CHEMISTRY

BOOKS - GRB CHEMISTRY (HINGLISH)

D-BLOCK ELEMENTS

Straight Objective Type

1. The set of compounds which does not exist, is

A. $PbI_4, BiCl_5, PH_5$

B. XeF_2, XeF_3^-, XeF_4

C. $FeI_3, CuI_2, CuCl_2$

D. $Hg(OH)_2, Ag_2O, V_2SO_4$

Answer: A

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2. Exess of KI reacts with $CuSO_4$ solution and then $Na_2S_2O_3$ solution is added to it. Which of the following statement is incorrect for this reaction ?

A. CuI will be formed

B. Evolved I_2 will be reduced

C. $Na_2S_2O_3$ will be oxidised.

D. CuI_2 will be formed.

Answer: D

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3. Metallic copper dissolves in

A. dilute HCl

B. concentrated HCl

C. aqueous KCN

D. pure ammonia

Answer: C

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4. Four statement of Cr and Mn are given below.

(P). Cr^{2+} and Mn^{3+} have the same electronic configuration.

(Q). Cr^{2+} is a reducing agent while Mn^{3+} in an oxidizing agent.

(S). Both Cr and Mn are oxidizing agent.

The correct statement are:

A. P,R,S

B. P,Q

C. P,Q,S

D. P,S

Answer: B

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5. The reaction that does not proceed in forward direction is:

A. $BeF_2 + HgI_2 \rightarrow BeI_2 + HgF_2$

B. $LiI + CsF \rightarrow LiF + CsI$

C. $CuI_2 + 2CuF \rightarrow CuF + 2CuI$

D. $CaS + H_2O \rightarrow CaO + H_2S$

Answer: A

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6. Which of the following statement is false?

A. $Cr_2O_7^{2-}$ has a $Cr - O - Cr$ bond

B. CrO_4^{2-} is tetrahedral in shape.

C. $Na_2Cr_2O_7$ is a primary standard in volumetry

D. $Na_2Cr_2O_7$ is less soluble than $K_2Cr_2O_7$

Answer: C

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7. The correct order of size would be:

A. $Ni < Pd \approx Pt$

B. $Pd < Pt < Ni$

C. $Pt > Ni > Pd$

D. $Pd > Pt > Ni$

Answer: A

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8. Which of the following is expected to have highest magnetic moment?

A. Ti^{2+}

B. Mn^{2+}

C. Co^{2+}

D. Cu^{2+}

Answer: B

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9. Which of the following compound affects mercury?

A. D_2O

B. H_2O

C. O_3

D. dil. HCl

Answer: C

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10. The highest oxidation state is exhibited by the transition metals with configuration:

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

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

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

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

Answer: D

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11. Which of the following compounds have colour but no unparied electrons?

A. $KMnO_4$

B. K_2MnO_4

C. $MnSO_4$

D. $MnCl_2$

Answer: A

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12. What is the general electronic configuration of transition elements

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

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

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

D. None of these

Answer: C

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13. Which of the following ions in solution undergoes disproportionation?

A. Fe^{+2}

B. Cr^{+3}

C. Cu^{+}

D. Zn^{+2}

Answer: C

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14. At $pH = 12$, $Cr_2O_7^{2-}$ changes to:

A. CrO_3

B. CrO_2^{2+}

C. CrO_3^{2-}

D. no change

Answer: C

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15. Arrange the following ions in their magnetic moment:

(P). V^{4+}

(Q). Mn^{4+}

(R). Fe^{3+}

(S) Ni^{2+}

A. QgtRgtPgtS

B. RgtSgtRgtP

C. RgtQgtSgtP

D. PgtSgtRgtQ

Answer: C

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16. Select the correct reaction for vanadium species:

A. $V_2O_4 \xrightarrow{H+} VO^{2+}$

B. $V_2O_5 \xrightarrow{H^+} VO_4^{3-}$

C. $V_2O_5 \xrightarrow{H^+} VO_2^+$

D. All of these

Answer: D

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17. A mineral is called an ore if :

A. metal present in the mineral is costly.

B. a metal can be extracted from it.

C. a metal can be extracted profitable from it

D. a metal cannot be extracted from it.

Answer: C

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18. Acidified chromic acid $+H_2O_2 \rightarrow \underset{(\text{blue colour})}{X+Y}$, X and Y are

A. CrO_5 and H_2O

B. Cr_2O_3 and H_2O

C. CrO_2 and H_2O

D. CrO and H_2O

Answer: A

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19. When $KMnO_4$ solution is added to hot oxalic acid solution the decoloursitation is slow in the beginning but becomes instantaneous after some time. This is because

A. Mn^{2+} acts as auto catalyst

B. CO_2 is formed

C. reaction is exothermic

D. MnO_4^- catalyses the reaction.

Answer: A

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20. Which metal in the first series of transition metals exhibits+1 oxidation state most frequently and why?

A. Sc

B. Ti

C. Cu

D. Ag

Answer: C

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21. A metal M which is not affected by strong acids like conc. HNO_3, conc, H_2SO_4 and conc. Solution of alkalies like NaOH, KOH. It formes MCl_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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22. Four elements A (with one valence electron), B (with three valence electrons), C (with five valance electrons) and D (with seven valance electrons) are lying in the second period of periodic table. Which of the following does not exist at room temperature?

A. C_2

B. A_2

C. D_2

D. None of these

Answer: B

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23. Which of the following contains the maximum number of unpaired electrons?

A. $TiCl_3$

B. $MnCl_2$

C. $FeSO_4$

D. $CuSO_4$

Answer: B

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24. In which of the following reaction "Philosopher's wool" is formed

A. $Zn + S \xrightarrow{\Delta} ZnS$

B. $Zn + Cl_2 \xrightarrow{\Delta} ZnCl_2$

C. $FeS + O_2 \xrightarrow{\Delta} FeO + SO_2$

D. $Zn + H_2O(\text{steam}) \xrightarrow{\Delta} ZnO + H_2$

Answer: D

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25. Which ground state E.C. of a transition element does not exist?

A. $3d^3$

B. $3d^4$

C. $3d^5$

D. $3d^8$

Answer: B

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26. $Na_2S_2O_3$ can be prepared by:

A. Na_2SO_3 solution + $S(\text{powder}) \xrightarrow{\text{Boiled}}$

B. $S + NaOH \rightarrow$

C. $Na_2S + Na_2CO_3 + SO_2 \rightarrow$

D. all of the above.

Answer: D

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27. What takes place when zinc metal is added to an aqueous solution containing magnesium nitrate and silver nitrate?

(P). Zn is oxidized

(Q). Mg^{2+} is reduced.

(R). Ag^{+} is reduced.

(S). No reaction takes place.

A. P and Q only

B. P and R only

C. P,Q and R only

D. S only

Answer: B

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28. In the galvanizing process, iron is coated with zinc. The resulting chemical protection is most similar to that provided when:

A. a magnesium bar is connected to an iron pipe

B. an iron can is plated with tin

C. copper pipes are connected using lead solder

D. a copper pipe is covered with epoxy paint.

Answer: A

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29. Which characteristic is most useful for determining that a substance is a metal?

A. Conductivity

B. Hardness

C. Melting point

D. X-ray pattern.

Answer: A

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30. Which set of reactants produces a gaseous product?

(P). $6MHNO_3(aq) + Cu(s)$

(Q). $6MHCl(aq) + CaCO_3(s)$

A. P only

B. Q only

C. Both P and Q

D. neither P nor Q

Answer: C

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31. The metal that forms a self-protecting film of oxide to prevent corrosion is:

A. Al

B. Cu

C. Fe

D. Zn

Answer: A

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32. Which element commonly exhibits both +1 and +3 oxidation states?

A. $Al(Z = 13)$

B. $Sc(Z = 21)$

C. $Sn(Z = 50)$

D. $Tl(Z = 81)$

Answer: D

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33. Which two sets of reactants best represent the amphoteric character of $Zn(OH)_2$?

Set 1: $Zn(OH)_2 \& OH^-(aq)$

Set 2: $Zn(OH)_2(s) \& H_2O(l)$

Set 3: $Zn(OH)_2(s) \& H^+(aq)$

Set 4: $Zn(OH)_2(s) \& NH_3(aq)$

A. Sets 1 and 2

B. Sets 1 and 3

C. Sets 2 and 4

D. Sets 3 and 4

Answer: B

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34. Which anion can undergo both oxidation and reduction?

A. $Cr_2O_7^{2-}$

B. NO_3^-

C. OCl^-

D. S^{2-}

Answer: C

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35. Which element exhibits the greatest number of oxidation states in its compounds?

A. Ca

B. V

C. Cu

D. As

Answer: B

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36. Which physical characteristic distinguishes copper from brass (an alloy of copper and zinc)?

A. Brass is a liquid at room temperature and copper is not.

B. Brass is much less dense that copper.

C. Brass is attracted to a magnetic but copper is not.

D. Brass is a much poorer electrical conductor than copper.

Answer: D

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37. Which is the net ionic equation for the reaction when 0.10 M solutions of silver nitrate and sodium sulphide are mixed?

A. $Ag^{+}(aq) + S^{-}(aq) \rightarrow AgS(s)$

B. $Ag^{2+}(aq) + S^{2-}(aq) \rightarrow AgS(s)$

C. $Ag^{2+}(aq) + S^{-}(aq) \rightarrow AgS_2(s)$

D. $Ag^{+}(aq) + S^{2-}(aq) \rightarrow Ag_2S(s)$

Answer: D

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38. For a stoichiometric mixture of reactants, which statement best describes the changes that occur when this reaction goes to completion?

$Zn + 4HNO_3 \rightarrow Zn(NO_3)_2 + 2NO_2 + 2H_2O$

A. All of the zinc is oxidized and some f the nitrogen is reduced.

B. All of the zinc is oxidised and all of the nitrogen is reduced.

C. Some of the zinc is oxidised and all of the nitrogen is reduced.

D. Some of the zinc is oxidized and some of the nitrogen is reduced.

Answer: A

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39. Which gaseous product is formed when dilute nitric acid reacts with silver metal in the absence of air?

A. H_2

B. O_2

C. NH_3

D. NO

Answer: D

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40. Ferric sulphate on heating gives:

A. SO_2 and SO_3

B. SO_2 only

C. SO_3 only

D. S

Answer: C

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41. Which of the following can be associated with the concept of Lanthanoid contraction?

A. Size of $Zr \approx Hf$

B. Shielding of one 4f electron by another is less than that of one d-electron by another

C. Similar chemical and physical properties of Nb and Ta

D. all of the above.

Answer: D

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42. The higher enthalpy of atomisation can be due to :

A. large number of unpaired electrons

B. strong interatomic interaction

C. strong metallic bonding

D. all of the above.

Answer: D

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43. Lowest enthalpy of atomisation among the following is of:

A. Sc

B. Cr

C. Mn

D. Zn

Answer: D

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44. The variability of oxidation states of transition elements arises out of:

A. incomplete filling of d-orbitals

B. oxidation states differing by a unit two

C. greater stability of lower oxidation state

D. greater stability of higher oxidation state

Answer: A

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45. The order of stability of +6 oxidation state for group VI follows the order:

A. $Cr > Mo > W$

B. $Cr < Mo < W$

C. $Mo > Cr > W$

D. $W < Cr > Mo$

Answer: B

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46. Which among the following is the best oxidising agent in acidic medium?

A. $Cr_2O_7^{2-}$

B. CrO_4^{2-}

C. MoO_3

D. WO_3

Answer: A

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47. Select the correct statement

A. stability of $Cu^{+2}_{(aq)}$, is greater than $Cu^{+1}_{(aq)}$ due to much more $\Delta H_{\text{hydration}}$ of Cu^{+2}

B. $Cu^{+2}_{(aq)}$ is more stable because IE_2 of Cu is less than IE_1

C. Generally salts of Cu^{+2} are diamagnetic and colourless

D. SRP $\left(E^{\ominus}\right)$ of Cu^{+2}/Cu is -ve

Answer: A

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48. Which of the following is not a common property of transition elements?

A. Formation of interstitial compound

B. Imparts different characteristic colours to oxidising flame

C. Irregular trend in I.E. and atomic radius in series.

D. Catalytic properties.

Answer: B

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49. Pick out the wrong reaction:

A. $2Na_2CrO_4 + 2H^+ \rightarrow Na_2Cr_2O_7 + 2Na^+ + H_2O$

B. $MnO_2 + 4KOH + O_2 \rightarrow 4KMnO_4 + 2H_2O$

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

D. $2MnO_4^- + 5C_2O_4^{2-} + 16H \rightarrow 2Mn^{+2} + 10CO_2 + 8H_2O$

Answer: B

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50. Which of the following is not arranged in correct sequence?

A. MO, M_2O_3, MO_2, M_2O_5-decreasing order of basic nature (M=d-block metal)

B. Sc,Ti,V,Cr,Mn-increasing order of highest possible oxidation state.

C. d^5, d^3, d^1, d^4-increasing magnetic moment.

D. Mn^{+2}, Fe^{+2}. Cr^{+2}, Co^{+2}-decreasing stability.

Answer: C

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51. When acidified solution of $K_2Cr_2O_7$ is shaken with aqeous solution of $FeSO_4$, Then:

A. $Cr_2O_7^{2-}$ ion is reduced to Cr^{3+} ions

B. $Cr_2O_7^{2-}$ ion is converted to CrO_4^{2-} ions

C. $Cr_2O_7^{2-}$ ion is reduced to Cr

D. $Cr_2O_7^{2-}$ ion is converted to CrO_3

Answer: A

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52. Which of the following is correct?

A. CrO_3 has peroxide bond in the structure.

B. Heating $(NH_4)_2Cr_2O_7$ produces Cr_2O_3 along with O_2.

C. Acidification of $K_2Cr_2O_7$ turns it yellow.

D. Cl_2 is liberated in little amount when $K_2Cr_2O_7$, KCl and conc. H_2SO_4 are heated together.

Answer: D

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53. Which transition element does not exhibit variable oxidation state?

A. Sc

B. Cu

C. Zn

D. Hg

Answer: A

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54. Which of the 3d-seres of the transition metals exhibits the largest number of oxidation states ?

A. Fe

B. Cr

C. V

D. Mn

Answer: D

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55. Which of the following is true for the species having $3d^4$ configuration?

(A) Cr^{2+} is reducing in nature.

(B) Mn^{3+} is oxidising in nature.

(C) Both (A) and (B)

(D) None of these

A. both are reducing in nature.

B. both are oxidising in nature.

C. Cr^{2+} is reducing, Mn^{3+} is oxidising.

D. Cr^{2+} is oxidising, Mn^{3+} is reducing.

Answer: C

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56. Choose the correct statement(s):

A. The stability of half filled d-subshell in Mn^{2+} can be related to its E° value

B. The stability of completely filled d^{10} configuration in Zn^{2+} can be related to its E° value.

C. E° For Ni is related to the highest negative $\Delta_{hyd}H^{\circ}$

D. all of the above.

Answer: D

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57. The ability of fluorine to stabilize the highest oxidation state due to higher lattice energy can be seen in:

A. CoF_3

B. VF_3

C. CrF_6

D. All of these

Answer: A

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58. Why is oxygen superior to fluorine in stabilising high oxidation states of transition metals?

A. Because oxygen is less electronegative than fluorine

B. Because of larger size of oxygen as compared to fluorine

C. because of the ability of oxygen to form multiple bonds to metals

D. both a and c

Answer: C

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59. Select the correct order of oxidising power in acidic medium.

A. $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$

B. $VO_2^+ < MnO_4^- < Cr_2O_7^{2-}$

C. $MnO_{40^-} < Cr_2O_7^{2-} < VO_2^+$

D. $Cr_2O_7^{2-} < VO_2^+ < MnO_4^-$

Answer: A

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60. identify the element for which +3 oxidation state is of least importance.

A. Mn

B. Fe

C. Ti

D. Cr

Answer: A

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61. Catalytic activity of the transition metals and their compounds can be ascribed to:

A. Their ability to adopt multiple oxidation states their ability to form complexes

B. Their ability to form complexes.

C. catalytic adsorption by utilization of 3d and 4s electrons for bonding.

D. all of the above

Answer: D

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62. Select the disproportionation reaction which are expected to be spontaneous in aq. Solution.

A. $MnO_4^{2-} \xrightarrow{H^+} MnO_4^- + MnO_2$

B. $Cu^+ \rightarrow Cu^{2+} + Cu$

C. Both a and b

D. neither a nor b

Answer: C

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63. Select the correct characteristics about Mn_2O_7:

A. It is a covalent green oil

B. It is an anhydride of $HMnO_4$

C. it is acidic in nature

D. all of the above.

Answer: D

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64. Fusion of chromite ore with sodium carbonate in excess of air gives a compound (X) (yellow solution) X when treated with sulphuric acid gives:

A. $Na_2Cr_2O_7$

B. $Na_2Cr_2O_7 \cdot 5H_2O$

C. $Na_2Cr_2O_7 \cdot 10H_2O$

D. $Na_2Cr_2O_7 \cdot 2H_2O$

Answer: D

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65. Which reaction is not possible using acidified $K_2Cr_2O_7$?

A. $I^- \rightarrow IO_3^-$

B. $Sn^{2+} \rightarrow Sn^{4+}$

C. $H_2S \rightarrow S$

D. $Fe^{2+} \rightarrow Fe^{3+}$

Answer: A

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66. Which among $Na_2Cr_2O_7$ and $K_2Cr_2O_7$ is more suitable as a primary standard in volumetric analysis?

A. $Na_2Cr_2O_7$

B. $K_2Cr_2O_7$

C. Both a and b

D. Neither a nor b

Answer: B

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67. $MnO_2 + KOH \xrightarrow{O_2} X$. X must be:

A. $KMnO_4$

B. K_2MnO_4

C. MnO

D. Mn_3O_4

Answer: B

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68. Identify the most stable species in aqueous solution.

A. Mn^{3+}

B. Cr^{3+}

C. V^{3+}

D. Ti^{3+}

Answer: B

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69. $N_2(g) + 3H_2(g) \overset{Fe+Mo}{\Longleftrightarrow} 2NH_3(g)$, Haber's process, Mo is used as:

A. a catalyst

B. a catalytic promoter

C. an oxidising agent

D. as a catalytic poison.

Answer: B

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70. An ornament of gold having 75% of gold, is of _____carat.

A. 18

B. 16

C. 24

D. 20

Answer: A

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71. Transition elements having more tendency to form complex than representative elements (s and p-block elements) due to:

A. availability of d-orbitals for bonding

B. variable oxidation states are not shown by transition elements

C. all electrons are paired in d-orbitals

D. orbitals are available for bonding.

Answer: A

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72. A compound of mercury used in consmetics, in Ayurvedic and Yunani medicines and known as Vermilion (Scarletred pigment) is:

A. $HgCl_2$

B. HgS

C. Hg_2Cl_2

D. Hgl

Answer: B

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73. Transition elements are usually characterised by variable oxidation states but Zn does not show this property because of :

A. completion of np-orbitals

B. completion of $(n-1)d$ orbitals.

C. completion of ns-orbitals

D. inert pair effect.

Answer: B

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74. The d-block element which is a liquid at room temperature, having high specific heat, less reactivity than hydrogen and its chloride (MX_2) is volatile on heating is:

A. Cu

B. Hg

C. Ce

D. Pm

Answer: B

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75. Coinage metals show the properties of:

A. typical elements

B. normal elements

C. inner-transition elements

D. transition element.

Answer: D

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76. The transition metal used in X-rays tube is:

A. Mo

B. Ta

C. Tc

D. Pm

Answer: A

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77. The higher oxidation states of transition elements are found to be in the combination with A and B, which are:

A. F, O

B. O, N

C. O, Cl

D. F, Cl

Answer: A

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78. The metals present in insulin and haemoglobin are respectively:

A. Zn,Hg

B. Zn,Fe

C. Co,Fe

D. Mg,Fe

Answer: B

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79. Manganese steel is used for making railway tracks because:

A. it is hard with high percentage of Mn

B. It is soft with high percentage of Mn

C. it is hard with small concentration of manganese with impurities

D. it is soft with small concentration of manganese with impurities

Answer: A

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80. Transition elements in lower oxidation states act as Lewis acid because:

A. they form complexes

B. they are oxidising agents

C. they donate electrons

D. they do not show catalytic properties.

Answer: A

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81. The electron which take part in order to exhibit variable oxidation states by transition metals are

A. ns only

B. $(n-1)d$ only

C. ns and $(n-1)d$ only but not np

D. $(n-1)d$ and np only but not ns

Answer: C

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82. Solution of MnO_4^- is purple-coloured due to :

A. d-d-transition

B. charge transfer from O to Mn

C. due to both d-d transition and charge transfer

D. none of the above.

Answer: B

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83. (T) imparts violet colour in the flame test

$$\xrightarrow{\text{compound}\,(U)+conc.\,H_2SO_4}(V)_{\text{Red gas}}\xrightarrow{NaOH+AgNO_3}(W)_{\text{Red ppt.}}\xrightarrow{NH_3\ \text{soln}}(X)$$

$$(W)_{\text{Red ppt.}}\xrightarrow{dil.\,HCl}(Y)_{\text{White ppt.}}$$

(U) Sublimes on heating $\xrightarrow[\Delta]{NaOH}(Z)_{gas}$

Identify (T) to (Z).

A.

$$T = KMnO_4, U = HCl, V = Cl_2, W = HgI_2, X = Hg(NH_2)NO_3,$$

B.

$$T = K_2Cr_2O_7, U = NH_4Cl, V = CrO_2Cl_2, W = Ag_2CrO_4, X = [$$

C.

$$T = K_2CrO_4, U = KCl, V = CrO_2Cl_2, W = HgI_2, X = Na_2CrO_4$$

D.

$$Y = K_2MnO_4, U = NaCl, V = CrO_3, W = AgNO_3, X = (NH_4)_2C$$

Answer: B

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84. $Cr_2O_7^{2-} \underset{Y}{\overset{X}{\Longleftrightarrow}}$ X and Y are respectively:

A. $X = OH^-, Y = H^+$

B. $X = H^+, Y = OH^-$

C. $X = OH^-, Y = H_2O_2$

D. $X = H_2O_2, Y = OH^-$

Answer: A

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85. CrO_3 dissolves in aqueous NaOH to give:

A. $Cr_2O_7^{2-}$

B. CrO_4^{2-}

C. $Cr(OH)_3$

D. $Cr(OH)_2$

Answer: B

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86. During estimation of oxalic acid vs $KMnO_4$, self indicator is:

A. $KMnO_4$

B. oxalic acid

C. K_2SO_4

D. $MnSO_4$

Answer: A

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87. $\underset{(\text{Diatomic covalent molecule})}{Y} \xleftarrow{KI} CuSO_4 \xrightarrow{dil.\,H_2SO_4} X$ (Blue colour)

X and Y are:

A. $X = I_2, Y = \left[Cu(H_2O)_4\right]^{2+}$

B. $X = \left[Cu(H_2O)_4\right]^{2+}, Y = I_2$

C. $X = \left[Cu(H_2O)_4\right]^{+}, Y = I_2$

D. $X = \left[Cu(H_2O)_4\right]^{2+}, Y = I_2.$

Answer: B

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88. $(NH_4)_2Cr_2O_7$ (ammonium dichromate) is used in fire works. The green coloured powder blown in air is:

A. Cr_2O_3

B. CrO_2

C. Cr_2O_4

D. CrO_3

Answer: A

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89. Iron becomes passive by_____due to formation of _____.

A. dil. HCl, Fe_2O_3

B. 80% conc. HNO_3, Fe_3O_4

C. conc. H_2SO_4, Fe_3O_4

D. conc. HCl, Fe_3O_4

Answer: B

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90. Bayer's reagent used to detect olefenic double bond is:

A. acidified $KMnO_4$

B. aqueous $KMnO_4$

C. 1% alkaline $KMnO_4$ solution.

D. $KMnO_4$ in benzene

Answer: C

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91. $Cu + \underset{(\text{bot})}{conc.}\ HNO_3 \rightarrow Cu(NO_3)_2 + X$

(oxide of nitrogen) then X is:

A. N_2O

B. NO_2

C. NO

D. N_2O_3

Answer: B

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92. $CuSO_4$ solution reacts with excess of KCN solution to form:-

A. $Cu(CN)_2$

B. $CuCN$

C. $K_2\left[Cu(CN)_2\right]$

D. $K_3\left[Cu(CN)_4\right]$

Answer: D

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93. Pick out the incorrect statement:

A. MnO_2 dissolves in conc. HCl, but does not form Mn^{4+} ions

B. MnO_2 oxidizes hot concentrated H_2SO_4 liberating oxygen.

C. K_2MnO_4 is formed when MnO_2 is fused KOH is oxidised by air, KNO_3, PbO_2 or $NaBiO_3$

D. Decomposition of acidic $KMnO_4$ is not catalysed by sunlight.

Answer: D

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94. The rusting of iron is formulated as $Fe_2O_3 \cdot xH_2O$ which involves the formation of:

A. Fe_2O_3

B. $Fe(OH)_3$

C. $Fe(OH)_2$

D. $Fe_2O_3 + Fe(OH)_3$

Answer: D

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95. Solid $CuSO_4 \cdot 5H_2O$ having covalent, ionic as well as co-ordinate bonds. Copper atom/ion forms_____co-ordinate bonds with water.

A. 1

B. 2

C. 3

D. 4

Answer: D

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96. $KMnO_4 + HC < oH_2O + X(g)$, X is a:
(Acidified)

A. red liquid

B. violet gas

C. greenish-yellow gas

D. yellow-brown gas

Answer: C

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97. Purple of Cassius is

A. pure gold

B. colliodal solution of gold

C. gold (I) hydroxide

D. gold (III) chloride

Answer: B

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98. Amongst the following species, maximum covalent character is exhibited by:

A. $FeCl_2$

B. $ZnCl_2$

C. $HgCl_2$

D. $CdCl_2$

Answer: C

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99. Pick out the incorrect statement:

A. MnO_4^{2-} is quite strongly oxidizing and stable only in very strong alkalies. In dilute alkali, neutral solution, it disproportionates.

B. In acidic solution, MnO_4^- is reduced to Mn^{2+} and thus, $KMnO_4$ is widely used as oxidising agent.

C. $KMnO_4$ does ot at as oxidising agent in alkaline medium.

D. $KMnO_4$ is manufactured by the fusion of pyrolusite ore with KOH in presence of air or KNO_3, followed by electrolytic oxidation in strongly alkaline solution.

Answer: C

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100. The aqueous solution of $CuCrO_4$ is green because it contains:

A. green Cu^{2+} ions

B. green CrO_4^{2-} ions

C. blue Cu^{2+} ions and green CrO_4^{2-} ions

D. blue Cu^{2+} ions and yellow CrO_4^{2-} ions.

Answer: D

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101. In nitroprusside ion the iron and NO exist as Fe (II) and NO^+ rather than the Fe(III) and NO. these forms can be differentiated by

A. magnetic moment in solid state

B. thermal decomposition method.

C. by reaction with KCN

D. by action with K_2SO_4

Answer: A

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102. Which reaction is possible at anode?

A. $2Cr^{3+} + 7H_2O \rightarrow Cr_2O_7^{2-} + 14H^+$

B. $F_2 \rightarrow 2F^-$

C. $\frac{1}{2}O_2 + 2H^+ \rightarrow H_2O$

D. None of the above.

Answer: A

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103. Colourless solutions of the following four salts are placed separately in four different test tubes and a strip of copper is dipped in each one of these. Which solution will turn blue?

A. KNO_3

B. $AgNO_3$

C. $Zn(NO_3)_2$

D. $ZnSO_4$

Answer: B

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104. When $KMnO_4$ solution is added to hot oxalic acid solution the decoloursitation is slow in the beginning but becomes instantaneous after some time. This is because

A. Mn^{2+} acts as autocatalyst

B. CO_2 is formed as the product

C. Reaction is exothermic

D. MnO_4^- catalyses the reaction.

Answer: A

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105. Metre scales are madeup of alloy:

A. invar

B. stainless steel

C. electron

D. magnalium

Answer: A

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106. The Ziegler-Natta catalyst used for polymerisation of ethene and styrene is $TiCl_4 + (C_2H_5)_3Al$, the catalysing species (active species) involved in the polymerisation is:

A. $TiCl_4$

B. $TiCl_3$

C. $TiCl_2$

D. $TiCl$

Answer: B

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107. Bordeaux used a fungicide is a mixture of

A. $CaSO_4 + Cu(OH)_2$

B. $CuSO_4 + Ca(OH)_2$

C. $CuSO_4 + CaO$

D. $CuO + CaO$

Answer: B

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108. Peacock ore is:

A. FeS_2

B. $CuFeS_2$

C. $CuCO_3 \cdot Cu(OH)_2$

D. Cu_5FeS_4

Answer: D

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109. Calomel (H_2Cl_2) on reaction with ammonium hydroxide gives

A. $HgNH_2Cl$

B. $NH_2 - Hg - Hg - Cl$

C. Hg_2O

D. HgO

Answer: A

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110. In context with the transition element, which of the following statement is incorrect?

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

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

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

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

Answer: D

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111. Which one of the following arrangements does not represent the correct order of the property stated against it?

A. $V^{2+} < Cr^{2+} < Mn^2 < Fe^{2+}$: paramagnetic behaviour

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

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

D. ScltTiltCrltMn: number of oxidation states.

Answer: A

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112. Which series of reactions correctly represents chemical rections related to iron and its compounds ?

A. $Fe \xrightarrow{Cl_2 \cdot heat} FeCl_3 \xrightarrow{heat, air} FeCl_2 \xrightarrow{Zn} Fe$

B. $Fe \xrightarrow{O_2, heat} Fe_3O_4 \xrightarrow{CO, 600^\circ C} FeO \xrightarrow{CO, 700^\circ C} Fe$

C. $Fe \xrightarrow{dil.\, H_2SO_4} FeSO_4 \xrightarrow{H_2SO_4, O_2} Fe_2(SO_4)_3 \xrightarrow{\Delta} Fe$

D. $Fe \xrightarrow{O_2, heat} FeO \xrightarrow{dil.\, H_2SO_4} FeSO_4 \xrightarrow{\Delta} Fe$

Answer: B

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113. The equation which is balanced and represents the correct product(s) is .

A.

$$\left[Mg(H_2O_6]^{2+} + (\text{EDTA})^{4-} \xrightarrow{\text{excess NaOH}} \left[Mg(\text{EDTA})^{2+} + 6H_2O\right.\right.$$

B. $CuSO_4 + 4KCN \rightarrow K_2\left[Cu(CN)_4\right] + K_2SO_4$

C. $Li_2O + 2KC < o2LiCl + K_2O$

D. $\left[CoCl(NH_3)_5\right]^+ + 5H^+ \rightarrow Co^{2+\square} + 5NH_4^+ + Cl^-$

Answer: D

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114. H_2S gas is passed through an acidic solution of $K_2Cr_2O_7$. The solution turns milky, why?

A. K_2SO_4

B. $Cr_2(SO_4)_3$

C. S

D. $CrSO_4$

Answer: D

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115. Copper becomes green when exposed to moist air for longer period because of the formation of a layer of

A. The formation of basic copper sulphate layer on the surface of copper.

B. The formation of basic copper sulphate layer on the surface of the metal

C. the formation of a layer of cupric hydroxide on the surface of copper.

D. the formation of a layer of basic carbonate of copper on the surface of copper.

Answer: D

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116. Among these, identify the species with an atom in $+6$ oxidation state: .

A. $[MnO_4)]^-$

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

C. Cr_2O_3

D. CrO_2Cl_2

Answer: D

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117. Gem stones such as ruby and emerald own emerald owe their color to

A. Cr^{3+} and Cr^{3+}

B. Cr^{3+} and Co^{3+}

C. Co^{3+} and Cr^{3+}

D. Co^{3+} and Co^{3+}

Answer: A

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118. Galvanization of iron denotes coating with .....

A. Zn

B. Pg

C. Cr

D. Cu

Answer: A

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119. Which of the following compounds is metallic and ferromagnetic ?

A. MnO_2 dissolves in conc. HCl, but does not form Mn^{4+} ions

B. TiO_2

C. CrO_2

D. VO_2

Answer: C

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120. Which one of the following species is stable in ferromagnetic?

A. MnO_4^{3-}

B. MnO_4^{2-}

C. Cu^+

D. Cr^{2+}

Answer: B

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121. What will occur if a block of copper metal is dropped into a beaker containing a solution of $1MZnSO_4$?

A. The copper metal will dissolve and zinc metal will be deposited.

B. No reaction will occur.

C. The copper metal will dissolve with evolution of oxygen gas.

D. The copper metal will dissolve with evolution of hydrogen.

Answer: B

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122. Solder is an alloy of :

A. Cu and Pb

B. Zn and Cu

C. Pb and Sn

D. Fe and Zn

Answer: C

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123. Which compound does not dissolve in hot diluted HNO_3?

A. HgS

B. PbS

C. CuS

D. CdS

Answer: A

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124. Anhydrous ferric chloride is prepared by

A. Heating hydrated ferric chloride at a high temperature in a stream of air.

B. heating metallic iron in a strem of dry chloride gas.

C. reaction of ferric oxide with HCl.

D. reaction of metallic iron with HCl.

Answer: B

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125. The product of oxidation of I^- with MnO_4^- in alkaline medium is:

A. IO_3^-

B. I_2

C. IO^-

D. IO_4^-

Answer: A

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126. $(NH_4)_2Cr_2O_7$ on heating gives a gas which is also given by :

A. heating NH_4NO_2

B. heating NH_4NO_3

C. treating H_2O_2 with $NaNO_2$

D. treatment Mg_3N_2 with H_2O

Answer: A

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127. Statement-1: silver is a transition element.

Statement-2: silver atom has completely filled d-robitals $\left(4d^{10}\right)$ in its ground state.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: B

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128. Statement-1: d-block metals have generally high M.P.

Statement-2: Greater number of electrons from $(n-1)d$ in addition to

ns electrons are involved in the interatomin metallic bonding.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: A

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129. Statement-1: The radii of third (5d) series are vircutally the same as those of the corresoponding members of the second (4d) series.

Statement-2: The filling of 4f orbitals before 5d orbitals results I a regular decrease in atomic radii called lathonoid contraction which essentially

compensates for the expected increase in atomic size with increasing atomic number.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: A

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130. Statement-1: From titanium (Z=22) to copper (Z=49) significant decrease in density may be noted.

Statement-2: The increase in metallic radius coupled with increase in atomic mass occurs across the period.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. Statement-1 and statement-2 both are false.

Answer: D

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131. Statement-1: Many copper (I) compound are unstable in aqueous solution and undergo disproportionation.

Statement-2: Cu^{2+} I mre stable than Cu^{+} because of much more negative $\Delta_{hyd}H^{\circ}$ of Cu^{2+} than Cu^{+}, which more than compensates for seconds ionisation enthalpy.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: A

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132. Assertion : The highest manganese fluroide is MnF_4 and the highest oxide is Mn_2O_7.

Reason : In Mn_2O_7, each Mn is tetrahedrally surrounded by $O's$ including $Mn-O-Mn$ bridge.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: B

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133. Statement-1: 1st and 2nd ionisation enthalpies in the first series of transition elements vary irregularly.

Statement-2: Variation depends on the stability of d-configuration.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: A

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134. Statement-1: Cr^{2+} is a stronger reducing agent than Fe^{2+}

Statement-2: In aqueous medium d^3 is more stable than d^5 configuration.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: A

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135. Statement-1: the highest oxidation state of transition metal is exhibited in its oxide or fluoride only.

Statement-2: Small size and high electronegativity of O and F can oxidise the metal to its highest oxidation state.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: A

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136. Statement-1: For the reaction:

$2I^- + S_2O_8^{2-} \rightarrow I_2 + 2SO_4^{2-}$, $Fe(III)$ catalyst is used

Statement-2: $2Fe^{3+} + 2I^- \rightarrow 2Fe^{2+} + I_2$

$2Fe^{2+} + S_2O_8^{2-} \rightarrow 2Fe^{3+} + 2SO_4^{2-}$

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: A

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137. Statement-1: $K_2Cr_2O_7 + 2NaCl \rightarrow Na_2Cr_2O_7 + 2KCl$

Statement-2: $K_2Cr_2O_7$ is less soluble than $Na_2Cr_2O_7$.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: D

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138. Assertion : $KMNO_4$ in aqueous solution is purple coloured due to charge transfer

Reason : In MnO_4^- these is no electron present in the d-orbital of Mn

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: B

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139. Assertion : K_2CrO_4 has yellow colour due to charge transfer.

Reason : CrO_4^{2-} ion is tetrahedral in shape.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: B

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140. Statement-1: The highest oxidation state of chromium in its compound is +6.

Statement-2: Chromium atom has only six electrons in ns and $(n-1)d$ orbitals.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: A

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141. Assertion : CrO_3 reacts with HCl to form chromyl chloride gas

Reason : Chromyl chloride (CrO_2Cl_2) has tetrahedral shape.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: B

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142. Statement-1: Zinc does nt show characteristic properties of transition metals.

Statement-2: In zinc outermost shell is completely filled.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: C

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143. Assertion: Tungsten has very high melting point.

Reason: Tungsten is a covalent compound.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: C

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144. Statement-1: Equivalent mass of $KMnO_4$ is equal to one-third of its molecular mass when it acts as an oxidising agent in an alkaline medium.

Statement-2: Oxidation number of Mn is +7 in $KMnO_4$.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: B

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145. Statement-1: Promethium is a man mae element.

Statement-2: It is radioactive and has been prepared by artifical means.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: A

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146. Statement-1: Promethium is a man made element.

Statement-2: Four water molecules are coordinated to Cu^{+} ion in water.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: A

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147. Statement-1: Cu^+ ion is colourless.

Statement-2: Four water molecules are coordinated to Cu^+ ion in water.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: C

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148. Statement I : Zn^{2+} is diamagnetic

Statement II : The electrons are lost from 4s orbital to from Zn^{2+}

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1.

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false.

D. statement-1 is false, statement-2 is true.

Answer: B

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Multiple Objective Type

1. Which element(s) of d-block have full d^{10} configuration in their ground state as well as in their common oxidation states?

A. Zn

B. Cd

C. Hg

D. Ag

Answer: A::B::C

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2. Which metal(s) has/have a typical metallic structure?

A. Zn

B. Cd

C. Hg

D. Mn

Answer: A::B::C::D

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3. Choose the correct statement(s):

A. Ions of the same charge in a given transition series show progressive decrease in radius with increasing atomic number.

B. Same trend as (a) is observed in the atomic radii.

C. there is occurrence of much more frequent metal-metal bonding in compounds of heavy transition metals.

D. Metals of 2nd and 3rd transition series have greater enthalpies of atomization than the corresponding element of first series.

Answer: A::B::C::D

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4. Choose the correct statement(s).

A. Successive enthalpies of transition elements do not increase as steeply as in the main group elements.

B. The magnitude of the increase in the second and third ionsiation enthalpies for the successive elements of transition series, in general, is much higher.

C. The lowest common oxidation state of transition metals is $+2$.

D. The second ionisation enthalpy of Cr and Cu are usually high.

Answer: A::B::C::D

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5. For which of the following elements is it difficult to obtain oxidation state greater than +2.

A. Zn

B. Cu

C. Ni

D. Mn

Answer: A::B::C

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6. Lesser number of oxidation states at the extreme ends of the transition series, stems from:

A. too few electrons to lose or share

B. too many d electrons for higher valence

C. greatest number of oxidation states for manganese +2 to +7

D. presence of filled f-orbitals.

Answer: A::B

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7. The $E^0\left(M^{2+}/M\right)$ value for copper is positive $(+0.34V)$. What is possibly the reason for this?

A. Increase in the sum of first and second ionisation enthalpy

B. high enthalpy of atomisation

C. Low enthalpy of hydration

D. High metlting point.

Answer: B::C

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8. A comparative study of $E^\circ\left(M^{3+} \mid M^{2+}\right)$ values show varying trends. Choose the correct trends (along with possibe reason) among the following.

A. Low value for Sc reflects the stability of Sc^{3+} which has a noble gas configuration.

B. Zn has the highest value due to stability of d^{10} configuration.

C. Comparatively high value for Mn and low value for Fe shows extra stability of $Mn^{2+}\left(d^5\right)$ and $Fe^{3+}\left(d^5\right)$.

D. Comparatively low value for V is related to the stability of half filled t_{2g} in V^{2+}.

Answer: A::B::C::D

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9. Beyond Mn no metal has a trihalide except:

A. Co

B. Fe

C. Ni

D. Cu

Answer: A::B

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10. Beyond Mn which trifluoride exists?

A. CoF_3

B. FeF_3

C. $FeCl_3$

D. $FeBr_3$

Answer: A::B::C::D

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11. Select the correct match for oxocation in acidic medium with respect to oxidation state.

A. $VO_2^+ \rightarrow V^V$

B. $VO^{2+} \rightarrow V^{IV}$

C. $TiO^{2+} \rightarrow Ti^{IV}$

D. $FeO_4^{2-} \rightarrow Fe^{VI}$.

Answer: A::B::C

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12. Select the correct statement(s) for interstitial compounds.

A. They are formed when small atoms like H,C or N are trapped inside the crystal lattices of metals.

B. They have high melting point, higher than those of pure metals.

C. They are hard, some borides approach diamond in hardness.

D. They retain metallic conductivity but are chemically inert.

Answer: A::B::C::D

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13. Select the correct reaction for vanadium species:

A. $V_2O_4 \xrightarrow{H^+} VO^{2+}$

B. $V_2O_5 \xrightarrow{OH^-} VO_4^{3-}$

C. $V_2O_5 \xrightarrow{H^+} VO_2^+$

D.

$$VO_2^+(\text{yellow}) \rightarrow VO^{2+}(\text{blue}) \rightarrow V^{3+}(\text{green}) \rightarrow V^{2+}(\text{purple/violet}$$

Answer: A::B::C::D

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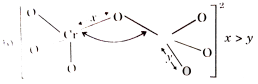
14. Select the correct statement(s) about $Cr_2O_7^{2-}$ and CrO_4^{2-}

A. $Cr_2 \underset{OH}{\overset{H^+}{\rightleftharpoons}} CrO_4^{2-}$

B. 

C. $\theta > 109^\circ 28'$

D. Central 'O' is not purely sp^3 hybridised.

Answer: B::C::D

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15. Select the correct reaction sequence(s)?

A. $2Mn^{2+} + 5S_2O_8^{2-} + 8H_2O \rightarrow 2MnO_4^- + 10SO_4^{2-} + 16H^+$

B. $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2$

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

D. $2MnO_4^- + H_2O + I^- \rightarrow 2MnO_2 + 2OH^- + IO_3^-$

Answer: A::B::C::D

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16. Choose the correct statement about $KMnO_4$.

A. $KMnO_4$ titration in presence of HCl is unsatisfactory because HCl is oxidised to Cl_2

B. Under standard conditions it should oxidize water.

C. In reaction (b) kinetics of the reaction is an important factor.

D. It can be used as a primary standard in volumetric analysis.

Answer: A::B::C

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17. Conversion of manganous salt to MnO_2 using $KMnO_4$ in netural medium is catalysed by:

A. $ZnSO_4$

B. ZnO

C. $Fe_2(SO_4)_3$

D. FeO

Answer: A::B

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18. An element of 3d-transition series shows two oxidation states x and y, differing by two units. Then:

A. compounds in oxidation state x are ionic if xgty

B. compounds in oxidation state x are ionic if xlty

C. compounds in oxidation state y are covalent if xlty

D. compound in oxidation state y are covalent if yltx

Answer: B::C

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19. To an acidified dichromate solution, a pinch of Na_2O_2 is added and shaken. What is observed ?

A. Blue colour

B. Orange colour changing to oxygen

C. Copious evolution of oxygen.

D. Bluish-green precipitate.

Answer: A::C

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20. Potash alum is a double salt, its aqueous solution shows the characteristics of:

A. Al^{3+} ions

B. K^+ ions

C. SO_4^{2-} ions

D. Al^{3+} ions not K^+ ions

Answer: A::B::C

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21. Addition of non-metals like B and C to the interstitial sites of a transition metal results the metal

A. of more ductability

B. of less ductability

C. of less malleability

D. of more hardness.

Answer: B::C::D

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22. Mercury is a liquid at 0° C because of

A. very high ionization energy

B. weak metallic bonds.

C. high heat of hydration

D. high heat of sublimation.

Answer: A::B

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23. The correct statement(s) about transition element is/are.

A. The most stable oxidation is +3 and its stability decreases across the period.

B. transition elements of 3d- series have almost same atomic sizes from Cr to Cu

C. The stability of +2 oxidation state increases across the period.

D. Some transition elements like Ni, Fe, Cr may show zero oxidation state in some of their compound.

Answer: A::B::C::D

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24. The ionisation energies of tranition elements are:

A. less than p-block elements

B. more than s-block elements

C. less than s-block elements

D. more than p-block elements.

Answer: A::B

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25. The metal(s) which does/do not form amalgam is/are:

A. Fe

B. Pt

C. Zn

D. Ag

Answer: A::B

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26. Which of the following statements concern with d-block metals?

A. Compounds containing ions of transition elements are usually coloured

B. Zinc has lowest melting point among 3d-series elements.

C. They show variable oxidation states, which differ by two units only

D. They easily form complexes.

Answer: A::B::D

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27. The highest oxidation state exhibited by a transition elements is _____.

A. $+7$ by Mn

B. $+8$ by Os

C. $+8$ by Ru

D. $+7$ by Fe

Answer: B::C

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28. Amphoteric oxide(s) is/are

A. Al_2O_3

B. SnO

C. ZnO

D. Fe_2O_3

Answer: A::B::C

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29. The catalytic activity of transition elements is related to their:

A. Variable oxidation states

B. Surface area

C. complex formation ability

D. magnetic moment.

Answer: A::B::C

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30. In the equation:

$M + 8CN^- + 2H_2O + O_2 \rightarrow 4\left[M(CN)_2\right]^- + 4OH^-$ metal M is:

A. Ag

B. Au

C. Cu

D. Hg

Answer: A::B

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31. $CuSO_4(aq) + 4NH_3 \rightarrow X$, then X is

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

B. paramagnetic

C. coloured

D. of a magnetic moment of 1.73 BM

Answer: A::B::C::D

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32. Amphoteric oxide(s) of Mn is/are

A. MnO_2

B. Mn_3O_4

C. Mn_2O_7

D. MnO

Answer: A::B

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33. The lanthanide contraction is responsible for the fact that

A. Zr and Hf have same atomic sizes

B. Zr and Hf have same properties

C. Zr and Hf have different atomic sizes

D. Zr and Hf have different properties.

Answer: A::B

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34. Ion(s) having non zero magnetic moment (spin only) is/are

A. Sc^{3+}

B. Ti^{3+}

C. Cu^{2+}

D. Zn^{2+}

Answer: B::C

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35. Correct statement(s) is/are:

A. an acidified solution of $K_2Cr_2O_7$ liberates iodine from KI

B. $K_2Cr_2O_7$ is used as a standard solution for estimation of Fe^{2+} ions

C. in acidic medium, $M = N/6$ for $K_2Cr_2O_7$

D. $(NH_4)_2Cr_2O_7$ on heating decomposes to yield Cr_2O_3 through an endothermic reaction.

Answer: A::B::C

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36. Interstitial compounds are formed by:

A. Co

B. Ni

C. Fe

D. Ca

Answer: A::B::C

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37. Acidified $KMnO_4$ can be decolourised by:

A. SO_2

B. H_2O_2

C. $FeSO_4$

D. $Fe_2(SO_4)_3$

Answer: A::B::C

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38. Which of the following alloys contain (s) Cu and Zn?

A. Bronze

B. Brass is much less dense that copper.

C. Gun metal

D. Type metal.

Answer: B::C

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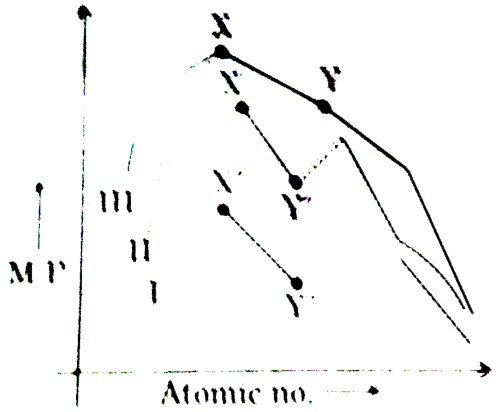
Comprehension Type

1. 

Refer to the graph for trends in M.P. of transition elements of 3d,4d and 5d series.

Q. Choose the correct statement(s).

A. III refers to 3rd transition series of periodic table.

B. X corresponds to tungsten

C. Y" corresponds to manganese.

D. all of the above.

Answer: D

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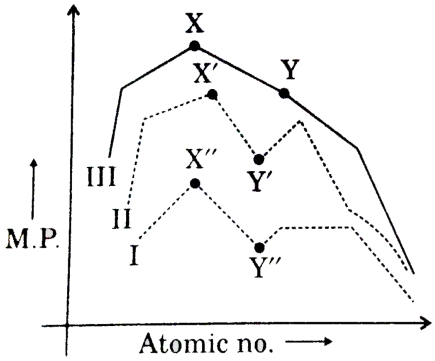
2.



Refer to the graph for trends in M.P. of transition elements of 3d,4d and 5d series.

Q. What does maxima at point 'X' indicate?

A. One unpaired electron per d-orbital is particularly favourable for strong inteeratomic interaction.

B. Strong metallic bonding.

C. Both a and b

D. None of the above.

Answer: C

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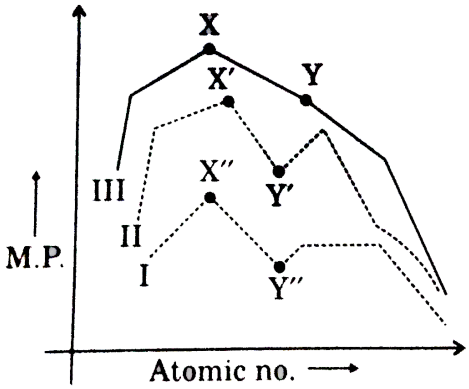

3.

Refer to the graph for trends in M.P. of transition elements of 3d,4d and 5d series.

Q. A metal having high boiling point:

A. has high enthalpy of atomization

B. tends to be noble in their reactions

C. has strong metallic bonding

D. all of the above.

Answer: D

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4. Transition metal and their compounds are used as catalysts in inductry and in biological systems. For example, in the contact process, vanadium compounds in the +5 state (V_2O_5 or VO_3^-) are used to oxidise SO_2 to SO_3

$$SO_2 + \frac{1}{2}O_2 \xrightarrow{V_2O_5} SO_3$$

It is though that the actual oxidation process takes place in two stages. in the first step, V^{5+} in the presence of oxide ions converts SO_2 to SO_3. at the same time, V^{5+} is reduced to V^{4+}.

$$2V^{5+} + O^{2-} + SO_2 \rightarrow 2V^{4+} + SO_3$$

In the second step. V^{5+} is regenerated from V^{4+} by oxygen:

$$2V^{4+} + \frac{1}{2}O_2 \rightarrow 2V^{5+} + O^{2-}$$

The overall process is, of course, the sum of these two steps:

$$SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$$

Q. Transition metals and their compounds catalyse reactions because:

A. they competely filled s-subshell

B. they have a comparable size due to poor shielding of d-subshell

C. they introduce an entirely new reaction mechanism with a lower activation energy.

D. They have variable oxidation states differ by two units.

Answer: C

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5. Transition metal and their compounds are used as catalysts in inductry and in biological systems. For example, in the contact process, vanadium compounds in the +5 state (V_2O_5 or VO_3^-) are used to oxidise SO_2 to SO_3

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The overall process is, of course, the sum of these two steps:

$$SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$$

Q. During the course of the reaction:

A. catalyst undergoes changes on oxidation state

B. catalyst increases the rate constant

C. catalyst is regenerated in its original form when the reactants form the products

D. all are correct.

Answer: D

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6. Transition metal and their compounds are used as catalysts in inductry and in biological systems. For example, in the contact process, vanadium compounds in the +5 state (V_2O_5 or VO_3^-) are used to oxidise SO_2 to SO_3

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The overall process is, of course, the sum of these two steps:

$SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$

Q. Catalytic activity of transition metals depends on:

A. their ability to exist in different oxidation states.

B. the size of the metal atoms.

C. the number of empty atomic orbitals available

D. None of the above.

Answer: A

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7. Transition metal and their compounds are used as catalysts in inductry and in biological systems. For example, in the contact process, vanadium compounds in the +5 state (V_2O_5 or VO_3^-) are used to oxidise SO_2 to SO_3

$$SO_2 + \frac{1}{2}O_2 \xrightarrow{V_2O_5} SO_3$$

It is though that the actual oxidation process takes place in two stages. in the first step, V^{5+} in the presence of oxide ions converts SO_2 to SO_3. at the same time, V^{5+} is reduced to V^{4+}.

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In the second step. V^{5+} is regenerated from V^{4+} by oxygen:

$$2V^{4+} + \frac{1}{2}O_2 \rightarrow 2V^{5+} + O^{2-}$$

The overall process is, of course, the sum of these two steps:

$$SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$$

Q. Which of the following ion involved in the above process will show paramagnetism?

A. V^{5+}

B. V^{4+}

C. O^{2-}

D. VO_3^-

Answer: B

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8. (X) is very important laboratory reagent which is prepared by its naturally occurring ore which is called pyrolusite. Pyrolusite when fused with alkali in the presence of O_2, green compound (Y) is produced. (Y) is converted into (X) by electrolysis or by using ozone.

Q. On small scale (X) is prepared by disproportionation of (Y) is acidic solution. which of the following is produced by disproportionation of (Y) in slightly alkaline solution.

A. $KMnO_4, Mn^{+2}$

B. $KMnO_4, MnO_2$

C. MnO_2, Mn^{+2}

D. K_2MnO_4, Mn^{+2}

Answer: B

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9. (X) is very important laboratory reagent which is prepared by its naturally occurring ore which is called pyrolusite. Pyrolusite when fused with alkali in the presence of O_2, green compound (Y) is produced. (Y) is converted into (X) by electrolysis or by using ozone.

Q. Select the correct statements.

A. (X) is tetrahedral and diamagnetic

B. (Y) is tetrahedral and paramagnetic

C. (X) produce dimanganese hepta oxide (ioly liquid) with conc. H_2SO_4.

D. all are correct.

Answer: D

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10. Due to availability of vacant orbitals of sufficiently low energy, d-block elements form complexes, d-block elements have different properties such as-catalytic, magnetic, alloy formation, interistitial compounds formation. Interistitial compounds are those compound in which small atoms like carbon and boron fits into interistices of d-block elements crystal. in interistitial compounds, there is no chemical bond formation. chemcial properties remain almost same but physical properties may change.

Q. Which of the property of interistitial compounds has the same behaviour as that of the elements?

A. Malleability

B. Ductility

C. Electrical conductance.

D. Hardness.

Answer: C

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11. Due to availability of vacant orbitals of sufficiently low energy, d-block elements form complexes, d-block elements have different properties such as-catalytic, magnetic, alloy formation, interistitial compounds formation. Interistitial compounds are those compound in which small atoms like carbon and boron fits into interistices of d-block elements crystal. in interistitial compounds, there is no chemical bond formation. chemcial properties remain almost same but physical properties may change.

Q. Which of the following property gets decreased in interistitial compounds compared to that of the element?

A. Malleability

B. Metallic lustre

C. Hardness

D. Density

Answer: A

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12. Due to availability of vacant orbitals of sufficiently low energy, d-block elements form complexes, d-block elements have different properties such as-catalytic, magnetic, alloy formation, interistitial compounds formation. Interistitial compounds are those compound in which small atoms like carbon and boron fits into interistices of d-block elements crystal. in interistitial compounds, there is no chemical bond formation. chemcial properties remain almost same but physical properties may change.

Q. Select correct statement.

A. Highest oxidation state of 3d-series is +8.

B. Ni, Cu and Zn are not transition element.

C. Zieglar-Natta catalyst containis Vanadium.

D. Aq. Solution of Cu^{2+}, Fe^{+3} and Cr^{3+} are blue, yellow and green respectively.

Answer: D

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Match The Column Type

1. match the following columns

Column-I (Species)		Column- II (Colour in aq-solution)	
(a)	Co^{3+}, Co^{2+}	(p)	Yellow
(b)	Fe^{2+}	(q)	Pink
(c)	Cu^{2+}	(r)	Green
(d)	Mn^{3+}	(s)	Violet
(e)	Fe^{3+}	(t)	Blue

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2.

Column-I (Metals)		Column-II
(a) Zn	(p)	Cyanide process involved in the commercial extraction
(b) Cu	(q)	Extracted by hydrometallurgical process
(c) Ag	(r)	Roasting involved in the commercial extraction
(d) Au	(s)	Present in bi ass

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3.

Column-I (Catalyst)		Column-II
(a) $TiCl_4$	(p)	Adams catalyst in reduction
(b) $PdCl_2$	(q)	In preparation of $(CH_3)_2$ $SiCl_2$
(c) Pt PtO	(r)	Used as the Ziegler-Natta catalyst in polythene production
(d) Cu	(s)	Wacker process for converting C_2H_4 to CH_3CHO

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4. Match the following columns

Column-I		Column-II	
(a)	Cr_2O_3	(p)	Neutral oxide
(b)	CrO_3	(q)	Amphoteric oxide
(c)	Fe_3O_4	(r)	Mixed oxide
(d)	N_2O	(s)	Acidic oxide

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5. Match the following columns

Column-I (Metal ion of 3*d*-series)		Column-II (Characteristics)	
(a)	Ni^{2+}	(p)	Produce blue aq. solution
(b)	Cr^{2+}	(q)	Half filled t_{2g} orbitals in octahedral complex
(c)	V^{2+}	(r)	Diamagnetic ion
(d)	Ti^{4+}	(s)	Calculated μ = 2.84 B.M. (spin only)

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6. Match the following columns

Column-I (Metals)		Column-II (Process)	
(a)	$TiCl_3$	(p)	Wacker process
(b)	$PdCl_2$	(q)	Ziegler-Natta polymerization
(c)	$CuCl_2$	(r)	Contact process
(d)	V_2O_5	(s)	Deacon's process

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Subjective Type

1. Number of halide ions among $\left(F^-, Cl^-, Br^-, I^-\right)$ which change their oxidation number on heating with $MnO_2 + conc.\ H_2CO_4$

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2. Select the number of correct matches for the outermost electronic configuration for d-block elements.

$Nb - 5s^1 4d^4 (\text{group-5})$ $\quad$ $W - 6s^2 5d^4 (\text{group-6})$

$Tc - 5s^1 4d^6 (\text{group-7})$ $Rus - 5s^1 4d^7 (\text{group-8})$

$Rh - 5s^1 4d^8 (\text{group-9})$ $Pd - 5s^0 4d^{10} (\text{group-10})$

$Pt - 6s^0 5d^9 (\text{group-10})$ $V - 4s^2 3d^3 (\text{group-5})$

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3. Find the number of species among the following which can exist.

$TiO_2, VO_2^+, CrO_4^{2-}, MnO_4^-, FeO_4^{2-}, FeO_4^{2-}, VO^{2+}, TiO^{2+}, Sc^2O_3, Mn$

.

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4. Find the number of halides which do not exist.

$TiI_4, TiI_3, TiI_2, TiF_2, TiBr_2, TiCl_2, TiF_4, TiCl_4, TiCl_3$

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5. The number of halides that do not exist among the following:

$CuF_2, CuCl_2, CuBr_2, CuI_2, CuCl, CuBr, Cu_2I_2, CuF$

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6. Find the number of mixed oxides among the following:

$Mn_3O_4, Fe_3O_4, Co_3O_4, Mn_2O_3, MnO_2, Fe_2O_3, NiO, CrO_2, CrO_3,$

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7. Given the species $Mn^{3+}, Co^{3+}, Ti^{2+}, V^{2+}, Cr^{2+}, Fe^{2+}$

(a). Find the number of species which are strong oxidising agent=X

(b). Find the number of species which are strong reducing agents and will liberate hydrogen from dilute acid=Y.

Hence, find the value of 3X-Y

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8. Find the number of colourless species among the following:

$Sc^{3+}, Ti^{4+}, V^{3+}, Zn^{2+}, Mn^{2+}, Fe^{3+}, Ni^{2+}, Cu^{2+}, Cr^{3+}$

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9. Which of the following is amphoteric oxide?

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

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10. Predict the number of species which will be colourless in aqueous solution, among the following

$Ti^{3+}, V^{3+}, Cu^{+}, Sc^{3+}, Mn^{2+}, Fe^{3+}, Co^{2+}$

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11. When mixture of NaCl and $K_2Cr_2O_7$ is gently warmed with conc. H_2SO_4 then compound X is formed. What is the oxidation state of

central atom of X?

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12. Number of ions which given blue colour in aqueous state:

$V^{+4}, Ni^{+2}, Ti^{+3}, Co^{+2}, Fe^{+3}, Cu^{+2}$

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13. Define the oxidation states of Mn in product of the given reaction $3K_2MnO_4 + 2H_2O + 4CO_2 \rightarrow 2X + Y + 4KHCO_3$ if the oxidation state of Mn in product X and Y are n_1 and n_2 respectively. Then find out the value of $(n_1 + n_2)$.

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14. Find the number of metal ions which can produce high spin and low spin octahedral complex,

$Sc^{+3}, Ti^{+3}, V^{+3}, Cr^{+3}, Mn^{+3}, Fe^{+3}, Co^{+3}, Ni^{+2}$

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15. How many non-axial d-orbitals are involved in hybridisation of CrO_2Cl_2?

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16. Find the number of species from the following which has magnetic moment value of 1.73 B.M.

$Fe^{2+}, Cu^{2+}, Ni^{2+}, NO_2, NO_2^-, Sc^{2+}$

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17. Total number of moles of Mohr's salt required per mole of dichromate ions during volumetric analysis are _____.

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18. Find the number of reaction (s) in which no redox change takes place:

(a). $BaCl_2 + Na_2CrO_4 \xrightarrow{CH_3COOH}$

(b). $K_2Cr_2O_7 + NaOH \rightarrow$

(c). $Cr_2O_7^{2-} + NO_3^- \xrightarrow{H^+}$

(d). $Cr_2O_7^{2-} + C_2H_5Oh \xrightarrow{H^+}$

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