

**CHEMISTRY****BOOKS - VK JAISWAL ENGLISH****d-BLOCK ELEMENTS****Level 1**

1.  $CrO_4^{2-} \xrightleftharpoons[pH=Y]{pH=X} Cr_2O_7^{2-}$  The pH values of (X) and (Y) are respectively

A. 6, 8

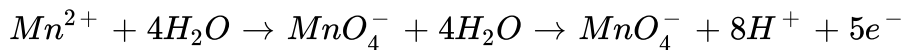
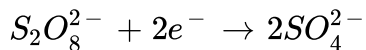
B. 6, 5

C. 8, 6

D. 7, 7

**Answer: A**

2. Manganese ions ( $Mn^{2+}$ ) can be oxidised by Persulphate ions  $S_2O_8^{2-}$  according to the following half-equations,



How many moles of  $S_2O_8^{2-}$  are required to oxidise 1mole of  $Mn^{2+}$ ?

A. 2.5

B. 2.0

C. 11.0

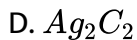
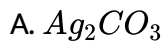
D. 0.4

**Answer: A**



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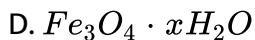
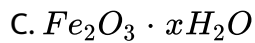
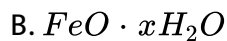
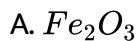
3. AgCl on fusion with sodium carbonate, gives :



**Answer: C**

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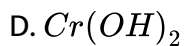
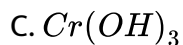
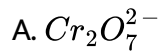
**4. Write the chemical formula of rust.**



**Answer: C**

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5.  $CrO_3$  dissolves in aqueous NaOH to give:

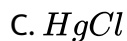


**Answer: B**



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6. Chemically philosopher of wool is



D.  $Hg_2Cl_2$

**Answer: A**

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7. Boiling  $CuCl_2$  with Cu in conc. HCl gives:

A.  $CuCl$

B.  $CuCl_2$

C.  $H[CuCl_2]$

D.  $Cu_2Cl$

**Answer: C**

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8. Thermal decomposition of zinc nitrate give:

A.  $Zn$

B.  $ZnO$

C.  $Zn(NO_3)_2$

D.  $NO$

**Answer: B**

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9. Malachite and azurite are used respectively are:

A. Blue and green pigment

B. Red and green pigment

C. Green and blue pigment

D. Green and red pigment

**Answer: C**

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10. Mercury containers are made of

A. Ag

B. Pb

C. Al

D. Fe

**Answer: D**



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11. 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, S

D. F, Cl

**Answer: A**



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**12.** White vitriol is

A. ZnS

B.  $ZnSO_4$

C.  $ZnSO_4 \cdot 7H_2O$

D.  $ZnCO_3$

**Answer: C**



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**13.** Among the following metals, the most dense is :



- A. Osmium
- B. Chromium
- C. Platinum
- D. Gold

**Answer: A**

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**14.** Give reason for the following:

Silver nitrate solution is kept in coloured bottles.

- A. oxidised in air
- B. decomposes in sunlight
- C. explodes in sunlight
- D. reacts with air in sunlight

**Answer: B**

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15. Which of the following is arranged in order of increasing melting point ?

A.  $Zn < Cu < Ni < Fe$

B.  $Fe < Ni < Cu < Zn$

C.  $Ni < Fe < Zn < Cu$

D.  $Cu < Zn < Fe < Ni$

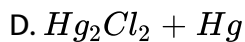
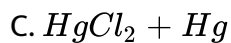
**Answer: A**

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16. Calomel is the name of

A.  $HgCl_2$

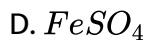
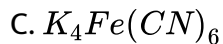
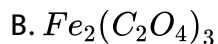
B.  $Hg_2Cl_2$



**Answer: B**

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17. The iron salt used in blue prints is :



**Answer: B**

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18. Percentage of gold in 14 carat gold is :

A. 58

B. 80

C. 40

D. 14

**Answer: A**



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19. The maximum and minimum melting points of first and second transition series respectively are observed with

A. *Cr* and *Zn*

B. *Cr* and *Hg*

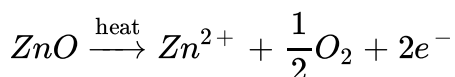
C. *Cr* and *Cd*

D. *Mo* and *Cd*

**Answer: C**

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20. Zinc oxide loses oxygen on heating according to the reaction,



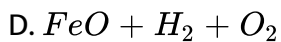
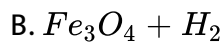
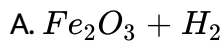
It becomes yellow on heating because

- A. d-d transition
- B. C-T spectra
- C. Higher polarisation caused by  $\text{Zn}^{2+}$  ion
- D. F-centres

**Answer: D**

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21. What happens when steam is passed over red hot iron ?



**Answer: B**

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**22. Verdigris is**

A. Basic copper acetate

B. Basic lead acetate

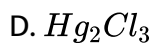
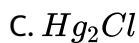
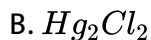
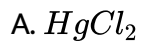
C. Basic lead

D. None

**Answer: A**

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23. The formula of corrosive sublimate is

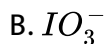


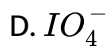
Answer: A



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



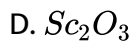


**Answer: B**



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25. Which of the following is the correct formula for a compound of scandium and oxygen?



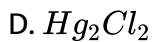
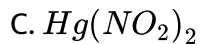
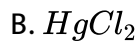
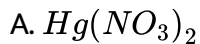
**Answer: D**



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26. Mercury on heating with aqua regia gives



**Answer: B**



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27. Chloroplatinic acid is

A. monobasic

B. dibasic

C. tribasic

D. tetrabasic

**Answer: B**

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

- A. Mercurous ion exists as  $Hg^+$
- B. Mercurous ion is diamagnetic and exists as dimer  $Hg_2^{2+}$
- C. Mercurous ion is colourless
- D. There is a metallic bond between two  $Hg^+$  ions

**Answer: A**

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**29.** Iron is rendered passive by treatment with

- A. dil. $H_2SO_4$

B. dil. HCl

C. conc.  $HNO_3$

D. conc.  $H_2SO_4$

**Answer: C**

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30.  $Na_2CO_3 + Fe_2O_3 \rightarrow A + CO_2$ , what is A in the reaction ?

A.  $NaFeO_2$

B.  $Na_2FeO_3$

C.  $Fe_3O_4$

D.  $Na_2FeO_4$

**Answer: A**

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31. Ferrous sulphate on heating gives:

A.  $SO_2$  and  $SO_3$

B.  $SO_2$  Only

C.  $SO_3$  Only

D.  $H_2S$  Only

**Answer: A**



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32. Photographic plates and films have an essential ingredient of

A. Silver Oxide

B. Silver Bromide

C. Silver Thiosulphate

D. Silver Nitrate

**Answer: B**



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**33.** In comparison of ferrous salts, ferric salts are:

- A. more stable
- B. less stable
- C. equally stable
- D. None of these

**Answer: A**



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**34.** Chrome yellow is chemically known as:

- A. lead chromate

B. lead sulphate

C. lead iodide

D. basic lead acetate

**Answer: A**



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**35.** The property, which is not characteristic of transition metals:

A. variable oxidation states

B. tendency to form complexes

C. formation of coloured compounds

D. None of these

**Answer: D**



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36. Iron is protected by coating it with a thin layer of:

A. Cu

B. Zn

C. Pb

D. Mg

**Answer: B**



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37. An oxide of copper which is red in colour has the formula:

A.  $CuO$

B.  $Cu_2O$

C.  $CuO_2$

D.  $Cu_2O_2$

**Answer: B**

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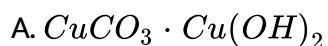
**38.** In a transition series, as the atomic number increases, paramagnetism

- A. increase gradually
- B. decrease gradually
- C. first increase to a maximum and then decrease
- D. first decrease to a minimum and then increase

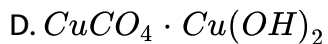
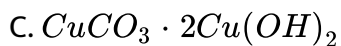
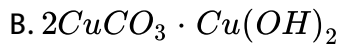
**Answer: C**

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**39.** The formula of azurite is :



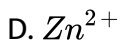




**Answer: C**

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**40. Oxide of metal cation which is not amphoteric ?**



**Answer: C**

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41. The most abundant transition metal in earth crust is :

A. Zn

B. Fe

C. Hg

D. Au

**Answer: B**



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42.  $CuSO_4$  solution + lime is called:

A. Luca's reagent

B. Befoed's reagent

C. Fehling solution A

D. Bordeaux mixture

**Answer: D**

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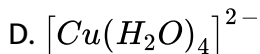
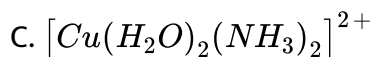
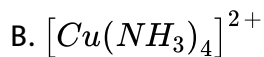
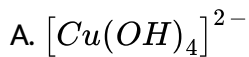
**43.** Preparation of looking mirrors involves the use of :

- A. red lead
- B. ammonical silver nitrate
- C. ammonical  $AgNO_3$ +red lead
- D. ammonical  $AgNO_3$ +red lead+HCHO

**Answer: D**

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**44.** When ammonia is added to cupric salt solution, the deep blue colour is observed it is due to the formation of:

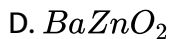
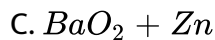


**Answer: B**



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45. Philosopher's wool when heated with  $BaO$  at  $100^\circ C$  gives the compounds:



**Answer: D**

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46. 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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47. On heating  $ZnCl_2 \cdot 2H_2O$ , the compounds obtained is

- A.  $ZnCl_2$
- B.  $Zn(OH)_2$

C.  $ZnO$

D.  $ZnH_2$

**Answer: B::C**



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**48.** 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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49. Fe is made passive by :

A.  $H_2SO_4$ (dil)

B.  $H_2PO_4$

C. conc. $HNO_3$

D. HCl

Answer: C



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50. When  $KMnO_4$  solution is added to hot oxalic acid solution, the decolourisation 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.  $MnO_4^-$  catalyst the reaction

**Answer: A**

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51. Gold dissolves in a aqua-regia forming:

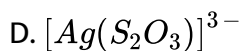
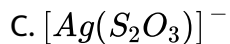
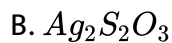
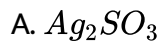
- A. Auric chloride
- B. Aurous chloride
- C. Chloroauric acid
- D. Aurous nitrate

**Answer: C**

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52. The solubility of silver bromide in hypo solution due to the formation of



**Answer: D**



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53. Metal used for making joints in jewellery is

A. Zn

B. Cu

C. Ag

D. Cd

**Answer: D**

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**54.** Zn and Cd metals do not show variable valency because:

- A. They have only two electrons in the outmost subshells
- B. Their d-subshells are completely filled
- C. Their d-subshells are partially filled
- D. They are relatively soft metals

**Answer: B**

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**55.** Zn and Cd metals do not show variable valency because:

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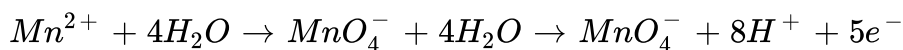
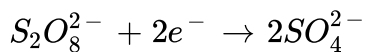
56.  $CrO_4^{2-}$  (yellow) changes to  $Cr_2O_7^{2-}$  (orange) in pH=x and vice-versa in pH=y. Hence, x and y are:

- A. 6, 8
- B. 6, 5
- C. 8, 6
- D. 7, 7

**Answer: A**

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57. Manganese ions ( $Mn^{2+}$ ) can be oxidised by Persulphate ions  $S_2O_8^{2-}$  according to the following half-equations,



How many moles of  $S_2O_8^{2-}$  are required to oxidise 1mole of  $Mn^{2+}$ ?

A. 2.5

B. 2.0

C. 11.0

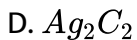
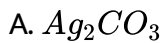
D. 0.4

**Answer: A**



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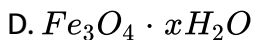
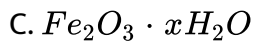
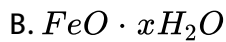
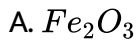
58. AgCl on fusion with  $Na_2CO_3$  forms:



**Answer: C**

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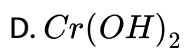
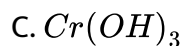
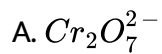
**59. Formula of Rust is :**



**Answer: C**

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60.  $CrO_4$  dissolves in aqueous NaOH to give :

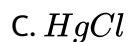


**Answer: B**



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61. Chemically philosopher of wool is :



D.  $Hg_2Cl_2$

**Answer: A**

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62. Boiling  $CuCl_2$  with Cu in conc. HCl gives:

A.  $CuCl$

B.  $CuCl_2$

C.  $H[CuCl_2]$

D.  $Cu_2Cl$

**Answer: A**

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63. Thermal decomposition of zinc nitrate give:

A.  $Zn$

B.  $ZnO$

C.  $Zn(NO_3)_2$

D.  $NO$

**Answer: B**

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**64.** Malachite and azurite are used respectively as:

A. Blue and green pigment

B. Red and green pigment

C. Green and blue pigment

D. Green and red pigment

**Answer: C**

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65. Mercury is transported in the containers made of :

A. Ag

B. Pb

C. Al

D. Fe

**Answer: D**



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66. 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, S

D. F, Cl

**Answer: A**



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**67.** White vitriol is

A. ZnS

B.  $ZnSO_4$

C.  $ZnSO_4 \cdot 7H_2O$

D.  $ZnCO_3$

**Answer: C**



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**68.** Among the following metals, the most dense is :

- A. Osmium
- B. Chromium
- C. Platinum
- D. Gold

**Answer: A**

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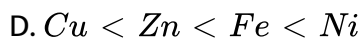
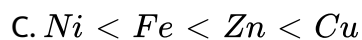
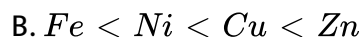
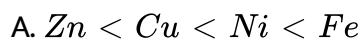
**69.** Silver nitrate is usually kept in coloured bottles because it is:

- A. oxidised in air
- B. decomposes in sunlight
- C. explodes in sunlight
- D. reacts with air in sunlight

**Answer: B**

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70. Which of the following is arranged in order of increasing melting point?

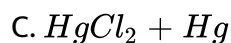
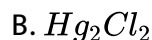
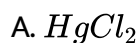


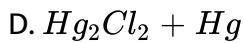
**Answer: A**



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71. Calomel is the name of :

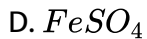
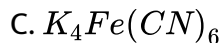
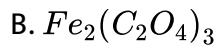




**Answer: B**

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72. The iron salt used in blue prints is :



**Answer: B**

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73. Percentage of gold in 14 carat gold is :

A. 58

B. 80

C. 40

D. 14

**Answer: A**



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**74.** The maximum and minimum melting point of first and second series elements respectively are obtained with:

A. *Cr* and *Zn*

B. *Cr* and *Hg*

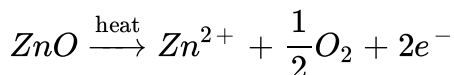
C. *Cr* and *Cd*

D. *Mo* and *Cd*

**Answer: C**

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75. Zinc oxide loses oxygen on heating according to the reaction,



It becomes yellow on heating because

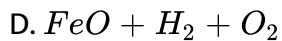
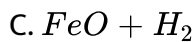
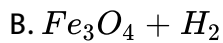
- A. d-d transition
- B. C-T spectra
- C. Higher polarisation caused by  $\text{Zn}^{2+}$  ion
- D. F-centres

**Answer: D**

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76. When steam is passed over red hot iron, the substance formed are:

- A.  $\text{Fe}_2\text{O}_3 + \text{H}_2$



**Answer: B**

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77. Verdigris is:

A. Basic copper acetate

B. Basic lead acetate

C. Basic lead

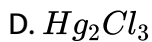
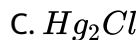
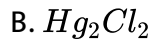
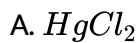
D. None

**Answer: A**

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78. Corrosive sublimate is :

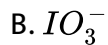


Answer: A



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79. The product of  $I^-$  with  $MnO_4^-$  in alkaline medium is:



**Answer: B**



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**80.** Which of the following is the correct formula for a compound of scandium and oxygen?

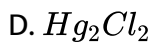
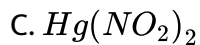
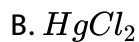
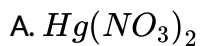


**Answer: D**



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**81.** Mercury on heating with aqua-regia gives:



**Answer: B**

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**82. Chloroplatinic acid is:**

A. monobasic

B. dibasic

C. tribasic

D. tetrabasic

**Answer: B**

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83. Which of the following statements is incorrect?

- A. Mercurous ion exists as  $Hg^+$
- B. Mercurous ion is diamagnetic and exists as dimer  $Hg_2^{2-}$
- C. Mercurous ion is colourless
- D. There is a metallic bond between two  $Hg^+$  ions

Answer: A



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84. Fe is made passive by :

- A. dil.  $H_2SO_4$
- B. dil. HCl
- C. conc.  $HNO_3$

D. conc.  $H_2SO_4$

**Answer: C**

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85.  $Na_2CO_3 + Fe_2O_3 \xrightarrow{\Delta} A + CO_2$  what is A in the reaction?

A.  $NaFeO_2$

B.  $Na_2FeO_3$

C.  $Fe_3O_4$

D.  $Na_2FeO_4$

**Answer: A**

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86. Ferrous sulphate on heating gives:

A.  $SO_2$  and  $SO_3$

B.  $SO_2$  Only

C.  $SO_3$  Only

D.  $H_2S$  Only

**Answer: A**

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87. Photographic films or plates have ..... as an essential ingredient.

A. Silver Oxide

B. Silver Bromide

C. Silver Thiosulphate

D. Silver Nitrate

**Answer: B**

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88. In comparison of ferrous salts, ferric salts are:

- A. more stable
- B. less stable
- C. equally stable
- D. None of these

**Answer: A**



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89. Chrome yellow is chemically known as:

- A. lead chromate
- B. lead sulphate
- C. lead iodide

D. basic lead acetate

**Answer: A**

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**90.** The property, which is not characteristic of transition metals:

- A. variable oxidation states
- B. tendency to form complexes
- C. formation of coloured compounds
- D. None of these

**Answer: D**

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**91.** Iron is protected by coating it with a thin layer of:



A. Cu

B. Zn

C. Pb

D. Mg

**Answer: B**



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**92.** An oxide of copper which is red in colour has the formula:

A.  $CuO$

B.  $Cu_2O$

C.  $CuO_2$

D.  $Cu_2O_2$

**Answer: B**



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93. In a transition series, as the atomic number increase paramagnetism:

- A. increase gradually
- B. decrease gradually
- C. first increase to a maximum and then decrease
- D. first decrease to a minimum and then increase

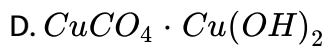
Answer: C



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94. The formula of azurite is:

- A.  $CuCO_3 \cdot Cu(OH)_2$
- B.  $2CuCO_3 \cdot Cu(OH)_2$
- C.  $CuCO_3 \cdot 2Cu(OH)_2$



**Answer: C**



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**95.** Oxide of metal cation which is not amphoteric?



**Answer: C**



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**96.** The most abundant transition metal in earth crust is :

A. Zn

B. Fe

C. Hg

D. Au

**Answer: B**

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97.  $CuSO_4$  solution +lime is called:

A. Luca's reagent

B. Befoed's reagent

C. Fihling solution A

D. Bordeaux mixture

**Answer: D**

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98. Preparation of looking mirrors involves the use of :

- A. red lead
- B. ammonical silver nitrate
- C. ammonical  $AgNO_3$ +red lead
- D. ammonical  $AgNO_3$ +red lead+HCHO

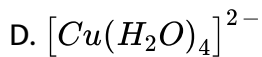
**Answer: D**



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99. When ammonia is added to cupric salt solution, the deep blue colour is observed it is due to the formation of:

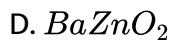
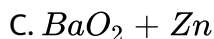
- A.  $[Cu(OH)_4]^{2-}$
- B.  $[Cu(NH_3)_4]^{2+}$
- C.  $[Cu(H_2O)_2(NH_3)_2]^{2+}$



**Answer: B**

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100. Philosopher's wool when heated with  $BaO$  at  $100^\circ C$  gives the compounds:



**Answer: D**

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101. The electrons 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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102. On heating  $ZnCl_2 \cdot 2H_2O$ , the compound obtained is:

- A.  $ZnCl_2$
- B.  $Zn(OH)_2$
- C.  $ZnO$
- D.  $ZnH_2$

**Answer: B::C**

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**103.** 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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**104.** Iron is rendered passive by treatment with:

A.  $H_2SO_4$ (dil)



B.  $H_2PO_4$

C. conc.  $HNO_3$

D. HCl

**Answer: C**

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

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

B.  $CO_2$  is formed

C. Reaction is exothermic

D.  $MnO_4^-$  catalyst the reaction

**Answer: A**



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106. Gold dissolves in a aqua-regia forming:

- A. Auric chloride
- B. Aurous chloride
- C. Chloroauric acid
- D. Aurous nitrate

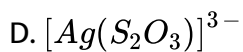
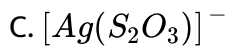
Answer: C



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107. The solubility of silver bromide in hypo solution is due to the formation of:

- A.  $Ag_2SO_3$
- B.  $Ag_2S_2O_3$



**Answer: D**

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**108.** Metal used for making joints in jewellery is:

A. Zn

B. Cu

C. Ag

D. Cd

**Answer: D**

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**109.** Zn and Cd metals do not show variable valency because:

- A. They have only two electrons in the outmost subshells
- B. Their d-subshells are completely filled
- C. Their d-subshells are partially filled
- D. They are relatively soft metals

**Answer: B**



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**110.** Zn and Cd metals do not show variable valency because:

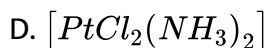
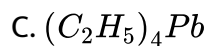
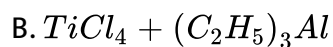
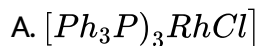
- A. They have only two electrons in the outmost subshells
- B. Their d-subshells are completely filled
- C. Their d-subshells are partially filled
- D. They are relatively soft metals

**Answer: B**

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## Level 2

1. Which of the following is known as Wilkinson's catalyst?



**Answer: A**

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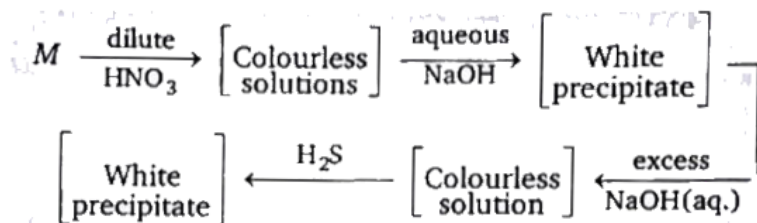
2. Which of the following is not a consequence of the Lanthanoid contraction?

- A. 5d series elements have a higher  $IE_1$  than 3d or 4d series
- B. Zr and Hf have a comparable size
- C. Zr and Hf occurs together in the earth crust in their minerals
- D. High density of the sixth period elements

Answer: D

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3. A metal M and its compound can give the following observable changes in a consequence of reactions



A. Mg

B. Pb

C. Zn

D. Sn

**Answer: C**

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4. Sodium thiosulphate is used to remove the unexposed AgBr from photographic films by forming a complex. In this complex of silver, the coordination number of silver is:

A. 2

B. 4

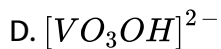
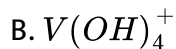
C. 6

D. 8

**Answer: B**

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5. Each of the following ion contains vanadium the +5 oxidation state except

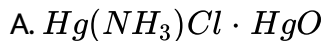


**Answer: C**

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6. Mercury (II) chloride solution on reaction with gaseous ammonia forms:



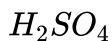


**Answer: A**

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7. Copper sulphate is prepared by blowing a current of air through copper scrap and dilute  $H_2SO_4$ . Dilute  $HNO_3$  is also added:

A. to oxidize copper to  $Cu^{2+}$  which then form  $CuSO_4$  with dilute



B. to oxidise  $Fe^{2+}$  to iron (III) sulphate, which remains in solution after crystallisation of  $CuSO_4$

C. to speed up the ionisation of  $H_2SO_4$  to give  $SO_4^{2-}$  ions

D. Which combines with  $H_2SO_4$  to give a very strong oxidising mixture and oxidise Cu to  $Cu^{2+}$

**Answer: A**



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8. 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. 1 and 2

B. 1 and 3

C. 2 and 4

D. 3 and 4

**Answer: B**

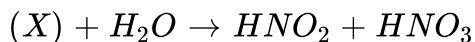
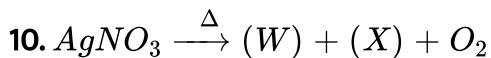
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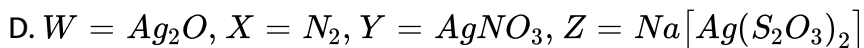
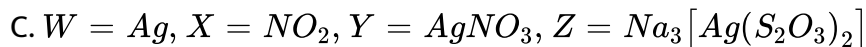
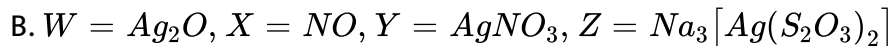
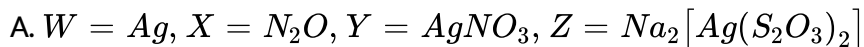
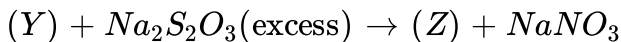
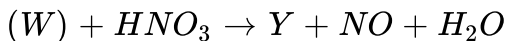
9. The false statement about iron (III) hydroxide is that:

- A. it is weaker base than  $Fe(OH)_2$
- B. with concentrated KOH, it forms a complex  $K_3[Fe(OH)_6]$
- C. it gradually loses water and transfer into  $Fe_2O_3$
- D. it exhibits amphoteric properties with its predominating acidic nature

**Answer: B::D**

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**Answer: C**



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**11.** The oxidation state of copper changes when aqueous copper (II) ions react with:

(I)  $NaOH(aq)$  (II)  $Fe(s)$  (III)  $KI(aq)$

A. I, II, III

B. II only

C. II, III

D. I only

**Answer: C**

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**12.** The aqueous solution of transition metal salt changes colour from pink to blue, when concentrated hydrochloric acid is added to it. The changes in colour is due to:

- A. evolution of hydrogen that changes the oxidation state of the metal ion
- B. change in the coordination number of the metal ion from 6 to 4 and formation of new species in solution
- C. formation of a coordination complex of the metal ion with hydrochloric acid
- D. protonation of the metal ion

**Answer: B**



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**13.** Limestone is present in the blast furnace production of iron in order to:

- (I) provide a source of CaO
- (II) remove some impurities
- (III) supply  $CO_2$

A. I, II, III

B. I, II

C. II, III

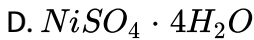
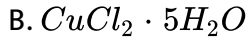
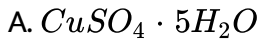
D. I only

**Answer: B**



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14. Paramagnetism is not exhibited by



Answer: C



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15. Which of the comparison Zn, Cd, Hg is/are incorrect?

(I)  $ZnCl_2$  is ionic whereas  $CdCl_2$  and  $HgCl_2$  is covalent

(II) Zn and Cd dissolves in dilute acid HCl liberating  $H_2$  but Hg can not

(III) Zn and cd forming with ppt. of  $Zn(OH)_2$  and  $Cd(OH)_2$  but Hg forms coloured ppt. of  $Hg(OH)_2$ .

(IV) All form  $A_2^{2+}$  type ion

A. Only III

B. I, III, IV

C. I and IV

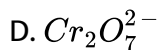
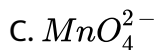
D. All of these

**Answer: B**



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**16.** The oxoanion in which the oxidation state of the central atom is same as its group number in the periodic table is:



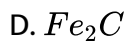
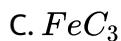
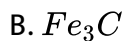
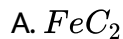
**Answer: D**



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17. Which compound is formed when iron reacts with carbon?

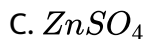
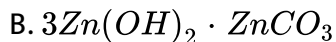


**Answer: B**



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18. Which of the following compound can produce Riemann's green with  $Co(NO_3)_2$  solution?

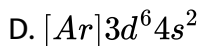
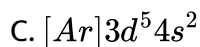
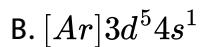
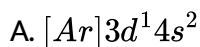


D. All of these

**Answer: D**

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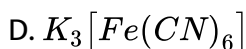
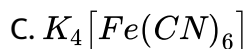
19. Which of the following electronic configuration is associated with the highest stable oxidation state?



**Answer: C**

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20. A blood red colour is obtained when ferric chloride solution reacts with:



**Answer: B**



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21. Metal-Metal bonding is more frequent in 4d or 5d series than in 3d series due to

A. their greater enthalpies of atomisation

B. the large size of the orbitals which participate in the metal-metal bond formation

- C. their ability to involve both  $ns$  and  $(n-1)d$  electrons in the bond formation
- D. the comparable size of 4d and 5d series elements

**Answer: A**

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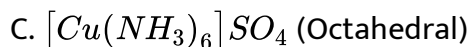
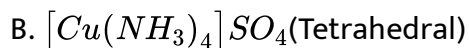
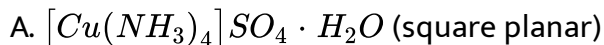
22. The maximum and minimum melting points of first and second transition series respectively are observed with

- A. Cr and Zn
- B. Cr and Cd
- C. Cr and Hg
- D. Mo and Cd

**Answer: B**

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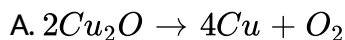
23. If a aqueous solution of copper (II) sulphate is saturated with ammonia, the blue compound ---- crystallises on evaporation.

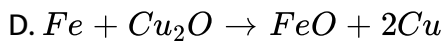
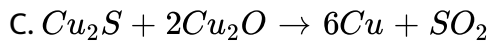


**Answer: A**

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24. In the extraction of copper, metal is formed in the Bessemer converter due to reaction

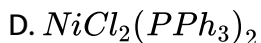
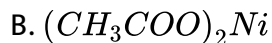
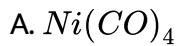




**Answer: C**

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25. The compound in which nickel has the lower oxidation states is :



**Answer: A**

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26. A metal  $M$  which is not affected by strong acids like conc.  $HNO_3$ , conc.  $H_2SO_4$  and conc. Solution of alkalies like  $NaOH$ ,  $KOH$  forms  $MCl_3$  which finds use for toning in photography. The metal  $M$  is

A. Ag

B. Hg

C. Au

D. Cu

**Answer: C**

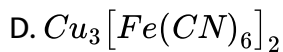
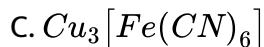


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27. Copper (II) ions gives reddish brown precipitate with potassium ferrocyanide. The formula of the precipitate is:

A.  $Cu_4[Fe(CN)_6]$

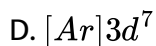
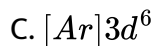
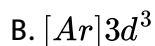
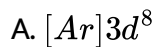
B.  $Cu_2[Fe(CN)_6]$



**Answer: B**

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**28.** Which of the following electronic configuration would be associated with the highest magnetic moment



**Answer: C**

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29. The correct statement about iron includes

(I) the oxidation state of iron is +6 in  $K_2FeO_4$

(II) that the iron shows +2 oxidation state with 6 electron in the 3d orbitals

(III) the common oxidation state of iron is +3 with five unpaired electron in the 3d orbital

A. I, II, III

B. I, II

C. II, III

D. I only

**Answer: A**



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30. Interstitial compounds are formed when small atoms are trapped inside the crystal lattice of metals. Which of the following are the

characteristic properties of interstitial compounds?

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

II. They are very hard.

III. They retain metallic conductivity.

IV. They are chemically very reactive.

A. I, II, III

B. I, III

C. II, IV

D. IV only

**Answer: A**



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**31.** The element below Mn in the periodic table, would be expected to

have high values for its :

(I) boiling point , (II) melting point

(III) density

A. I, II, III

B. I, II

C. II, III

D. I only

**Answer: A**

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**32.** All Zn(+II) compounds are white because:

A.  $Zn^{2+}$  has a  $d^{10}$  configuration and the d-subshell is full

B.  $Zn^{2+}$  shows d-d transition

C.  $Zn^{2+}$  has no electron in the 4s-subshell

D. Zn is not a transition element

**Answer: A**

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33. Identify the wrong statement regarding copper sulphate :

- A. It reacts with KI to give  $I_2$
- B. It reacts with KCl to give  $Cl_2$
- C. It's tartarate complex reacts with NaOH and glucose to give  $Cu_2O$
- D. It gives CuO on strong heating in air

Answer: B



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34. The transition metals exhibit higher enthalpies of atomisation due to:

- A. their ability to show variable oxidation states
- B. the presence of incompletely filled d-subshell
- C. their ability to exist in the solid state with unpaired electrons

D. strong interatomic interaction arises because of having large number of unpaired electrons in their atoms

**Answer: D**

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**35.** Which of the following are correct about Zn,Cd,Hg

- I) They exhibit enthalpy of atomisation as the d-subshell is full
- II) Zn,Cd do not show variable oxidation states, Hg can show +1,+2 states
- III) Compounds of *Zn*, *Cd*, *Hg* are paramagnetic
- IV) They are soft metals

A. I, II, III

B. I, III

C. II, IV

D. IV only

**Answer: C**



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36. When mercury (II) chloride is treated with excess of stannous chloride, the products obtained are :

- A. liquid Hg and  $SnCl_4$
- B.  $Hg_2Cl_2$  and  $SnCl_4$
- C.  $Hg_2Cl_2$  and  $[SnCl_4]^{2-}$
- D. liquid Hg and  $[SnCl_4]^{2-}$

Answer: A



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37. Which of the following is NOT a characteristic of the transition elements in the series from scandium to zinc?

- A. The formation of coloured cations

- B. The presence of at least one unpaired electron in a d-orbital of a cation
- C. The ability of form complex ions
- D. The possession of an oxidation state of +1

**Answer: A:D**

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**38.** Spiegeleisen is an alloy of

- A.  $Cu + Zn + Ni$
- B.  $Ni + Cr$
- C.  $Mn + Fe + C$
- D.  $Fe + Cr + Ni$

**Answer: C**

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39. The treatment of zinc with very dilute nitric acid produces:

A.  $NO$

B.  $N_2O$

C.  $NO_2$

D.  $NH_4^+$

Answer: D



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40. Sodium chromate,  $Na_2CrO_4$  is made commercially by :

A. heating mixture of  $Cr_2O_3$  and  $Na_2CO_3$

B. heating mixture of chromate ore and sodium carbonate in the presence of oxygen



C. heating sodium dichromate with sodium carbonate

D. reacting NaOH with chromic acid

**Answer: B**

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**41.** Anhydrous mercurous chloride can be prepared by:

A. the reduction of  $HgCl_2$  with  $SnCl_2$  solution

B. the reaction of  $HgCl_2$  with Hg

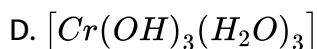
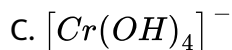
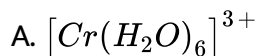
C. the reaction of Hg with concentrated HCl

D. None of these

**Answer: B**

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42. When aqueous NaOH is added to an aqueous solution of chromium (III) ions, a green blue precipitate is first formed which re - dissolves to give a green solution. The green colour is due to



Answer: C



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43.  $HgCl_2$  is a covalent compound, sparingly soluble in water, the solubility increase by the addition of chloride ions due to:

A. common ion effect

B. formation of complex  $[HgCl_4]^{2-}$

C. weakening of Hg-Cl bonds

D. strong ion-dipole forces

**Answer: B**

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44. Amongst  $TiF_6^{2-}$ ,  $CoF_6^{3-}$ ,  $Cu_2Cl_2$  and  $NiCl_4^{2-}$  the colourless species are:

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

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

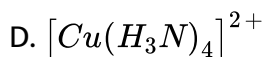
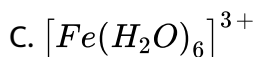
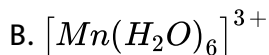
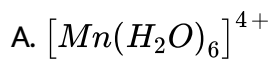
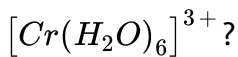
C.  $Cu_2Cl_2$  and  $NiCl_4^{2-}$

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

**Answer: D**

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45. Which of the following complex ion has a magnetic moment same as



**Answer: A**



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46. Silver nitrate solution is kept in brown bottles in laboratory because:

A. it reacts with ordinary bottles

B. brown bottles cut the passage of light through

C. brown bottles do not react with it

D. ordinary bottles catalyze its decomposition

**Answer: B**

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47. Copper is very slowly oxidised on the surface in moist air, giving a green coating of verdigris is :



**Answer: C**

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48.  $Fe(OH)_2$  is precipitated from Fe(II) solutions as a white solid turns dark green and then brown due to the formation of:

A.  $Fe(OH)_2$  and  $Fe(OH)_3$

B. Only  $Fe(OH)_3$

C.  $Fe_2O_3 \cdot (H_2O)_n$

D.  $Fe_2O_3 \cdot 2H_2O$

**Answer: C**

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**49.** Pure  $O_2$  instead of air is used to oxidise the pig iron because:

A. Molten metal took up small amount of nitrogen which makes the steel brittle

B. Air is not as efficient to oxidise all the impurities to their respective oxides

C. Air contains moisture and will precipitate iron as  $Fe_2O_3$

D. Iron reacts with air to  $FeCO_3$

**Answer: A**



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**50.** Give the correct order of initials T of F for following statements. Use T if statements is true and F if it is false.

*I)* Sulphide reacts with  $Na_2[Fe(CN)_5(NO)]$  to form a purple coloured compound  $Na_4[Fe(CN)_5(NOS)]$ . In the reaction, the oxidation state of iron changes.

*II)*  $Pt(IV)$  compounds are relatively more stable than  $Ni(IV)$  compounds

*III)* The welding of magnesium can be done in the atmosphere of Helium.

*IV)*  $LiAlH_4$  on hydrolysis will give  $H_2$

A. FFTT

B. FT TT

C. TFFT

D. TFFT

Answer: B

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51. For  $(A) + K_2CO_3 + air \xrightarrow{Heat} (B)$

$(B) + Cl_2 \rightarrow (C)$  pink

Which of the following is correct ?

A. X=black,  $MnO_2$ , Y=Blue,  $CrO_4$ , Z= $KMnO_4$

B. X=Green,  $Cr_2O_3$ , Y=Yellow,  $K_2CrO_4$ , Z= $K_2Cr_2O_7$

C. X=black,  $MnO_2$ , Y=green,  $K_2MnO_4$ , Z= $KMnO_4$

D. X=black,  $Bi_2O_3$ , Y=colourless,  $KBiO_2$ , Z= $KBiO_3$

Answer: C

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52. Sodium thiosulphate,  $Na_2S_2O_3 \cdot 5H_2O$  is used in photography to

- A. Reduce the silver bromide to metallic silver
- B. Convert the metallic silver to silver salt
- C. Reduce undecomposed AgBr as soluble silver thiosulphate complex
- D. Remove reduced silver

**Answer: C**



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53. The advantage(s) of using  $O_2$  rather than air in the steel industry is(are)

- (I) there is a faster conversion, so a given plant can produce more steel in a day.
- (II) larger quantities can be handled
- (III) it gives a pure product and the surface is free from nitrides

A. I only

B. II and III only

C. II only

D. I, II and III

**Answer: D**



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54. When  $AgNO_3$  comes in contact with skin, it leaves a black stain. This is because of:

A.  $HNO_3$  produced by hydrolysis of  $AgNO_3$

B.  $AgOH$  produced by hydrolysis of  $AgNO_3$

C. Its reduction of silver

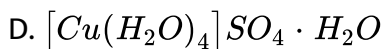
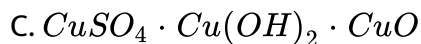
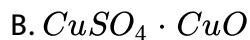
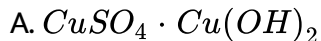
D. Its oxidation to silver oxide

**Answer: C**



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55. The aqueous solution of copper(II) sulphate is slowly hydrolysed forming basic copper sulphate whose chemical composition is:

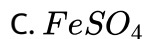
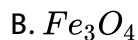
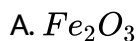


**Answer: A**



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56. Passivity of iron is due to formation of:



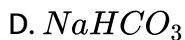
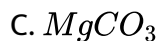
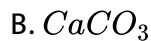
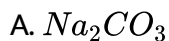
D. None of these

**Answer: B**



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57. Zinc carbonate is precipitated from zinc sulphate solution by the addition of:



**Answer: D**



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58. Mark the correct statements:

- A. Hg forms an amalgam with iron
- B. Hg vapour is non-poisonous
- C. Hg is mono atomic and monovalent in mercurous compound
- D. Oxysalts of mercury are thermally unstable

Answer: D

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59. Mercury is the only metal which is liquid at  $0^{\circ}C$ .this is due to

- A. Very high ionisation energy and weak metallic bond
- B. Low ionisation potential
- C. High atomic weight
- D. High vapour pressure

**Answer: A**

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**60.** A white precipitate of  $\text{AgCl}$  dissolves in excess of

*I)  $\text{NH}_3(\text{aq})$     II)  $\text{Na}_2\text{S}_2\text{O}_3$     III)  $\text{NaCN}$*

A. III only

B. I, II, III

C. I, II

D. I only

**Answer: B**

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**61.** In context of the lanthanoids, which of the following statement is not correct?

- A. Availability of 4f electrons results in the formation of compounds in +4 state of all the members of the series
- B. There is a gradual decrease in the radii of the members with increasing atomic number in the series
- C. All the members exhibit +3 oxidation state
- D. Because of similar properties the separation of lanthanoids is not easy

**Answer: A**

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**62.** Properties common to the elements manganese, iron, cobalt, nickel and copper include the ready formation by them all of

(I) coloured ions in aqueous solution

(II) oxides of nitrogen are formed on reaction with concentrated  $HNO_3$

(III) chlorides of formula  $MCl_2$  and  $MCl_3$

A. I, II, III

B. I, II

C. II, III

D. I only

**Answer: B**

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**63.** Which of the following process is not associated with steel making?

A. Bessemer process

B. Open-Hearth process

C. Kaldo process

D. Auto-oxidation

**Answer: D**

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64. Oxygen is absorbed by molten Ag, which is evolved on cooling and the silver particles are scattered, this phenomenon is known as:

- A. silvering of mirror
- B. spitting of silver
- C. frosting of silver
- D. hairing of silver

**Answer: B**



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65. Which of the following statements regarding copper salts is not true?

- A. Copper(I) disproportionates to copper and copper (II) ion in aqueous solution

- B. Copper(I) can be stabilised by the formation of insoluble complex compounds such as  $CuCl_2^-$  and  $Cu(CN)_2^-$
- C. Copper(II) oxide is red powder
- D. The water of crystallization of copper sulphate is five

**Answer: C::D**

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**66.** Zinc(II) ion on reaction with NaOH first give a white precipitate which dissolves in excess of NaOH due to the formation of :

- A.  $ZnO$
- B.  $Zn(OH)_2$
- C.  $[Zn(OH)_4]^{2-}$
- D.  $[Zn(H_2O)_4]^{2-}$

**Answer: C**

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67. The conversion of pig iron to steel frequently requires the addition of:

(I) oxygen or iron oxide (II) transition elements (III) inner transition elements (IV) silica

A. I, II, III

B. I, II

C. II, III

D. I only

**Answer: B**

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68. Dilute nitric acid on reaction with silver liberates:

A. NO gas

B.  $NO_2$  gas

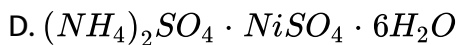
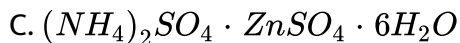
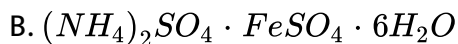
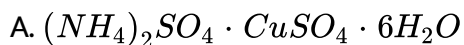
C.  $N_2$  gas

D.  $O_2$  gas

**Answer: A**

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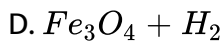
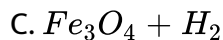
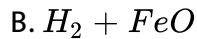
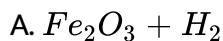
**69.** Which of the following double salt does not exists?



**Answer: C**

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70. When steam is passed over red hot iron, the substance formed are:

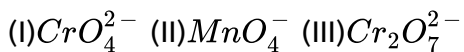


Answer: C



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71. The oxoanion which contains all equivalent  $M - O$  bond is:



A. III only

B. I, II, III

C. I, II

D. I only

**Answer: C**



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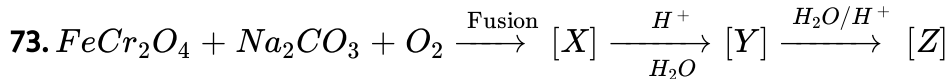
72. In the extraction of silver by Mac-arther cyanide process, a small of  $KNO_3$  is also added as a flux. The function of  $KNO_3$  is:

- A. to oxidise Ag in the native form to  $Ag^+$
- B. to oxidise lead and zinc impurities
- C. to form a complex with  $Ag^+$  which is then reduced to metallic silver by using zinc
- D. to oxidise the sulphur in the argentite ore to  $SO_2$  which escapes from the reaction

**Answer: B**



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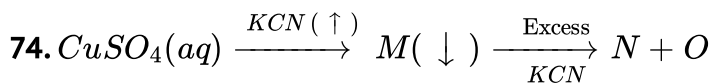


Which of the following statement is true for the compounds [X], [Y] and [Z]?

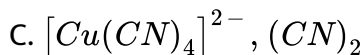
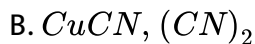
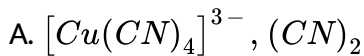
- A. In all three compounds, the chromium is in +6 oxidation state
- B. [Z] is a deep blue-violet coloured compound which decomposes rapidly in aqueous solution into  $\text{Cr}^{3+}$  and dioxygen
- C. Saturated solution of [Y] gives bright orange compound, chromic anhydride, with concentrated  $\text{H}_2\text{SO}_4$
- D. All of these

**Answer: D**

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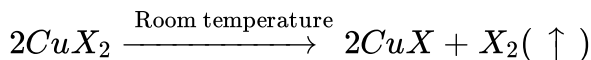
Then final products N and O are respectively.



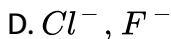
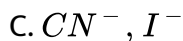
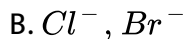
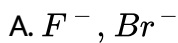
**Answer: A**

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**75.** Consider the following transformation :



Then  $X^-$  can be:



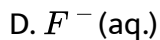
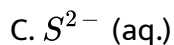
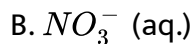
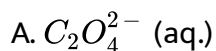


**Answer: C**



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**76.** Acidified permanganate solution does not oxidise:



**Answer: C::D**



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**77.** Which of the following salt on heating with solid  $K_2Cr_2O_7$  and Conc.  $H_2SO_4$ , orange red vapours are evolved which turn NaOH solution yellow.

A.  $NaBr$

B.  $NaCl$

C.  $NaNO_3$

D.  $NaI$

**Answer: B**

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**78.** Which of the following is called Wilkinson's catalyst?

A.  $[Ph_3P)_3RhCl]$

B.  $TiCl_4 + (C_2H_5)_3Al$

C.  $(C_2H_5)_4Pb$

D.  $[PtCl_2(NH_3)_2]$

**Answer: A**

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79. Which of the following is not a consequence of the Lanthanoid contraction?

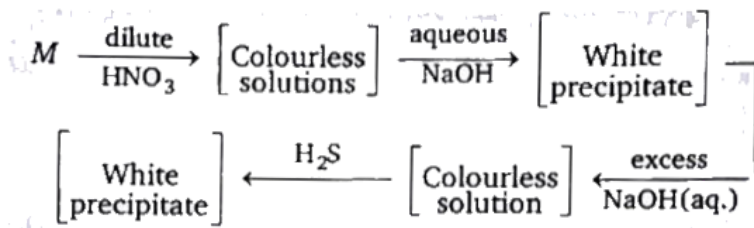
- A. 5d series elements have a higher  $IE_1$  than 3d or 4d series
- B. Zr and Hf have a comparable size
- C. Zr and Hf occurs together in the earth crust in their minerals
- D. High density of the sixth period elements

**Answer: D**



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80. A metal M and its compound can give the following observable changes in a consequence of reactions



- A. Mg
- B. Pb
- C. Zn
- D. Sn

**Answer: C**

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81. Sodium thiosulphate is used to remove the unexposed AgBr from photographic films by forming a complex. In this complex of silver, the coordination number of silver is:

- A. 2

B. 4

C. 6

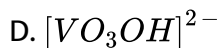
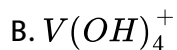
D. 8

**Answer: B**



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**82.** Each of the following ion contains vanadium the +V oxidation state except:

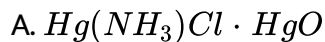


**Answer: C**



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83. Mercury (II) chloride solution on reaction with gaseous ammonia forms:



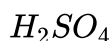
**Answer: A**



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84. Copper sulphate is prepared by blowing a current of air through copper scrap and dilute  $H_2SO_4$ . Dilute  $HNO_3$  is also added:

A. to oxidize copper to  $Cu^{2+}$  which then form  $CuSO_4$  with dilute



- B. to oxidise  $Fe^{2+}$  to iron (III) sulphate, which remains in solution after crystallisation of  $CuSO_4$
- C. to speed up the ionisation of  $H_2SO_4$  to give  $SO_4^{2-}$  ions
- D. Which combines with  $H_2SO_4$  to give a very strong oxidising mixture and oxidise Cu to  $Cu^{2+}$

**Answer: A**



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

Set 1:  $Zn(OH)_2(s)$  and  $OH^-(aq)$

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

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

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

A. 1 and 2

B. 1 and 3

C. 2 and 4

D. 3 and 4

**Answer: B**

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**86.** The false statement about iron (III) hydroxide is that:

A. it is weaker base than  $Fe(OH)_2$

B. with concentrated KOH, it forms a complex  $K_3[Fe(OH)_6]$

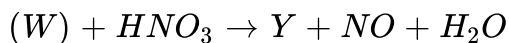
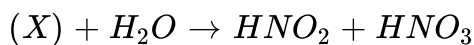
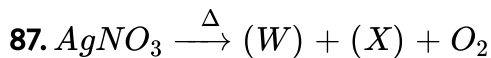
C. it gradually loses water and transfer into  $Fe_2O_3$

D. it exhibits amphoteric properties with its predominating acidic nature

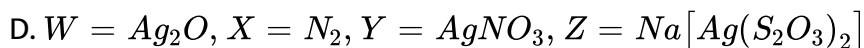
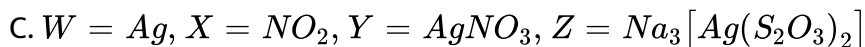
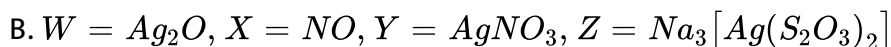
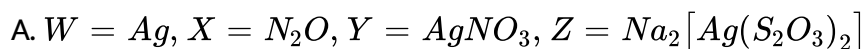
**Answer: B::D**

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Identify (W) to (Z).



**Answer: C**



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88. The oxidation state of copper changes when aqueous copper (II) ions react with:

(I)  $NaOH(aq)$  (II)  $Fe(s)$  (III)  $KI(aq)$

A. I, II, III

B. II only

C. II, III

D. I only

**Answer: C**



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**89.** The aqueous solution of transition metal salt changes colour from pink to blue, when concentrated hydrochloric acid is added to it. The changes in colour is due to:

A. evolution of hydrogen that changes the oxidation state of the metal ion

- B. change in the coordination number of the metal ion from 6 to 4  
and formation of new species in solution
- C. formation of a coordination complex of the metal ion with  
hydrochloric acid
- D. protonation of the metal ion

**Answer: B**

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**90.** Limestone is present in the blast furnace production of iron in order to:

- (I) provide a source of CaO
- (II) remove some impurities
- (III) supply  $CO_2$

A. I, II, III

B. I, II

C. II, III

D. I only

**Answer: B**

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91. Paramagnetism is not exhibited by:

A.  $CuSO_4 \cdot 5H_2O$

B.  $CuCl_2 \cdot 5H_2O$

C.  $CuI$

D.  $NiSO_4 \cdot 4H_2O$

**Answer: C**

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92. Which of the comparison Zn, Cd, Hg is/are incorrect?

(I)  $ZnCl_2$  is ionic whereas  $CdCl_2$  and  $HgCl_2$  is covalent

(II) Zn and Cd dissolves in dilute acid HCl liberating  $H_2$  but Hg can not

(III) Zn and cd forming with ppt. of  $Zn(OH)_2$  and  $Cd(OH)_2$  but Hg forms coloured ppt. of  $Hg(OH)_2$ .

(IV) All form  $A_2^{2+}$  type ion

A. Only III

B. I, III, IV

C. I and III

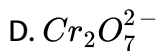
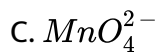
D. All of these

**Answer: B**



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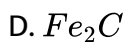
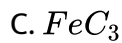
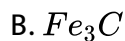
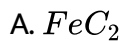
93. The oxoanion in which the oxidation state of the central atom is same as its group number in the periodic table is:



**Answer: D**

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**94.** Which compound is formed when iron reacts with carbon?



**Answer: B**

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95. Which of the following compound can produce Riemann's green with  $Co(NO_3)_2$  solution?

A.  $ZnO$

B.  $3Zn(OH)_2 \cdot ZnCO_3$

C.  $ZnSO_4$

D. All of these

**Answer: D**

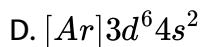
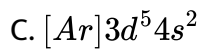


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96. Which of the following electronic configuration is associated with the highest stable oxidation state?

A.  $[Ar]3d^14s^2$

B.  $[Ar]3d^54s^1$

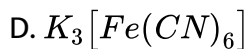
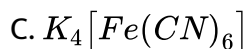


**Answer: C**



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97. A blood red colour is obtained when ferric chloride solution reacts with:



**Answer: B**



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98. Metal-Metal bonding is more frequent in 4d or 5d series than in 3d series due to

- A. their greater enthalpies of atomisation
- B. the large size of the orbitals which participate in the metal-metal bond formation
- C. their ability to involve both  $ns$  and  $(n-1)d$  electrons in the bond formation
- D. the comparable size of 4d and 5d series elements

**Answer: A**



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99. The maximum and minimum m.p. of 1st transition and 2nd transition series respectively are obtained with:

- A. Cr and Zn

B. Cr and Cd

C. Cr and Hg

D. Mo and Cd

**Answer: B**

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**100.** When an aqueous solution of copper (II) sulphate is saturated with ammonia, the blue compound crystallises on evaporation. The formula of this blue compound is:

A.  $[Cu(NH_3)_4]SO_4 \cdot H_2O$  (square planar)

B.  $[Cu(NH_3)_4]SO_4$  (Tetrahedral)

C.  $[Cu(NH_3)_6]SO_4$  (Octahedral)

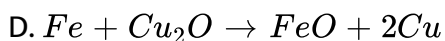
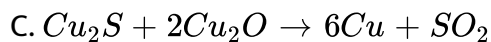
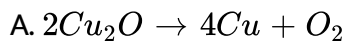
D.  $[Cu(SO_2)(NH_3)_5]$  (Octahedral)

**Answer: A**



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101. In the extraction of copper, metal is formed in the Bessemer converter due to reaction :

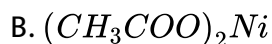
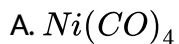


Answer: C



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102. The compound in which nickel has the lower oxidation states is :



C.  $NiO$

D.  $NiCl_2(PPh_3)_2$

**Answer: A**

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**103.** A metal M which is not affected by strong acids like conc. $HNO_3$ , conc. $H_2SO_4$  and conc. Solution of alkalies like  $NaOH$ ,  $KOH$  and  $MCl_3$ , which finds use for tanning in photography? The metal M is:

A. Ag

B. Hg

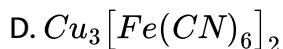
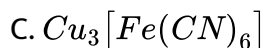
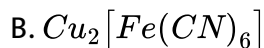
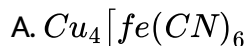
C. Au

D. Cu

**Answer: C**

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104. Copper (II) ions gives reddish brown precipitate with potassium ferrocyanide. The formula of the precipitate is:

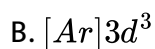
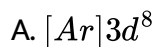


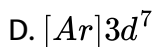
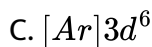
**Answer: B**



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105. Which of the following electronic configuration is associated with the highest magnetic moment?





**Answer: C**



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**106.** The correct statement about iron includes

(I) the highest oxidation state of iron is +6 in  $K_2FeO_4$

(II) that the iron shows +2 oxidation state with six electrons in the 3d orbitals

(III) the common oxidation state of iron is +3 with five unpaired electrons in the 3d orbital

A. I, II, III

B. I, II

C. II, III

D. I only

**Answer: A**



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

- I. They have high melting points in comparison to pure metals.
- II. They are very hard.
- III. They retain metallic conductivity.
- IV. They are chemically very reactive.

A. I, II, III

B. I, III

C. II, IV

D. IV only

**Answer: A**





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**108.** Technetium, the element below manganese in the Periodic Table, would be expected to have high values for its:

(I) melting point (II)boiling point (III)density

A. I, II, III

B. I, II

C. II, IV

D. IV only

**Answer: A**



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**109.** All Zn(+II) compounds are white because:

A.  $Zn^{2+}$  has a  $d^{10}$  configuration and the d-subshell is full



B.  $Zn^{2+}$  shows d-d transition

C.  $Zn^{2+}$  has no electron in the 4s-subshell

D. Zn is not a transition element

**Answer: A**

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**110.** Identify the wrong statement regarding copper sulphate :

A. It reacts with KI to give  $I_2$

B. It reacts with KCl to give  $Cl_2$

C. It's tartarate complex reacts with NaOH and glucose to give  $Cu_2O$

D. It gives CuO on strong heating in air

**Answer: B**

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111. The transition metals exhibit higher enthalpies of atomisation due to :

- A. their ability to show variable oxidation states
- B. the presence of incompletely filled d-subshell
- C. their ability to exist in the solid state with unpaired electrons
- D. strong interatomic interaction arises because of having large number of unpaired electrons in their atoms

**Answer: D**



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112. Which of the following are correct about Zn,Cd,Hg

- I) They exhibit enthalpy of atomisation as the d-subshell is full
- II) Zn,Cd do not show variable oxidation states, Hg can show +1,+2 states
- III) Compounds of *Zn*, *Cd*, *Hg* are paramagnetic
- IV) They are soft metals

A. I, II, III

B. I, III

C. II, IV

D. IV only

**Answer: C**

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**113.** When mercury (II) chloride is treated with excess of stannous chloride, the products obtained are :

A. liquid Hg and  $\text{SnCl}_4$

B.  $\text{Hg}_2\text{Cl}_2$  and  $\text{SnCl}_4$

C.  $\text{Hg}_2\text{Cl}_2$  and  $[\text{SnCl}_4]^{2-}$

D. liquid Hg and  $[\text{SnCl}_4]^{2-}$

**Answer: A**

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114. Which of the following is NOT a characteristic of the transition elements in the series from scandium to zinc?

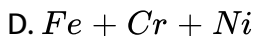
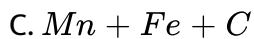
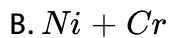
- A. The formation of coloured cations
- B. The presence of at least one unpaired electron in a d-orbital of a cation
- C. The ability to form complex ions
- D. The possession of an oxidation state of +1

**Answer: D**

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115. Spiegeleisen is an alloy of

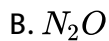
- A.  $Cu + Zn + Ni$



**Answer: C**

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**116.** The treatment of zinc with very dilute nitric acid produces:



**Answer: D**

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117. Sodium chromate,  $Na_2CrO_4$  is made commercially by :

- A. heating mixture of  $Cr_2O_3$  and  $Na_2CO_3$
- B. heating mixture of chromate ore and sodium carbonate in the presence of oxygen
- C. heating sodium dichromate with sodium carbonate
- D. reacting NaOH with chromic acid

**Answer: B**



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118. Anhydrous mercurous chloride can be prepared by:

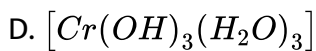
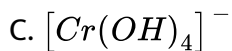
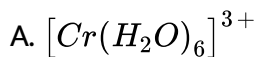
- A. the reduction of  $HgCl_2$  with  $SnCl_2$  solution
- B. the reaction of  $HgCl_2$  with Hg
- C. the reaction of Hg with concentrated HCl

D. None of these

**Answer: B**

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**119.** When aqueous sodium hydroxide is added to an aqueous solution of chromium (III) ions, a green blue precipitate is first formed which redissolves to give a green solution. This green colour is due to :



**Answer: C**

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120.  $\text{HgCl}_2$  is a covalent compound, sparingly soluble in water, the solubility increase by the addition of chloride ions due to:

- A. common ion effect
- B. formation of complex  $[\text{HgCl}_4]^{2-}$
- C. weakening of Hg-Cl bonds
- D. strong ion-dipole forces

**Answer: B**

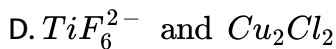


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121. Amongst  $\text{TiF}_6^{2-}$ ,  $\text{CoF}_6^{3-}$ ,  $\text{Cu}_2\text{Cl}_2$  and  $\text{NiCl}_4^{2-}$  the colourless species are:

- A.  $\text{CoF}_6^{3-}$  and  $\text{NiCl}_4^{2-}$
- B.  $\text{TiF}_6^{2-}$  and  $\text{CoF}_6^{3-}$
- C.  $\text{Cu}_2\text{Cl}_2$  and  $\text{NiCl}_4^{2-}$

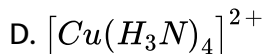
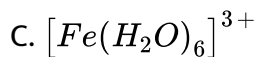
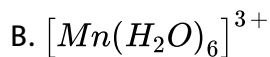
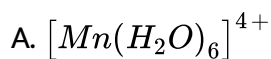
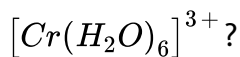




**Answer: D**

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**122.** Which of the following complex ion has a magnetic moment same as



**Answer: A**

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123. Silver nitrate solution is kept in brown bottles in laboratory because:

- A. it reacts with ordinary bottles
- B. brown bottles cut the passage of light through
- C. brown bottles do not react with it
- D. ordinary bottles catalyst its decomposition

**Answer: B**



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124. Copper is very slowly oxidised on the surface in moist air, giving a green coating of vergiris is :

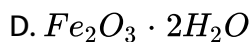
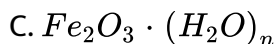
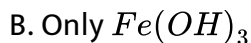
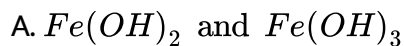
- A.  $Cu_2O$
- B.  $CuCO_3$
- C.  $Cu(CH_3COO)_2 \cdot Cu(OH)_2$
- D.  $CuSO_4$

**Answer: C**



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**125.**  $Fe(OH)_2$  is precipitated from Fe(II) solutions as a white solid turns dark green and then brown due to the formation of:



**Answer: C**



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**126.** Pure  $O_2$  instead of air is used to oxidise the pig iron because:

- A. Molten metal took up small amount of nitrogen which makes the steel brittle
- B. Air is not as efficient to oxidise all the impurities to their respective oxides
- C. Air contains moisture and will precipitate iron as  $Fe_2O_3$
- D. Iron reacts with air to  $FeCO_3$

**Answer: A**



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**127.** Give the correct order of initials T of F for following statements. Use T if statements is true and F if it is false.

I) Sulphide reacts with  $Na_2[Fe(CN)_5(NO)]$  to form a purple coloured compound  $Na_4[Fe(CN)_5(NOS)]$ . In the reaction, the oxidation state of iron changes.

II)  $Pt(IV)$  compounds are relatively more stable than  $Ni(IV)$  compounds

III) The welding of magnesium can be done in the atmosphere of Helium.

IV)  $LiAlH_4$  on hydrolysis will give  $H_2$

A. FFTT

B. FTTT

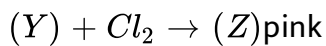
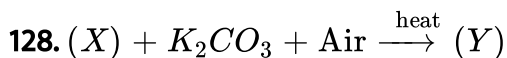
C. TFTF

D. TFFT

Answer: B



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Which of the following is correct?

A. X=black,  $MnO_2$ , Y=Blue,  $CrO_4$ , Z= $KMnO_4$

B. X=Green,  $Cr_2O_3$ , Y=Yellow,  $K_2CrO_4$ , Z= $K_2Cr_2O_7$

C. X=black,  $MnO_2$ , Y=green,  $K_2MnO_4$ , Z= $KMnO_4$

D. X=black,  $Bi_2O_3$ , Y=colourless,  $KBiO_2$ , Z= $KBiO_3$

**Answer: C**

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**129.** Sodium thiosulphate,  $Na_2S_2O_3 \cdot 5H_2O$  is used in photography to:

A. Reduce the silver bromide to metallic silver

B. Convert the metallic silver to silver salt

C. Reduce undecomposed AgBr as soluble silver thiosulphate complex

D. Remove reduced silver

**Answer: C**

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**130.** The advantage(s) of using  $O_2$  rather than air in the steel industry is(are)

(I) there is a faster conversion , so a given plant can produce more steel in a day.

(II) larger quantities can be handled

(III) it gives a pure product and the surface is free from nitrides

A. I only

B. II and III only

C. II only

D. I, II and III

**Answer: D**



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**131.** When  $AgNO_3$  comes in contact with skin, it leaves a black stain. This is because of:

A.  $HNO_3$  produced by hydrolysis of  $AgNO_3$

B.  $AgOH$  produced by hydrolysis of  $AgNO_3$

C. Its reduction of silver

D. Its oxidation to silver oxide

**Answer: C**

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**132.** The aqueous solution of copper(II) sulphate is slowly hydrolysed forming basic copper sulphate whose chemical composition is:

A.  $CuSO_4 \cdot Cu(OH)_2$

B.  $CuSO_4 \cdot CuO$

C.  $CuSO_4 \cdot Cu(OH)_2 \cdot CuO$

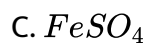
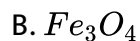
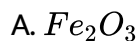
D.  $[Cu(H_2O)_4]SO_4 \cdot H_2O$

**Answer: A**



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133. Passivity of iron is due to formation of:

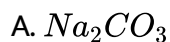


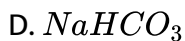
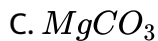
D. None of these

**Answer: B**

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134. Zinc carbonate is precipitated from zinc sulphate solution by the addition of:





**Answer: D**

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**135. Mark the correct statements:**

A. Hg forms an amalgam with iron

B. Hg vapour is non-poisonous

C. Hg is mono atomic and monovalent in mercurous compound

D. Oxysalts of mercury are thermally unstable

**Answer: D**

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136. Mercury is a liquid metal because

- A. Very high ionisation energy and weak metallic bond
- B. Low ionisation potential
- C. High atomic weight
- D. High vapour pressure

**Answer: A**



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137. A white precipitate of AgCl dissolves in excess of :

(I)  $NH_3(aq)$  (II)  $Na_2S_2O_3$  (III) NaCN

- A. III only
- B. I, II, III
- C. I, II
- D. I only

**Answer: B**



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**138.** In context of the lanthanoids, which of the following statement is not correct?

- A. Availability of 4f electrons results in the formation of compounds in +4 state of all the members of the series
- B. There is a gradual decrease in the radii of the members with increasing atomic number in the series
- C. All the members exhibit +3 oxidation state
- D. Because of similar properties the separation of lanthanoids is not easy

**Answer: A**



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139. Properties common to the elements manganese, iron, cobalt, nickel and copper include the ready formation by them all of

(I) coloured ions in aqueous solution

(II) oxides of nitrogen are formed on reaction with concentrated  $HNO_3$

(III) chlorides of formula  $MCl_2$  and  $MCl_3$

A. I, II, III

B. I, II

C. II, III

D. I only

**Answer: B**



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140. Which of the following process is not associated with steel making?

A. Bessemer process

B. Open-Hearth process

C. Kaldo process

D. Auto-oxidation

**Answer: D**

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**141.** Oxygen is absorbed by molten Ag, which is evolved on cooling and the silver particles are scattered, this phenomenon is known as:

A. silvering of mirror

B. spitting of silver

C. frosting of silver

D. hairing of silver

**Answer: B**

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142. Which of the following statements regarding copper salts is not true?

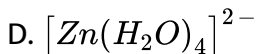
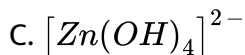
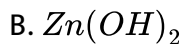
- A. Copper(I) disproportionates to copper and copper (II) ion in aqueous solution
- B. Copper(I) can be stabilised by the formation of insoluble complex compounds such as  $CuCl_2^-$  and  $Cu(CN)_2^-$
- C. Copper(II) oxide is red powder
- D. The water of crystallization of copper sulphate is five

Answer: C



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143. Zinc(II) ion on reaction with NaOH first give a white precipitate which dissolves in excess of NaOH due to the formation of :



**Answer: C**



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**144.** The conversion of pig iron to steel frequently requires the addition of:

(I) oxygen or iron oxide (II) transition elements (III) inner transition elements (IV) silica

A. I, II, III

B. I, II

C. II, III

D. I only



**Answer: B**

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**145.** Dilute nitric acid on reaction with silver liberates:

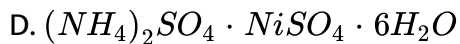
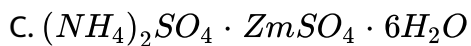
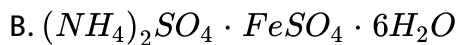
- A. NO gas
- B.  $NO_2$  gas
- C.  $N_2$  gas
- D.  $O_2$  gas

**Answer: A**

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**146.** Which of the following double salt does not exist?

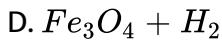
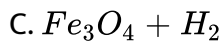
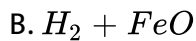
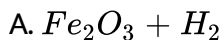
- A.  $(NH_4)_2SO_4 \cdot CuSO_4 \cdot 6H_2O$



**Answer: A**

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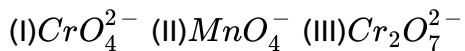
**147.** When steam is passed over red hot iron, the substance formed are:



**Answer: C**

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148. The oxoanion which contains all equivalent  $M - O$  bond is:



A. III only

B. I, II, III

C. I, II

D. I only

Answer: C



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149. In the extraction of silver by Mac-arther cyanide process, a small of  $KNO_3$  is also added as a flux. The function of  $KNO_3$  is:

A. to oxidise  $Ag$  in the native form to  $Ag^+$

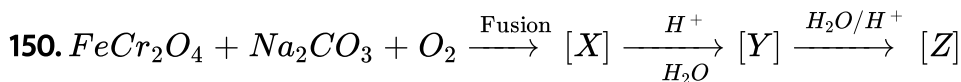
B. to oxidise lead and zinc impurities

C. to form a complex with  $Ag^+$  which is then reduced to metallic silver by using zinc

D. to oxidise the sulphur in the argentite ore to  $SO_2$  which escapes from the reaction

**Answer: B**

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Which of the following statement is true for the compounds [X], [Y] and [Z]?

A. In all three compounds, the chromium is in +6 oxidation state

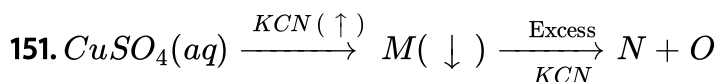
B. [Z] is a deep blue-violet coloured compound which decomposes rapidly in aqueous solution into  $Cr^{3+}$  and dioxygen

C. Saturated solution of [Y] gives bright orange compound, chromic anhydride, with concentrated  $H_2SO_4$

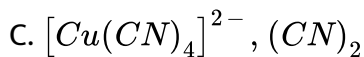
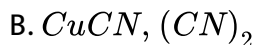
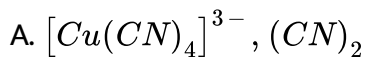
D. All of these

**Answer: D**

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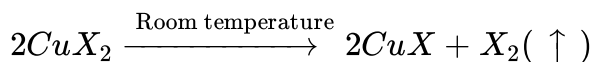
Then final products N and O are respectively.



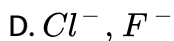
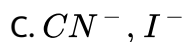
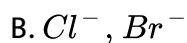
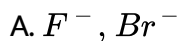
**Answer: A**

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152. Consider the following transformation :



Then  $X^-$  can be:

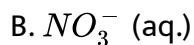
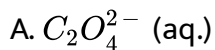


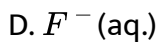
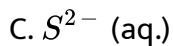
Answer: C



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153. Acidified permanganate solution does not oxidise:



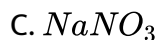


**Answer: C::D**



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**154.** Which of the following soled salt on heating with solid  $K_2Cr_2O_7$  and conc.  $H_2SO_4$  orange red vapours are evolved which turn aqueous NaOH solution yellow?



**Answer: B**

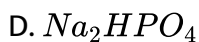
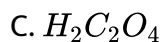
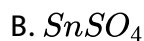
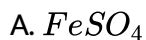


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### Level 3

1. In salts of polyatomic anion, as polarising power of cation increase, thermal stability of the salt decrease and decomposed species may further undergo redox reaction

Q. Which of the following species undergoes non-redox thermal decomposition reaction on heating?



**Answer: D**

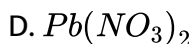
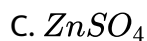
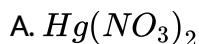


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2. In salts of polyatomic anion, as polarising power of cation increase, thermal stability of the salt decrease and decomposed species may further undergo redox reaction

Q. Water soluble salt(x) was heated into three products A, B and C and B and C are two different paramagnetic gases. A is red in hot condition, then salt(x) is :



**Answer: D**

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3. Light green (compound 'A')  $\xrightarrow{\Delta}$  white Residue(B)  $\xrightarrow[\text{Temp.}]{\text{high } C}$   $D + E$

(i)'D' and 'E' are two acidic gas.

(ii) 'D' is passed through  $HgCl_2$  solution to give yellow ppt.

(iii) 'E' is passed through water first and then  $H_2S$  is passed, white turbidity is obtained.

(iv) A is water soluble and addition of  $HgCl_2$  in it, yellow ppt. is obtained but white ppt does not turn into grey on addition of excess solution of 'A'

Q. 'D' and 'E' are respectively.

A.  $SO_2$  and  $SO_3$

B.  $SO_3$  and  $SO_2$

C.  $SO_2$  and  $CO_2$

D.  $CO_2$  and  $CO$

**Answer: B**

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4.

$Lightgreen(Compound\ 'A') \xrightarrow{\Delta} WhiteResidue\ '(B)' \xrightarrow[Temp]{High} C + D + \dots$

i) 'D' and 'E' are two acidic gases.

ii) 'D' is passed through  $HgCl_2$  solution to give yellow pt.

iii) 'E' is passed through water first and then  $H_2S$  is passed, white turbidity is obtained.

iv) A is water soluble and addition of  $HgCl_2$  in it, white ppt is obtained but white ppt does not turn into grey on addition of excess solution of 'A'.

Yellow ppt in the above observation is

- A. Mercuric oxide
- B. Basic mercury(II) sulphite
- C. Basic mercury (II) sulphate
- D. Mercuric iodine

**Answer: C**

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5.



i) 'D' and 'E' are two acidic gases.

ii) 'D' is passed through  $HgCl_2$  solution to give yellow ppt.

iii) 'E' is passed through water first and then  $H_2S$  is passed, white turbidity is obtained.

iv) A is water soluble and addition of  $HgCl_2$  in it, white ppt is obtained but white ppt does not turn into grey on addition of excess solution of 'A'.

'C' is soluble in

A. dil. HCl

B. dil.  $H_2SO_4$

C. Conc.  $CH_3COOH$

D. Boiled conc. HCl

**Answer: D**



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6. Light green (compound 'A')  $\xrightarrow{\Delta}$  white Residue(B)  $\xrightarrow[\text{Temp.}]{\text{high } C}$  + D + E

(i) 'D' and 'E' are two acidic gas.

(ii) 'D' is passed through  $HgCl_2$  solution to give yellow ppt.

(iii) 'E' is passed through water first and then  $H_2S$  is passed, white turbidity is obtained.

(iv) A is water soluble and addition of  $HgCl_2$  in it, yellow ppt. is obtained but white ppt does not turn into grey on addition of excess solution of 'A'

Q. Yellow ppt in the above observation is :

A. 0

B. 2

C. 7

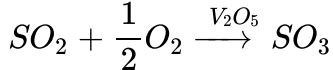
D. 5

**Answer: C**



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7. Transition metal and their compounds are used as catalyst in industry and in biological system. 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  $SO_3$ :



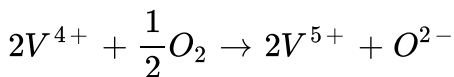
It is thought that the actual oxidation process takes place in two stages.

In the first step,  $V^{5+}$  in the presence of oxide ions converts  $SO_2$  to  $SO_3$ .

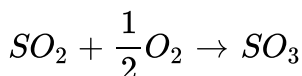
At the same time,  $V^{5+}$  is reduced to  $V^{4+}$ .



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



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



Q. Catalytic activity in transition metals depends on:

- A. Catalyst undergoes changes in oxidation state
- B. Catalyst increase the rate constant
- C. Catalyst is regenerated in its original form when the reactants form the products
- D. All are correct

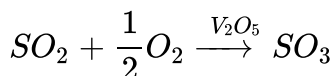
**Answer: D**



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8. Transition metal and their compounds are used as catalyst in industry and in biological system. 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

$SO_3$ :



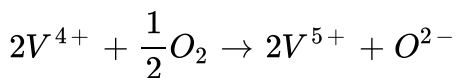
It is thought that the actual oxidation process takes place in two stages.

In the first step,  $V^{5+}$  in the presence of oxide ions converts  $SO_2$  to  $SO_3$ .

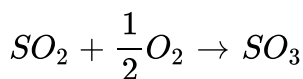
At the same time,  $V^{5+}$  is reduced to  $V^{4+}$ .



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



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



Q. Catalytic activity in 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 these

**Answer: A**

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9.  $MnO_2$  is the most important oxide of manganese,  $MnO_2$  occurs naturally as the black coloured mineral pyrolusite. It is an oxidising agent, and decomposes to  $Mn_3O_4$  on heating to  $530^\circ\text{C}$ . It is used in the preparation of potassium permanganate and in the production of  $Cl_2$  gas. Over half million tonnes per year of  $MnO_2$  is used in dry batteries.

Q. In the laboratory,  $MnO_2$  is made by:

A. heating Mn in  $O_2$

B. oxidising  $Mn^{2+}$  in air

C. electrolytic oxidation of  $MnSO_4$



D. precipitating  $MnO_2$  from solution when performing titration of  $KMnO_4$  in alkaline medium

**Answer: D**

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10.  $MnO_2$  is the most important oxide of manganese,  $MnO_2$  occurs naturally as the black coloured mineral pyrolusite. It is an oxidising agent, and decomposes to  $Mn_3O_4$  on heating to  $530^\circ\text{C}$ . It is used in the preparation of potassium permanganate and in the production of  $Cl_2$  gas. Over half million tonnes per year of  $MnO_2$  is used in dry batteries.

Q. When  $MnO_2$  is fused with KOH in the presence of air, the product formed is:

- A. Purple colour  $KMnO_4$
- B. Green colour  $K_2MnO_4$
- C. Colourless  $MnO_4^-$

D. None of these

**Answer: B**

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11.  $MnO_2$  is the most important oxide of manganese,  $MnO_2$  occurs naturally as the black coloured mineral pyrolusite. It is an oxidising agent, and decomposes to  $Mn_3O_4$  on heating to  $530^\circ\text{C}$ . It is used in the preparation of potassium permanganate and in the production of  $Cl_2$  gas. Over half million tonnes per year of  $MnO_2$  is used in dry batteries.

Q.  $MnO_2$  dissolves in concentrated HCl to form:

A.  $Mn^{4+}$  ion and  $Cl_2$

B.  $Mn^{2+}$  ion and  $Cl_2$

C.  $[MnCl_4]^{2-}$  and  $Cl_2$

D. only  $[MnCl_4]^{2-}$

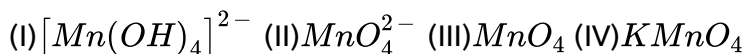
**Answer: B**



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12.  $MnO_2$  is the most important oxide of manganese,  $MnO_2$  occurs naturally as the black coloured mineral pyrolusite. It is an oxidising agent, and decomposes to  $Mn_3O_4$  on heating to  $530^\circ C$ . It is used in the preparation of potassium permanganate and in the production of  $Cl_2$  gas. Over half million tonnes per year of  $MnO_2$  is used in dry batteries.

Q. In which of the following species, the colour is due to charge transfer?



A. I, II, III

B. II, IV

C. I, III

D. only IV

Answer: D



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13. Iron (+II) is one of the most important oxidation states and salts are called ferrous salts. Most of the  $Fe(+II)$  salts are pale green and contain  $[Fe(H_2O)_6]^{2+}$  ion.  $Fe(+II)$  compounds are easily oxidised by air and so are difficult to obtain pure  $Fe^{2+}$  form many complexes like  $K_4[Fe(CN)_6]$ .

Q. Anhydrous  $FeCl_2$  is made by :

- A. heating Fe with dilute HCl
- B. heating Fe with gaseous HCl
- C. reacting Fe with conc. HCl
- D. heating Fe with  $Cl_2$  gas

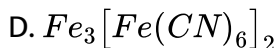
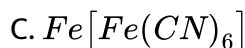
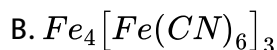
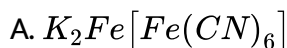
Answer: B

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14. Iron (+II) is one of the most important oxidation states and salts are called ferrous salts. Most of the  $Fe(+II)$  salts are pale green and

contain  $[Fe(H_2O)_6]^{2+}$  ion. Fe(+II) compounds are easily oxidised by air and so are difficult to obtain pure  $Fe^{2+}$  form many complexes like  $K_4[Fe(CN)_6]$ .

Q.  $K_3[Fe(CN)_6]$  is used in the detection of  $Fe^{2+}$  ion with which it gives a deep blue colour. This colour is due to the formation of :

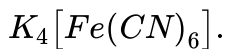


**Answer: D**



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**15.** Iron (+II) is one of the most important oxidation states and salts are called ferrous salts. Most of the  $Fe(+II)$  salts are pale green and contain  $[Fe(H_2O)_6]^{2+}$  ion. Fe(+II) compounds are easily oxidised by air and so are difficult to obtain pure  $Fe^{2+}$  form many complexes like



Q.  $K_3[Fe(CN)_6]$  is used in the detection of  $Fe^{2+}$  ion with which it gives a deep blue colour. This colour is due to the formation of :

A. I, II, III

B. I, III

C. II, III

D. I only

**Answer: A**



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**16.** Iron forms iron halides salts by reacting the metal directly with halogen.  $FeI_3$  does not exist.  $FeF_3$  is white soled inspite of five unpaired electrons with  $d^5$  configuration .  $FeCl_3$  is soluble in water and is used as a mordant in dyeing industry.

Q.  $FeI_3$  does not exist because:

A. of large size

B.  $Fe^{3+}$  oxidise  $I^-$  to  $I_2$

C. of low lattice energy

D. iodine is not highly electronegative enough to oxidise Fe to  $Fe^{3+}$

**Answer: B**

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17. Iron forms iron halides salts by reacting the metal directly with halogen.  $FeI_3$  does not exist.  $FeF_3$  is white soled inspite of five unpaired electrons with  $d^5$  configuration .  $FeCl_3$  is soluble in water and is used as a mordant in dyeing industry.

Q. Anhydrous  $FeCl_3$  can be prepared by reaction of:

A. Fe with dry chlorine

B. Fe with dil.HCl in the presence of  $O_2$

C.  $Fe(OH)_3$  with conc. HCl

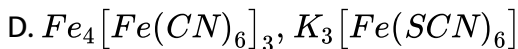
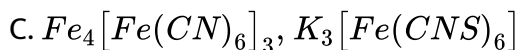
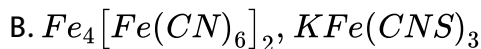
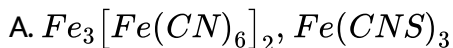
D.  $Fe_2O_3$  with conc. HCl

Answer: A

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18. Iron forms iron halides salts by reacting the metal directly with halogen.  $FeI_3$  does not exist.  $FeF_3$  is white soled inspite of five unpaired electrons with  $d^5$  configuration .  $FeCl_3$  is soluble in water and is used as a mordant in dyeing industry.

Q.  $FeCl_3$  solution added to  $K_4[Fe(CN)_6]$  gives A while with  $KSCN$  gives B. A and B respectively are:



Answer: D

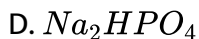
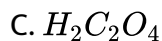
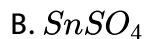
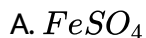




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19. In salts of polyatomic anion, as polarising power of cation increase, thermal stability of the salt decrease and decomposed species may further undergo redox reaction

Q. Which of the following species undergoes non-redox thermal decomposition reaction on heating?



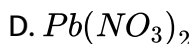
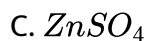
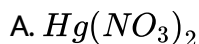
**Answer: D**



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20. In salts of polyatomic anion, as polarising power of cation increase, thermal stability of the salt decrease and decomposed species may further undergo redox reaction

Q. Water soluble salt(x) was heated into three products A, B and C and B and C are two different paramagnetic gases. A is red in hot condition, then salt(x) is :



**Answer: D**

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21. Light green (compound 'A')  $\xrightarrow{\Delta}$  white Residue(B)  $\xrightarrow[\text{Temp.}]{\text{high}}$  C + D + E

(i)'D' and 'E' are two acidic gas.

(ii) 'D' is passed through  $HgCl_2$  solution to give yellow ppt.

(iii) 'E' is passed through water first and then  $H_2S$  is passed, white turbidity is obtained.

(iv) A is water soluble and addition of  $HgCl_2$  in it, yellow ppt. is obtained but white ppt does not turn into grey on addition of excess solution of 'A'

Q. 'D' and 'E' are respectively.

A.  $SO_2$  and  $SO_3$

B.  $SO_3$  and  $SO_2$

C.  $SO_2$  and  $CO_2$

D.  $CO_2$  and  $CO$

**Answer: B**

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22. Light green (compound 'A')  $\xrightarrow{\Delta}$  white Residue(B)  $\xrightarrow[\text{Temp.}]{\text{high } C}$  + D + E

(i)'D' and 'E' are two acidic gas.

(ii) 'D' is passed through  $HgCl_2$  solution to give yellow ppt.

(iii) 'E' is passed through water first and then  $H_2S$  is passed, white turbidity is obtained.

(iv) A is water soluble and addition of  $HgCl_2$  in it, yellow ppt. is obtained but white ppt does not turn into grey on addition of excess solution of 'A'

Q. Yellow ppt in the above observation is :

- A. Mercuric oxide
- B. Basic mercury(II) sulphite
- C. Basic mercury (II) sulphate
- D. Mercuric iodine

**Answer: C**

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23. Light green (compound 'A')  $\xrightarrow{\Delta}$  white Residue(B)  $\xrightarrow[\text{Temp.}]{\text{high } C}$   $D + E$

(i) 'D' and 'E' are two acidic gas.

(ii) 'D' is passed through  $HgCl_2$  solution to give yellow ppt.

(iii) 'E' is passed through water first and then  $H_2S$  is passed, white

turbidity is obtained.

(iv) A is water soluble and addition of  $HgCl_2$  in it, yellow ppt. is obtained but white ppt does not turn into grey on addition of excess solution of 'A'

Q. 'C' is soluble in :

A. dil. HCl

B. dil.  $H_2SO_4$

C. Conc.  $CH_3COOH$

D. Boiled conc. HCl

**Answer: D**

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24. Light green (compound 'A')  $\xrightarrow{\Delta}$  white Residue(B)  $\xrightarrow[\text{Temp.}]{\text{high } C}$   $D + E$

(i) 'D' and 'E' are two acidic gas.

(ii) 'D' is passed through  $HgCl_2$  solution to give yellow ppt.

(iii) 'E' is passed through water first and then  $H_2S$  is passed, white turbidity is obtained.

(iv) A is water soluble and addition of  $HgCl_2$  in it, yellow ppt. is obtained but white ppt does not turn into grey on addition of excess solution of 'A'

Q. The no. of water crystallisation in 'A' is :

A. 0

B. 2

C. 7

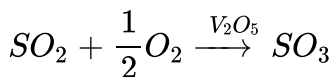
D. 5

**Answer: C**



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**25.** Transition metal and their compounds are used as catalyst in industry and in biological system. 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  $SO_3$ :



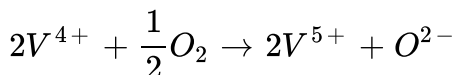
It is thought that the actual oxidation process takes place in two stages.

In the first step,  $V^{5+}$  in the presence of oxide ions converts  $SO_2$  to  $SO_3$ .

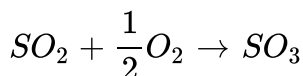
At the same time,  $V^{5+}$  is reduced to  $V^{4+}$ .



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



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



Q. During the course of the reaction:

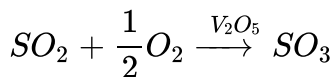
- A. Catalyst undergoes changes in oxidation state
- B. Catalyst increase the rate constant
- C. Catalyst is regenerated in its original form when the reactants form the products
- D. All are correct

**Answer: D**



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**26.** Transition metal and their compounds are used as catalyst in industry and in biological system. 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  $SO_3$ :



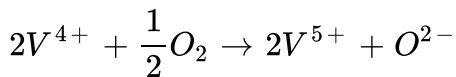
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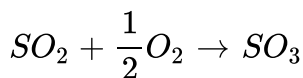
At the same time,  $V^{5+}$  is reduced to  $V^{4+}$ .



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



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



Q. Catalytic activity in 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 these



Answer: A

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27.  $MnO_2$  is the most important oxide of manganese,  $MnO_2$  occurs naturally as the black coloured mineral pyrolusite. It is an oxidising agent, and decomposes to  $Mn_3O_4$  on heating to  $530^\circ\text{C}$ . It is used in the preparation of potassium permanganate and in the production of  $Cl_2$  gas. Over half million tonnes per year of  $MnO_2$  is used in dry batteries.

Q. In the laboratory,  $MnO_2$  is made by:

A. heating Mn in  $O_2$

B. oxidising  $Mn^{2+}$  in air

C. electrolytic oxidation of  $MnSO_4$

D. precipitating  $MnO_2$  from solution when performing titration of  $KMnO_4$  in alkaline medium

Answer: D

28.  $MnO_2$  is the most important oxide of manganese,  $MnO_2$  occurs naturally as the black coloured mineral pyrolusite. It is an oxidising agent, and decomposes to  $Mn_3O_4$  on heating to  $530^\circ\text{C}$ . It is used in the preparation of potassium permanganate and in the production of  $Cl_2$  gas. Over half million tonnes per year of  $MnO_2$  is used in dry batteries.

Q. When  $MnO_2$  is fused with KOH in the presence of air, the product formed is:

- A. Purple colour  $KMnO_4$
- B. Green colour  $K_2MnO_4$
- C. Colourless  $MnO_4^-$
- D. Purple colour  $KMnO_4$

**Answer: B**

29.  $MnO_2$  is the most important oxide of manganese,  $MnO_2$  occurs naturally as the black coloured mineral pyrolusite. It is an oxidising agent, and decomposes to  $Mn_3O_4$  on heating to  $530^\circ C$ . It is used in the preparation of potassium permanganate and in the production of  $Cl_2$  gas. Over half million tonnes per year of  $MnO_2$  is used in dry batteries.

Q.  $MnO_2$  dissolves in concentrated HCl to form:

A.  $Mn^{4+}$  ion and  $Cl_2$

B.  $Mn^{2+}$  ion and  $Cl_2$

C.  $[MnCl_4]^{2-}$  and  $Cl_2$

D. only  $[MnCl_4]^{2-}$

**Answer: B**

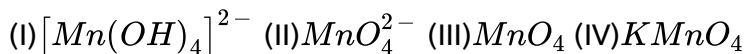


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30.  $MnO_2$  is the most important oxide of manganese,  $MnO_2$  occurs naturally as the black coloured mineral pyrolusite. It is an oxidising agent,

and decomposes to  $Mn_3O_4$  on heating to  $530^\circ\text{C}$ . It is used in the preparation of potassium permanaganate and in the production of  $Cl_2$  gas. Over half million tonnes per year of  $MnO_2$  is used in dry batteries.

Q. In which of the following species, the colour is due to charge transfer?



A. I, II, III

B. II, IV

C. I, III

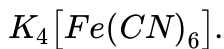
D. only IV

**Answer: D**



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**31.** Iron (+II) is one of the most important oxidation states and salts are called ferrous salts. Most of the  $Fe(+II)$  salts are pale green and contain  $[Fe(H_2O)_6]^{2+}$  ion.  $Fe(+II)$  compounds are easily oxidised by air and so are difficult to obtain pure  $Fe^{2+}$  form many complexes like



Q. Anhydrous  $FeCl_2$  is made by :

- A. heating Fe with dilute HCl
- B. heating Fe with gaseous HCl
- C. reacting Fe with conc. HCl
- D. heating Fe with  $Cl_2$  gas

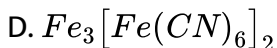
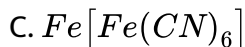
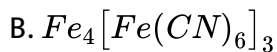
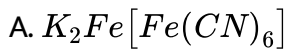
**Answer: B**



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**32.** Iron (+II) is one of the most important oxidation states and salts are called ferrous salts. Most of the  $Fe(+II)$  salts are pale green and contain  $[Fe(H_2O)_6]^{2+}$  ion.  $Fe(+II)$  compounds are easily oxidised by air and so are difficult to obtain pure  $Fe^{2+}$  form many complexes like  $K_4[Fe(CN)_6]$ .

Q.  $K_3[Fe(CN)_6]$  is used in the detection of  $Fe^{2+}$  ion with which it gives a deep blue colour. This colour is due to the formation of :



**Answer: D**

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**33.** Iron (+II) is one of the most important oxidation states and salts are called ferrous salts. Most of the  $Fe(+II)$  salts are pale green and contain  $[Fe(H_2O)_6]^{2+}$  ion.  $Fe(+II)$  compounds are easily oxidised by air and so are difficult to obtain pure  $Fe^{2+}$  form many complexes like  $K_4[Fe(CN)_6]$ .

$Q.FeSO_4$  is used in brown ring test for nitrates and nitrites. In this test, a freshly prepared  $FeSO_4$  solution is mixed with solution containing  $NO_2^-$  or  $NO_3^-$  and the conc.  $H_2SO_4$  is run down the side of the test tube. If the mixture gets hot or is shaken.

(I) the brown colour disappear (II)NO is evolved (III) a yellow solution in  $Fe_2(SO_4)_3$  is formed

A. I, II, III

B. I, III

C. II, III

D. I only

**Answer: A**



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**34.** Iron forms iron halides salts by reacting the metal directly with halogen.  $FeI_3$  does not exist.  $FeF_3$  is white soled inspite of five unpaired electrons with  $d^5$  configuration .  $FeCl_3$  is soluble in water and is used as a mordant in dyeing industry.

Q. $FeI_3$  does not exist because:

A. of large size

B.  $Fe^{3+}$  oxidise  $I^-$  to  $I_2$

C. of low lattice energy

D. iodine is not highly electronegative enough to oxidise Fe to  $Fe^{3+}$

**Answer: B**



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**35.** Iron forms iron halides salts by reacting the metal directly with halogen.  $FeI_3$  does not exist.  $FeF_3$  is white soled inspite of five unpaired electrons with  $d^5$  configuration .  $FeCl_3$  is soluble in water and is used as a mordant in dyeing industry.

Q.Anhydrous  $FeCl_3$  can be prepared by reaction of:

A. Fe with dry chlorine

B. Fe with dil.HCl in the presence of  $O_2$

C.  $Fe(OH)_3$  with conc. HCl

D.  $Fe_2O_3$  with conc. HCl



Answer: A



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36. Iron forms iron halides salts by reacting the metal directly with halogen.  $FeI_3$  does not exist.  $FeF_3$  is white soled inspite of five unpaired electrons with  $d^5$  configuration .  $FeCl_3$  is soluble in water and is used as a mordant in dyeing industry.

Q.  $FeCl_3$  solution added to  $K_4[Fe(CN)_6]$  gives A while with  $KSCN$  gives B. A and B respectively are:

- A.  $Fe_3[Fe(CN)_6]_2, Fe(CNS)_3$
- B.  $Fe_4[Fe(CN)_6]_2, KFe(CNS)_3$
- C.  $Fe_4[Fe(CN)_6]_3, K_3[Fe(CNS)_6]$
- D.  $Fe_4[Fe(CN)_6]_3, K_3[Fe(SCN)_6]$

Answer: D



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ONE OR MORE ANSWER IS/ARE CORRECT

1. What changes occur when acidified  $Cr_2O_7^{2-}$  ion react with  $H_2O_2$  solution in presence of ether solvent?

- A. Orange colour of solution turns blue
- B. Oxidation state of Cr-atom decrease
- C. Oxidation state of Cr-atom remains constant
- D. Orange colour of solution turns green

Answer: A::C

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2. Mercury is the only metal which is liquid at  $0^\circ C$ . This is due to its:

- A. very high ionisation energy

- B. weak metallic bonds
- C. high heat of hydration
- D. high heat of sublimation

**Answer: A::B**

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3. 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  $x > y$
- B. compounds in oxidation state  $x$  are ionic if  $x < y$
- C. compounds in oxidation state  $y$  are covalents if  $x < y$
- D. compounds in oxidation state  $y$  are covalents if  $x > y$

**Answer: B::C**

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4. The metal oxide which decomposes on heating, is:

A. ZnO

B.  $Al_2O_3$

C.  $Ag_2O$

D.  $HgO$

Answer: C::D



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5. Which of the following acids attack(s) on copper and silver?

A. dilute  $HNO_3$

B. dilute  $HCl$

C. conc.  $H_2SO_4$

D. aqua regia

**Answer: A::C::D**

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**6. Which of the following statements are true for Mohr's salt?**

- A. It decolourizes  $KMnO_4$  solution
- B. It is a double salt
- C. It is colourless salt
- D. It is a primary standard substance

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

 [Watch Video Solution](#)

**7. Which of the following statement(s) is/are correct?**

- A. The Chief ore of zinc is cinnabar

B. Mac-Arther's process is used to extract silver

C.  $Na_2S_2O_3$  is used to remove the unexposed AgBr from the photographic films

D. Nessler's reagent is complex of zinc in +2 oxidation state

**Answer: B::C**

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**8. Roasting of copper pyrites is done:**

A. to remove moisture and volatile impurities

B. to oxidise free sulphur

C. to decompose pyrites into  $Cu_2S$  and  $FeS$

D. to decompose  $Cu_2S$  into blister copper

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

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9. Identify the correct statements:

- A. iron belongs to first transition series of the periodic table
- B. The purest form of commercial iron is wrought iron
- C. Anhydrous ferrous sulphate is called as yellow vitriol
- D. Iron is the most abundant transition metal

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



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10. Which statements about mercury are correct?

- A. Hg is a liquid metal
- B. Hg forms two series of salts
- C. Hg forms no amalgam with iron and platinum

D. Hg does not show variable valency

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



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**11.** Which statements about corrosive sublimate ( $HgCl_2$ ) are correct?

A. It sublimes on heating

B. It oxidises stannous chloride

C. It is highly poisonous

D. It is prepared by heating mercury in chloride

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



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**12.** Identify the statement which is correct for copper sulphate



A. It reacts with  $NaOH$  and glucose to give  $Cu_2O$

B. It reacts with  $KCl$  to give  $Cu_2O$

C. It gives  $CuO$  on heating in air

D. It reacts with  $KI$  to give brown colouration

**Answer: A::C::D**



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**13.** 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 green

C. Copious evolution of oxygen

D. Bluish-green precipitate

**Answer: A::C**

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14. Pick out the correct statement(s):

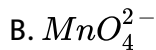
- A.  $MnO_2$  dissolves in conc.HCl but does not form  $Mn^{4+}$  ions
- B. Decomposition of acidic  $KMnO_4$  is not catalyst by sunlight
- C.  $MnO_4^{2-}$  is strongly oxidising and stable only in very strong alkali. In dilute alkali, water or acidic solutions it disproportionates
- D.  $KMnO_4$  does not act as oxidising agent in alkaline medium

Answer: A:C

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15. The species that undergoes disproportionation in an alkaline medium are:

- A.  $Cl_4$



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



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**16.** Which of the following statements regarding d block elements are true?

A. the colour of anhydrous  $CuSO_4$  is blue

B. "spitting of silver" can be prevented by covering the surface of molten silver with charcoal

C. Iodine liberated in a reaction can be estimated by titration against a standard thiosulphate solution

D. Lanthanum is first element of third transition series

**Answer: B::D**

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17. Which is/are insoluble in  $NH_3$  solution?

A. AgCl

B. AgBr

C. AgI

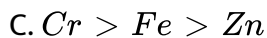
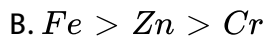
D.  $Ag_2S$

**Answer: C::D**

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18. Order of paramagnetic character among following element is/are"

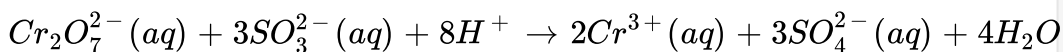
A.  $Mn > Fe > Cr$



**Answer: C::D**

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**19.** Choose correct statements (s) regarding the following reactions.



A.  $Cr_2O_7^{2-}$  is oxidising agent

B.  $SO_3^{2-}$  is reducing agent

C. The oxidation number of per 'S' atom in  $2SO_3^{2-}$  is increase by two

D. The oxidation number of per 'Cr' atom in  $Cr_2O_7^{2-}$  is decrease by two

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

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20. Mercuric chloride is converted into mercury by:

- A. placing copper metal in aqueous solution of  $HgCl_2$
- B. treating aqueous solution of  $HgCl_2$  with excess of stannous chloride
- C. treating aqueous solution  $HgCl_2$  with  $PbCl_2$  solution
- D. None of these

**Answer: A::B**

 [Watch Video Solution](#)

21. What changes occur when acidified  $Cr_2O_7^{2-}$  ion react with  $H_2O_2$  solution in presence of ether solvent?

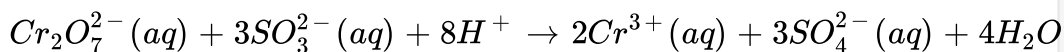
- A. Orange colour of solution turns blue

- B. Oxidation state of Cr-atom decrease
- C. Oxidation state of Cr-atom remains constant
- D. Orange colour of solution turns green

**Answer: A::C**

 [Watch Video Solution](#)

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

 [Watch Video Solution](#)

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**Answer: A::C**

 [Watch Video Solution](#)

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- A. very high ionisation energy
- B. weak metallic bonds



C. high heat of hydration

D. high heat of sublimation

**Answer: A::B**

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25. An element of 3d-transition series two oxidation states  $x$  and  $y$ , differ by two units then:

A. compounds in oxidation state  $x$  are ionic if  $x > y$

B. compounds in oxidation state  $x$  are ionic if  $x < y$

C. compounds in oxidation state  $y$  are covalents if  $x < y$

D. compounds in oxidation state  $y$  are covalents if  $x > y$

**Answer: B::C**

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26. The metal oxide which decomposes on heating is/are:

A. ZnO

B.  $Al_2O_3$

C.  $Ag_2O$

D.  $HgO$

Answer: C::D



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B. dilute  $HCl$

C. conc.  $H_2SO_4$

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C.  $Na_2S_2O_3$  is used to remove the unexposed AgBr from the photographic films

D. Nessler's reagent is complex of zinc in +2 oxidation state

**Answer: B::C**

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**30.** Roasting of copper pyrites is done:

A. to remove moisture and volatile impurities

B. to oxidise free sulphur

C. to decompose pyrites into  $Cu_2S$  and  $FeS$

D. to decompose  $Cu_2S$  into blister copper

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

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31. Identify the correct statements:

- A. iron belongs to first transition series of the periodic table
- B. The purest form of commercial iron is wrought iron
- C. Anhydrous ferrous sulphate is called as yellow vitriol
- D. Iron is the most abundant transition metal

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



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32. Which statements about mercury are correct?

- A. Hg is a liquid metal
- B. Hg forms two series of salts
- C. Hg forms no amalgam with iron and platinum

D. Hg does not show variable valency

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

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**33.** Which statements about corrosive sublimate ( $HgCl_2$ ) are correct?

A. It sublimes on heating

B. It oxidises stannous chloride

C. It is highly poisonous

D. It is prepared by heating mercury in chloride

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

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**34.** Which statements are correct regarding copper sulphate?

A. It reacts with  $NaOH$  and glucose to give  $Cu_2O$

B. It reacts with  $KCl$  to give  $Cu_2O$

C. It gives  $CuO$  on heating in air

D. It reacts with  $KI$  to give brown colouration

**Answer: A::C::D**



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**35.** 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 green

C. Copious evolution of oxygen

D. Bluish-green precipitate

**Answer: A::C**

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36. Pick out the correct statement(s):

- A.  $MnO_2$  dissolves in conc.HCl but does not form  $Mn^{4+}$  ions
- B. Decomposition of acidic  $KMnO_4$  is not catalyst by sunlight
- C.  $MnO_4^{2-}$  is strongly oxidising and stable only in very strong alkali. In dilute alkali, water or acidic solutions it disproportionates
- D.  $KMnO_4$  does not act as oxidising agent in alkaline medium

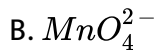
Answer: A:C

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37. The species that undergoes disproportionation in an alkaline medium are:

- A.  $Cl_2$





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



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**38.** Which of the following statements regarding copper salts are true?

A. the colour of anhydrous  $CuSO_4$  is blue

B. "splitting of silver" can be prevented by covering the surface of molten silver with charcoal

C. Iodine liberated in a reaction can be estimated by titration against a standard thiosulphate solution

D. Lanthanum is first element of third transition series

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



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39. Which is/are insoluble in  $NH_3$  solution?

A.  $AgCl$

B.  $AgBr$

C.  $AgI$

D.  $Ag_2S$

Answer: C::D



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40. Order of paramagnetic character among following elements is/are:

A.  $Mn > Fe > Cr$

B.  $Fe > Zn > Cr$

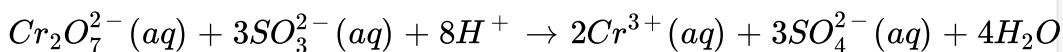
C.  $Cr > Fe > Zn$

D.  $Cr > Mn > Fe$

Answer: C::D

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41. Choose correct statement(s) regarding the following reaction:



A.  $Cr_2O_7^{2-}$  is oxidising agent

B.  $SO_3^{2-}$  is reducing agent

C. The oxidation number of per 'S' atom in  $2SO_3^{2-}$  is increase by two

D. The oxidation number of per 'Cr' atom in  $Cr_2O_7^{2-}$  is decrease by two

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

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42. Mercuric chloride is converted into mercury by:

- A. placing copper metal in aqueous solution of  $HgCl_2$
- B. treating aqueous solution of  $HgCl_2$  with excess of stannous chloride
- C. treating aqueous solution  $HgCl_2$  with  $PbCl_2$  solution
- D. None of these

Answer: A::B



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43. What changes occur when acidified  $CrO_4^{2-}$  ion react with  $H_2O_2$  solution in presence of ether solvent?

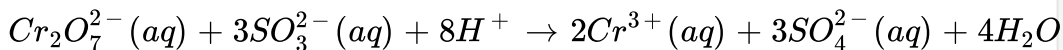
- A. Orange colour of solution turns blue
- B. Oxidation state of Cr-atom decrease
- C. Oxidation state of Cr-atom remains constant

D. Orange colour of solution turns green

Answer: A::B

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44. Choose correct statement(s) regarding the following reaction:



A.  $\text{Cr}_2\text{O}_7^{2-}$  is oxidising agent

B.  $\text{SO}_3^{2-}$  is reducing agent

C. The oxidation number of per 'S' atom in  $2\text{SO}_3^{2-}$  is increase by two

D. The oxidation number of per 'Cr' atom in  $\text{Cr}_2\text{O}_7^{2-}$  is decrease by two

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

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## MATCH THE COLUMN

1. Entries of Column-I are to be matched with entries of Column-II. Each entry of Column-I may have the matching with one or more than one entries of Column-II.

Column-I	Column-II
(A) Kipp's apparatus waste	(P) $(\text{NH}_4)_2\text{SO}_4 \cdot \text{FeSO}_4 \cdot 6\text{H}_2\text{O}$
(B) Green coloured compound	(Q) $\text{Cu}(\text{OH})_2 \cdot \text{CuCO}_3$
(C) leave(s) brown residue on heating	(R) $\text{FeSO}_4$ solution
(D) leave(s) black residue on heating	(S) $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$

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2. Entries of Column-I are to be matched with entries of Column-II. Each entry of Column-I may have the matching with one or more than one entries of Column-II.

Column-I	Column-II
(A) $\text{Co}^{2+}(\text{aq})$	(P) Pink / light pink
(B) $\text{Mn}^{2+}(\text{aq})$	(Q) Purple
(C) $\text{V}^{2+}(\text{aq})$	(R) Outer orbital complex and magnetic moment = $\sqrt{15}$ BM.
(D) $\text{Ti}^{3+}(\text{aq})$	(S) Inner orbital complex and magnetic moment = $\sqrt{3}$ BM.
	(T) Paramagnetic



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3. Entries of Column-I are to be matched with entries of Column-II. Each entry of Column-I may have the matching with one or more than one entries of Column-II.

Column-I	Column-II
(A) $\text{Co}^{2+} (\text{aq})$	(P) Pink / light pink
(B) $\text{Mn}^{2+} (\text{aq})$	(Q) Purple
(C) $\text{V}^{2+} (\text{aq})$	(R) Outer orbital complex and magnetic moment = $\sqrt{15}$ BM.
(D) $\text{Ti}^{3+} (\text{aq})$	(S) Inner orbital complex and magnetic moment = $\sqrt{3}$ BM.
	(T) Paramagnetic



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## ASSERTION-REASON TYPE QUESTIONS

1. Assertion: Melting point of Mn is more than that of Fe.

Reason : Mn has higher number of unpaired  $e^{-}$  than Fe in atomic state.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: D**

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2.  $Cu_{(aq.)}^+$  has less stable nature than  $Cu_{(aq.)}^{2+}$  but  $Fe_{(aq.)}^{3+}$  is more stable than  $Fe_{(aq.)}^{2+}$ .

Half-filled and completely filled, sub-shell are more stable.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion



B. If both assertion and reason are true and the reason is not the correct explanation of assertion

C. If assertion is false but reason is true

D. If assertion is true but the reason is false

**Answer: B**

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3. Assertion: Zn gives  $H_2$  gas with dil. HCl and also with dil.  $H_2SO_4$ .

Reason : In different medium, change in oxidation number shown by manganese is altogether different.

A. If both assertion and reason are true and the reason is the correct explanation of assertion

B. If both assertion and reason are true and the reason is not the correct explanation of assertion

C. If assertion is false but reason is true

D. If assertion is true but the reason is false

**Answer: B**

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4. Assertion:  $KMnO_4$  has different equivalent weights in acid, neutral or alkaline medium.

Reason: In different, change in oxidation number shown by manganese is altogether different.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: A**

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5. Assertion:  $Cu^{2+}$  is more stable than  $Cu^+$

Reason: Electrode potential is more important in determining stable oxidation state than electronic configuration.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: A**

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6. Statement 1: Concentrated solution of  $CuCl_2$  in water is yellow in colour.

Statement 2: The concentrated solution contains  $[CuCl_4]^{2-}$  ion and  $[Cu(H_2O_4)]^{2+}$  ion.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: A**



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7. Assertion:  $KMnO_4$  is purple in colour due to charge transfer .

Reason :There is no electron present in d-orbitals of maganese in  $MnO_4^-$  )

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: B**



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

Reason : Chromyl chloride ( $CrO_2Cl_2$ ) has tetrahedral shape.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: B**



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**9. Mercury is the only metal which is liquid at  $0^{\circ}\text{C}$ . This is due to its:**

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion

C. If assertion is false but reason is true

D. If assertion is true but the reason is false

**Answer: A**



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10. Assertion:  $CuSO_4 \cdot 5H_2O$  and  $FeSO_4 \cdot 7H_2O$  are blue and green colour compounds respectively.

Reason: Both compounds have their specific colour due to phenomenon of polarisation of anion.

A. If both assertion and reason are true and the reason is the correct explanation of assertion

B. If both assertion and reason are true and the reason is not the correct explanation of assertion

C. If assertion is false but reason is true

D. If assertion is true but the reason is false

**Answer: C**

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11. Assertion:  $FeSO_4$  and  $Fe_2(SO_4)_3$  undergoes intramolecular redox reaction on thermal decomposition

Reason: Both salts give brown solid of  $Fe_2O_3$  after decomposition.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: D**

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12. Assertion:  $Zn(OH)_2$  is dissolved in both  $NH_4OH$  and NaOH solution

Reason- NaOH and  $NH_4OH$  being basic can dissolve amphoteric

$Zn(OH)_2$ .

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: C**



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13. Assertion: Increasing order of covalent character among given compounds is  $HgCl_2 < CdCl_2 < ZnCl_2$

Reason: Order of size of cations is  $Zn^{2+} < Cd^{2+} < Hg^{2+}$  .

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: D**



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**14.** Assertion:  $AgNO_3$  reacts with  $KCN$  to form white ppt. of  $AgCN$ . This white ppt. Disappears when excess  $KCN$  is added.

Reason:  $AgCN$  decomposes to form silver-carbide and evolve  $N_2$  gas.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: C**



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**15.** Assertion: Zero and negative oxidation state of d-block metal ion are not possible in their complex compound.

Reason: Low oxidation state of the metal ions are found when a complex compound has ligands capable of  $\pi$  – acceptor character in addition to the  $\sigma$  – bonding.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: A**

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**16.** Assertion: Aqueated copper(I) cation undergoes disproportionation as:



Reason: Hydration energy of  $Cu^{2+}$  is higher than that of  $Cu^+$  which compensates second ionisation energy of Cu.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion

- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: A**

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**17. Assertion:** Melting point of Mn is more than that of Fe.

**Reason :** Mn has higher number of unpaired  $e^-$  than Fe in atomic state.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true

D. If assertion is true but the reason is false

**Answer: D**



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**18.** Assertion:  $Cu^{2+}(aq)$  is less than  $Cu^{3+}(aq)$  but  $Fe^{3+}$  is more stable than  $Fe^{2+}(aq)$

Reason : Half filled and completely filled subshells are more stable

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: B**



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19. Assertion: Zn gives  $H_2$  gas with dil. HCl and dil.  $H_2SO_4$  but not with  $HNO_3$ .

Reason :  $NO_3^-$  ion is reduced in preference to hydronium ion.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: B**



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20. Assertion:  $KMnO_4$  has different equivalent weights in acid, neutral or alkaline medium.

Reason: In different, change in oxidation number shown by manganese is altogether different.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: A**



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21. Assertion:  $Cu^{2+}$  is more stable than  $Cu^+$

Reason: Electrode potential is more important in determining stable oxidation state than electronic configuration.

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- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: A**



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22. Assertion: Concentrated aqueous solution of  $CuCl_2$  is green in colour.

Reason : The solution contains two complex ions i.e.,

$[Cu(H_2O)_4]^{2+}$  and  $[CuCl_4]^{2-}$  in equilibrium.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: A**



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**23.** Assertion:  $KMnO_4$  is purple in colour due to charge transfer .

Reason :There is no electron present in d-orbitals of manganese in  $MnO_4^-$  )

- A. If both assertion and reason are true and the reason is the correct explanation of assertion
- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: B**



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**24.** Assertion:  $CrO_3$  reacts with HCl to form chromyl chloride gas.

Reason: Chromyl chloride ( $CrO_2Cl_2$ ) has tetrahedral shape.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion

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D. If assertion is true but the reason is false

**Answer: B**

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**25.** Assertion: Hg is the only metal which is liquid at  $0^{\circ}C$ .

Reason: It has very I.P. and weak metallic bond.

A. If both assertion and reason are true and the reason is the correct explanation of assertion

B. If both assertion and reason are true and the reason is not the correct explanation of assertion

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**Answer: A**

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**26.** Assertion:  $CuSO_4 \cdot 5H_2O$  and  $FeSO_4 \cdot 7H_2O$  are blue and green colour compounds respectively.

Reason: Both compounds have their specific colour due to phenomenon of polarisation of anion.

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**Answer: C**



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27. Assertion:  $FeSO_4$  and  $Fe_2(SO_4)_3$  undergoes intramolecular redox reaction on thermal decomposition

Reason: Both salts give brown solid of  $Fe_2O_3$  after decomposition.

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**Answer: D**



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28. Assertion:  $Zn(OH)_2$  is dissolved in both  $NH_4OH$  and NaOH solution

Reason- NaOH and  $NH_4OH$  being basic can dissolve amphoteric

$Zn(OH)_2$ .

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Answer: C



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29. Assertion: Increasing order of covalent character among given compounds is  $HgCl_2 < CdCl_2 < ZnCl_2$

Reason: Order of size of cations is  $Zn^{2+} < Cd^{2+} < Hg^{2+}$  .

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**Answer: D**



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Reason:  $AgCN$  decomposes to form silver-carbide and evolve  $N_2$  gas.



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**Answer: C**



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**31.** Assertion: Zero and negative oxidation state of d-block metal ion are not possible in their complex compound.

Reason: Low oxidation state of the metal ions are found when a complex compound has ligands capable of  $\pi$  – acceptor character in addition to the  $\sigma$  – bonding.

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- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: A**



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**32.** Assertion: Aquated copper(I) cation undergoes disproportionation as:



Reason: Hydration energy of  $Cu^{2+}$  is higher than that of  $Cu^+$  which compensates second ionisation energy of Cu.

- A. If both assertion and reason are true and the reason is the correct explanation of assertion

- B. If both assertion and reason are true and the reason is not the correct explanation of assertion
- C. If assertion is false but reason is true
- D. If assertion is true but the reason is false

**Answer: A**

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## SUBJECTIVE PROBLEMS

1. Calculate the magnetic moment of a high-spin octahedral complex that has six electrons in 3d-orbitals

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2. How many  $\pi$ -bonds are present in ferrocene?



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3. The magnetic moment of a transition metal ion is 3.87BM. The number of unpaired electrons present in it is

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4. Calculate the magnetic moment of a high-spin octahedral complex that has six electrons in 3d-orbitals

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5. How many  $\pi$  – bonds are present in ferrocene?

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6. The magnetic moment of a transition metal ion is found to be 3.87 Bohr Magnetons (BM). The number of unpaired electrons present in it is:



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