer: C**

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## Questions Level Iii

**1.** A metal M which is not affected by strong acids like conc. $HNO_3$ conc. $H_2SO_4$ and concentrated solutions of alkalies like KOH and NaOH but dissolves in aqua-regia and forms $MCI_3$ which is used for toning in photography. The metal M is:

A. Ag

B. Hg

C. Au

D. Cu

**Answer: C**

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**2.** The acidic, basic or amphoteric nature of $Mn_2O_7, V_2O_5,$ and $CrO$ are respectively

A. acidic, acidic and basic

B. basic, amphoteric and acidic

C. acidic, amphoteric and basic

D. acidic, basic and amphoteric

**Answer: D**

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**3.** An inorganic compound on strong heating gave a blackish brown powder and two oxides of sulphur. The powder was dissolved in HC1 when a yellow solution was obtained which

gave a blood red coloured solution with thiocyanide ions. The inorganic compound may be:

A. $CuSO_4$

B. $ZnSO_4$

C. $NiSO_4$

D. $FeSO_4$

**Answer: D**

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**4.** $MnO_2 \xrightarrow{I} MnO_4^{2-} \xrightarrow{II} MnO_4^-$ I and II are

A. fuse with KOH/air, electrolytic oxidation

B. fuse with KOH/air, electrolyltic reduction

C. fuse with conc. $HNO_3$ /air, electrolytic reduction

D. dissolve in $H_2O$ oxidation

**Answer: A**

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**5.** Identify the product and its colour when $MnO_2$ is fused with solid KOH in the presence of $O_2$ K M n O 4 , purple K 2 M n O 4 purple green M n O clourless M n O 2 O 3 brown

A. $KMnO_4$, purple

B. $K_2MnO_4$ dark green

C. $MnO$ clourless

D. $MnO_2O_3$ brown

**Answer: B**

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**6.** When manganous salt is fused with a mixture of $KNO_3$ and solid NaOH, the oxidation number of Mn changes from +2 to + 4 + 3 + 6 + 7

A. $+4$

B. $+3$

C. $+6$

D. $+7$

**Answer: C**

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**7.** Consider following statements, I. The size of the lanthanide $M^{3+}$ ions decreases as the atomic number of M increases. II. Electronic spectra of lanthanides show very broad bands. III. As with transition metals, coordination number six is very common in lanthanide complexes. Which of the statements given above is/are correct?

A. I only

B. I and II

C. I and III

D. III only

**Answer: B**

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**8.** Most transition metals I:forms sets of compounds which display different oxidation states of the metal.. II: for coloured ions in solution III: bum vigorously inoxygen IV: replace H, from dilute acids of these

A. I, II, III are correct

B. II, III, IV are correct

C. I, II are correct

D. I, IV are correct

**Answer: C**

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**9.** $\left[Fe(H_2O)_5NO\right]^{2+}$ is brown-ring complex. In this complex

A. There are three electrons unpaired making iron as Fe(I)and nitrosyl as $NO^+$

B. magnetic moment of Fe is 3.87 BM

C. the colour is due to charge transfer

D. all of the above are correct statements

**Answer: D**

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**10.** When $K_2CrO_4$ is added to $CuSO_4$ solution, there is formation of $CuCrO_4$ , as well as $CuCr_2O_2$. Formation of $CuCr_2O_7$ is due to

A. basic nature of $CuSO_4$ solution which converts $CrO_4^{2-}$ to $Cr_2O_7^{2-}$

B. acidic nature of $CuSO_4$ solution which converts $CrO_4^{2-}$ to $CrO_7^{2-}$

C. $CuSO_4$ has the typical property of converting $CuCrO_4$ is formed to $CuCr_2O_7$

D. no $CuCr_2O_7$ is formed

**Answer: B**

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**11.** Select the correct statements(s)

A. A Transition metals and many of their compounds show paramagnetic behaviour

B. BThe enthalpies of atomisation of the transition metals are high

C. C. Transition metals and their many compounds act as good catalyst

D. D. The enthalpies of atomisation of the transition metals are lower than alkali metals

**Answer: A::B::C**

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**12.** Which of the following statements are true?

A. Coloured compounds of transition elements are paramagnetic

B. Colourless compounds of transition elements are diamagnetic

C. Transition elements form complex compounds

D. Colourless compounds of transition elements are paramagnetic.

**Answer: A::B::C**

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**13.** Although +3 is the characteristic oxidation state for lanthanoids, cerium shows-14.oxidationstate also because

A. it has variablc ionisation enthalpy

B. it has a tendency w attain noble gas configuration

C. it has tendency to attain $f^0$ configuration

D. it resembles $Pb^{4+}$

**Answer: B::C**

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**14.** Select correct statements.

A. In less acidic solution $K_2Cr_2O_7$ and $H_2O_2$ give blue coloured $CrO(O_2)_2$

B. In alkaline $H_2O_2$, $K_3CrO_8$ (with tetraperoxo species) $\left[Cr(O_2)_4\right]^{3-}$ is formed

C. In ammoniacal solution, $K_2Cr_2O_7$ gives $(NH_3)_2CrO_4$

D. $CrO_4^{2-}$ changes to $Cr_2O_7^{2-}$ by oxidation

**Answer: A::B::C**

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**15.** When $CO_2$ is passed into aqueous

A. $Na_2CrO_4$ solution, its yellow colour changes to orange

B. $K_2MnO_4$ solution it disproportionates to $KMnO_4$ and $MnO_2$

C. $Na_2Cr_2O_7$ solution, its orange colour changes to green

D. $KMnO_4$ solution its pink colour change to green

**Answer: A::B**

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**16.** Select correct statements (s)

A. When $FeCl_3$ solution is added to $K_4\left[Fe(CN)_6\right]$ solution, in addition to $Fe^{III}\left[Fe^{II}(CN)_6\right]^-$, $Fe^{II}\left[Fe^{II}(CN)_6\right]^-$ is also formed due to side redox reaction

B. When $FeCl_2$ solution is added to $K_3\left[Fe(CN)_6\right]$ solution, in addition to $Fe^{II}\left[Fe^{III}(CN)_6\right]Fe^{III}\left[Fe^{II}(CN)_6\right]$ is also formed due to side redox reaction

C. $Fe^{III}\left[Fe^{II}(CN)_6\right]^-$ is paramagnetic while $Fe^{II}\left[Fe^{III}(CN)_6\right]^-$ is diamagnetic

D. $Fe^{III}[Fe^{II}(CN)_6]^-$ is diamagnetic while $Fe^{II}[Fe^{III}(CN)_6]^-$ is paramagnetic

**Answer: A::B::D**

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**17.** Which of the following statements are correct

A. A deep red vapour is evolved

B. Chromyl chloride is formed

C. Chlorine gas is evolved

D. The vapour when passed into NaOH solution gives a yellow solution

**Answer: A::B::D**

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**18.** Amongst the following, identify the species with an atom in +6 oxidation state:

A. $KMnO_4$

B. $K_2MnO_4$

C. $CrO_2Cl_2$

D. $K_3Cr(CN)_6$

**Answer: B::C**

Watch Video Solution

**19.** Which metals are present in german silver?

A. Cu

B. Ni

C. Zn

D. Ag

**Answer: A::C**

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**20.** The complex forming tendency of a transition metal depends upon:

A. availability of a number of vacant d-orbitals

B. high ionisation energy

C. small size of its cation or high charge density

D. variable oxidation states

**Answer: A::C**

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**21.** The correct statements about $Cr^{2+}$ and $Mn^{3+}$ is (are) (Atomic numbers of Cr-24 and Mn=25]

A. $Cr^{2+}$ is a reducing agent.

B. $Mn^{3+}$ is an oxidizing agent.

C. Both $Cr^{2+}$ and $Mn^{3+}$ exhibit $d^4$electronic configuration.

D. When $Cr^{2+}$ is used as a reducing agent, the chromium ion attains $d^5$electronic configuration.

**Answer: A::B::C**

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**22.** Which of the following salt solutions will be coloured?

A. $Zn(NO_3)_2$

B. $Mn(NO_3)_3$

C. $Co(NO_3)_3$

D. $FeCl_3$

**Answer: B::C::D**

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**23.** Potassium manganate $(K_2MnO_4)$ is formed when

A. chlorine is passed through aqueous $KMnO_4$ solution.

B. manganese dioxide is heated with potassium hydroxide in air.

C. formaldehyde reacts with potassium permanganate in presence of strong alkali.

D. potassium permanganate reacts with $H_2SO_4$

**Answer: B::C**

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**24.** The magnetic moment of a metal ion of first transition series is 2.83 BM. Therefore it will have how many unpaired

electrons?

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**25.** The coefficient of $H_2SO_4$ on balancing the following equation is .....

$$K_2Cr_2O_7 + H_2SO_4 + KI \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + H_2O + I_2$$

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**26.** The number of electrons present in the 5f orbital in ground state of Np (atomic number=93) is.....

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**27.** The oxidation number of Mn in the product of alkaline oxidative fusion of $MnO_2$ is

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**28.** The number of water molecule(s) directly bonded to the metal centre in $CuSO_4 5H_2O$ is

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**29.** Out of the following, how many of them have magnetic moment value $\sqrt{24}$ BM.

$Ti^{2+}, Ti^{3+}, V^{2+}, Cr^{2+}, Cr^{3+}. Mn^{2+}, Fe^{2+}$

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**30.** Out of the following how many oxides are basic:

$TiO, Sc_2O_3, Ti_2O_3, , VO, V_2O_5, CrO_3, Cr_2O_3, CuO, TiO_2$

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**31.** This section contains questions each with two columns-I and II. Match the items given in column with that in column II.

| Column I | Column II |
|---|---|
| A. Ni | p. Elements having same number of unpaired electron in their dipositive in column I |
| B. Na | q. At least 13 electrons are having magnetic quantum number 'zero' |
| C. Mn | r. Atom is paramagnetic |
| D. Pd | s. Element is not transition element |

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**32.** This section contains questions each with two columns-I and II. Match the items given in column with that in column II.

| Column I | Column II |
|---|---|
| A. $K_2MnO_4$ | p. Transition element in +6 oxidation sta |
| B. $KMnO_4$ | q. Paramagnetic |
| C. $K_2Cr_2O_7$ | r. Manufactured from pyrolusite ore |
| D. $K_2CrO_4$ | s. Manufactured from chromite ore |

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**33.** This section contains questions each with two columns-I and II. Match the items given in column with that in column II.

| Column I | Column II |
|---|---|
| A. Mn + dil $HNO_3$ | p. NO |
| B. Mn + conc $HNO_3$ | q. $NO_2$ |
| C. Ag + dil $HNO_3$ | r. $Mn(NO_3)_2$ |
| D. Ag + conc $HNO_3$ | s. $AgNO_3$ |
| | t. $H_2$ |

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**34.** This section contains questions each with two columns-I and II. Match the items given in column with that in column II.

| Column I | Column II |
|---|---|
| A. Gadolinium | p. shows an oxidation state of +3 |
| B. Terbium | q. shows an oxidation state of +4 |
| C. Thorium | r. heaviest naturally occurring metal |
| D. Uranium | s. is an actinoid |

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**35.** This section contains questions each with two columns-I and II. Match the items given in column with that in column II.

| Column I | Column II |
|---|---|
| A. MnO | p. Treating $KMnO_4$ with cold conc. $H_2SO_4$ |
| B. $MnO_2$ | q. Heating $KMnO_4$ to 746 K |
| C. $Mn_2O_7$ | r. Treating hot $MnSO_4$ with neutral $KMnO_4$ |
| D. $O_2$ solution | s. Heating $KMnO_4$ in a current of hydrogen |

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**36.** This section contains questions each with two columns-I and II. Match the items given in column with that in column II.

| Column I | Column II |
|---|---|
| A. Copper | p. Forms a coloured salt |
| B. Silver | q. Dissolves only in royal water |
| C. Gold | r. Liquid element |
| D. Mercury | s. Has the electronic configuration $(n-1)d^{10}ns^1$ |

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**37.** Assertion : Anhydrous copper (II) chloride is covalent while anhydrous copper (II) fluoride is ionic in nature.

Reason : In halides of transition metals, the ionic character decreases with increase in atomic mass of the halogen.

A. Statement 1 is True, statement 2 is True, Statement 2 is Correct explanation for Statement 1.

B. Statement 1 is 'True, Statement 2 is True, Statcmcnt2 is NOT a correct explanation for Statement I.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Statement 2 is True.

**Answer: A**

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**38.** Statement-1 : $Ce^{3+}$ cannot be easily oxidised to $Ce^{4+}$ . Statement-2 : $Ce^{3+}$ tends to lose its only 1 electron from 4f orbitals.

A. Statement 1 is True, statement 2 is True, Statement 2 is Correct explanation for Statement 1.

B. Statement 1 is 'True, Statement 2 is True, Statcmcnt2 is NOT a correct explanation for Statement I.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Statement 2 is True.

**Answer: D**

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**39.** Assertion : In acidic medium, $K_2Cr_2O_7$ exists as $Cr_2O_7^{2-}$ (orange) while in basic medium it is converted to $CrO_4^{2-}$ (yellow).

Reason : $K_2Cr_2O_7$ is hygroscopic in nature and changes colour on reaction with water.

A. Statement 1 is True, statement 2 is True, Statement 2 is Correct explanation for Statement 1.

B. Statement 1 is 'True, Statement 2 is True, Statcmcnt2 is NOT a correct explanation for Statement I.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Statement 2 is True.

**Answer: C**

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**40.** Assertion : The purple colour of $KMnO_4$, is due to the charge transfer transition.

Reason : The colour of most of the transition metal complexes'is due to d-d transition. a)If both (A) and (R) are

correct and (R) is the correct explanation of(A). b)If both (A) and (R) are correct, but(R) is not the correct explanation of (A). c)If(A) is correct, but (R) is incorrect. d)If both (A) and (R) are incorrect.

A. Statement 1 is True, statement 2 is True, Statement 2 is Correct explanation for Statement 1.

B. Statement 1 is 'True, Statement 2 is True, Statcmcnt2 is NOT a correct explanation for Statement I.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Statement 2 is True.

**Answer: B**

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**41.** Assertion : Actinoids show larger number of oxidation states than lanthanoids.

Reason : Highest oxidation state shown by lanthanoids is +4 while that of actinoids is +7.

A. Statement 1 is True, statement 2 is True, Statement 2 is Correct explanation for Statement 1.

B. Statement 1 is 'True, Statement 2 is True, Statcmcnt2 is NOT a correct explanation for Statement I.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Statement 2 is True.

**Answer: B**

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**42.** When we pass carbon dioxide gas through a green coloured solution of potassium manganate, the colour of solution changes to purple and a brown coloured solid gets precipitated. The green colour of potassium manganate solution also becomes purple when it is subjected to electrolysis using iron electrodes.

The change of colour from green to purple is due to

A. conversion of $Mn^{6+}$ to $Mn^{7+}$

B. conversion of $Mn^{6+}$ to $Mn^{4+}$

C. conversion of $Mn^{4+}$ to $Mn^{7+}$

D. conversion of $Mn^{4+}$ to $Mn^{6+}$

**Answer: A**

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**43.** When we pass carbon dioxide gas through a green coloured solution of potassium manganate, the colour of solution changes to purple and a brown coloured solid gets precipitated. The green colour of potassium manganate solution also becomes purple when it is subjected to electrolysis using iron electrodes.

In the brown solid precipitate, oxidation state of Mn is

A. $+2$

B. $+4$

C. $+6$

D. $+7$

**Answer: B**

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**44.** When we pass carbon dioxide gas through a green coloured solution of potassium manganate, the colour of solution changes to purple and a brown coloured solid gets precipitated. The green colour of potassium manganate solution also becomes purple when it is subjected to electrolysis using iron electrodes.

In following reaction

$$3K_2MnO_4 + 2H_2O + 4CO_2 \rightarrow \underset{\text{(green)}}{2KmnO_4}\underset{\text{(purple)}}{} + MnO_2 + 4KHCO_3$$

the function of $CO_2$ is

A. to make solution acidic

B. to make solution basic

C. to act only as a medium of reaction

D. none of the above

**Answer: A**

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**45.** .

The correct order of basic strength lanthanoid hydroxides given below is:

$\underset{I}{La(OH)_3}\ \underset{II}{Lu(OH)_3}\ III_{Ce(OH)_3}$

A. $I > III > II$

B. $I < III < II$

C. $I > II > III$

D. $I < II < III$

**Answer: A**

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**46.** In the separation of lanthanoids by using cation exchange column, the lanthanoid ion which is obtained first:

A. $Lu^{3+}$

B. $Dy^{3+}$

C. $Pm^{3+}$

D. $La^{3+}$

**Answer: A**

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**47.** The $4f^{14}$ configuration is observed in:

A. Yb and Lu

B. Dy and Pm

C. Lu and La

D. Tm and Lu

**Answer: A**

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**48.** .

Which among the following has lowest magnetic moment?

A. $3d^7$

B. $3d^9$

C. $3d^2$

D. $3d^3$

**Answer: B**

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**49.** Presence of unpaired electrons makes a species paramagnetic. Each unpaired electron has a magnetic moment associated with its spin angular momentum and orbital angular momentum. For the compounds of the first series of transition metals, the contribution of the orbital angular momentum is effectively quenched and hence is considerably important. For these, the magnetic moment is determined by the number of unpaired electrons and is calculated by using the spin-only formula, i.e., $\mu = \sqrt{n(n+2)}$ where n=number of unpaired electrons and $\mu$=magnetic momentin (in Bohr

magneton, B.M.). If n=1, then $\mu = 1.73B.M.$

Which one of the following transition metal ions is paramagnetic?

A. $3d^7$

B. $Zn^{2+}$

C. $Cu^{2+}$

D. $Au^{+}$

**Answer: C**

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**50.** Presence of unpaired electrons makes a species paramagnetic. Each unpaired electron has a magnetic moment associated with its spin angular momentum and orbital

angular momentum. For the compounds of the first series of transition metals, the contribution of the orbital angular momentum is effectively quenched and hence is considerably important. For these, the magnetic moment is determined by the number of unpaired electrons and is calculated by using the spin-only formula, i.e., $\mu = \sqrt{n(n+2)}$ where n=number of unpaired electrons and $\mu$=magnetic momentin (in Bohr magneton, B.M.). If n=1, then $\mu = 1.73B.\ M.$

The magnetic moment of a transition metal ion is found to be 3.87 B.M. The number of unpaired electrons present in it is:

A. 2

B. 3

C. 4

D. 5

**Answer: B**

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