CHEMISTRY

JEE MAIN AND ADVANCED

THE D AND F-BLOCK ELEMENTS

Example

1. On what ground can you say that scandium $(Z = 21)$ is a transition element but zinc $(Z = 30)$ is not?

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2. Silver atom has completely filled d orbitals $\left(4d^{10}\right)$ in its ground state. How can you say it is a transition element?

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3. The second ionisation enthalpies of both Cr and Cu are higher than those of the next element. Explain.

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4. Why is enthalpy of atomisation is the lowest for Zn in 3d series of transition elements ?

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5. Why Zn generally do not show oxidation state greater than 2 ?

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6. Why d block metals show variable oxidation state ?

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7. How can we show that change in oxidation state is different from variable oxidation state for non transition element ?

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8. How would you account for the increasing oxidising power in the series $VO_2^{\oplus} < Cr_2O_7^{2-} < MnO_4^{\ominus}$?

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9. Name the transition element which does not exhibit variable oxidation states .

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10. Name any two transition metals which exhibit oxidation state of +8 .

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11. The oxidation state of Fe in $Fe(CO)_5$ is

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12. In 3d series , Mn shows highest oxidation state . Why ?

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13. For the first row transition metals the $E^{\ominus}$ value are:

V	Cr	Mn	Fe	Co	Ni	Cu
-1.18	-0.91	-1.18	-0.44	-0.28	-0.25	$+0.34$

Explain the irregularity in the above values.

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14. Why is the value for $\frac{Mn^{3+}}{Mn^{2+}}$ couple much more positive than that for $\frac{Cr^{3+}}{Cr^{2+}}$ or $\frac{Fe^{3+}}{Fe^{2+}}$? Explain

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

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

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17. Which is a stronger reducing agent Cr^{2+} or Fe^{2+} and why?

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18. Calculate the magnetic moment of a divalent ion in aqueous solution if its atomic number is 25.

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19. Why permanganate titrations in presence of hydrochloric acid are unsatisfactory ?

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20. Explain why is Ce^{4+} ion a strong oxidising agent ?

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21. Out of following which is more than basic $Lu(OH)_3$ and $Ce(OH)_3$.

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22. Actinoid contraction is greater from element to element than lanthanoid contraction Why?

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23. Why do actinoids elements show wide range of oxidation states ?

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24. Given chemical test for making distinction between Fe^{2+} and Fe^{3+} ions.

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Try Yourself

1. Write the electronic configuration of given atoms/ ions.

(i) Cr (ii)Mn^{3+} (iii) Fe^{3+}

(iv) W (v) Pd^{2+} (vi) Pd

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2. Out of Mn and Fe which has higher IE_3 and why ?

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3. In 3d series which element have highest IE_3 ?

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4. In 3d , 4d and 5d series which element is expected to have highest IE_1 ?

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5. MnF_7 is not stable while Mn_2O_7 is stable.

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6. What is the hybridisation of Mn in K_2MnO_4 ?

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7. Why is FeI_3 not stable ?

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8. Why highest oxidation state are stable with F and O ?

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9. Why IE_3 of Mn is high ?

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10. Calculate spin only moment of given ions

(i) Cu^{2+}

(ii) Cr^{2+}

(iii) Fe^{3+}

(iv) Ni^{2+}

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11. Why is Cu^+ ion not stable in aqueous solution ?

or

Why is Cu^+ is not known in aqueous solution ?

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12. Write the disproportionate reaction of MnO_4^{2-} ?

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13. Why $Ce(OH)_3$ is more basic than $Lu(OH)_3$?

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14. Which have maximum paramagnetism in M^{3+} ion for Lanthanoid (spin only) ?

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15. Discuss the effect of pH on CrO_4^{2-} ?

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Assingnment Section A Objective Type Questions One Option Is Correct

1. The general valence shell electronic configuration of transition elements is

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

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

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

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

Answer: C

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2. Which of the following does not have abnormal electronic configuration ?

A. Cr

B. Pd

C. Pt

D. Hg

Answer: D

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3. Which of the element is not a typical transition element ?

A. Fe

B. Pd

C. Cr

D. Zn

Answer: D

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4. The trend in ionisation enthalpy of transition element is not regular because

A. Removal of one electron alters the relative energies of 4s and 3d orbitals.

B. Due to different E.C. (stability)

C. Poor screening of 3p orbital

D. Both(1) & (2)

Answer: A

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5. The element having lowest IE_1

A. Fe

B. Co

C. Ni

D. Cu

Answer: C

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6. Choose the pair in which IE_1 of first element is greater than IE_1 of second element but in case of IE_2 order is/are reversed

A. $Mn > Cr$

B. $Mn > Fe$

C. $Zn > Cu$

D. All of these

Answer: D

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7. Which of the following element does not show the variable oxidation state ?

A. Fe

B. Mn

C. Cu

D. Zn

Answer: D

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8. The most common oxidation states of 3d series elements

A. $+2$

B. $+3$

C. $+4$

D. $+7$

Answer: A

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9. In 3d series highest oxidation state is shown by

A. Mn

B. Fe

C. Cu

D. V

Answer: A

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10. With F highest stable oxidation state of Mn is

A. $+6$

B. $+4$

C. $+7$

D. $+3$

Answer: B

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11. With O highest possible oxidation state of Mn is

A. $+7$

B. $+4$

C. $+5$

D. $+3$

Answer: A

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12. Oxygen stablises higher oxidation state because

A. It is electronegative

B. Of its tendency to form double bond

C. Of small size

D. Of large size

Answer: B

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13. Which of the following have highest magnetic moment ?

A. Fe^{2+}

B. Mn^{+}

C. Fe^{3+}

D. Fe^{+}

Answer: B

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14. Reduction potential of Mn^{2+}/M will depend on

A. $IE_1 + IE_2$

B. $\Delta H_{\text{atomisation}}$

C. `Hydration energy

D. All of these

Answer: D

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15. Amongst the following ions, which is considered as most stable in M^{2+} state ?

A. $Ti^{2+}/Ti(-1.63V)$

B. $V^{2+}/V(-1.11V)$

C. $Cr^{2+}/Cr(-0.90V)$

D. $Mn^{2+}/Mn(1.18V)$

Answer: A

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16. Electrode potential of Mn^{2+}/M for Ni is abnormal because of

A. High $IE_1 + IE_2$

B. High hydration energy

C. $\Delta H_{\text{atomisation}}$

D. Electronic configuration of Ni^{2+}

Answer: B

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17. The species which is paramagnetic

A. Cr^+

B. Zn^{2+}

C. Cu^{+}

D. MnO_2O^{-}

Answer: A

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18. A compound of a metal ion $M^{X+}(z = 24)$ has a spin only magnetic moment of $\sqrt{15}B.M.$. The number of unpaired electrons in the compound are

A. 2

B. 4

C. 5

D. 3

Answer: D

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19. The species which convert Cu^{2+} to Cu^{+}

A. I^{-}

B. $HCHO/OH^{-}$

C. CN^{-}

D. All of these

Answer: D

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20. Which of the following is not a condition for complex formation?

A. Small atomic size

B. High nuclear charge

C. Variable oxidation state

D. Availability of vacant d-orbitals

Answer: C

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21. Brass is an alloy of

A. Silver and copper

B. Copper and zinc

C. Copper and tin

D. Copper , zinc and tin

Answer: B

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22. In acidic medium one mole of MnO_4^- accepts how many moles of electrons in a redox process?

A. 1

B. 3

C. 5

D. 6

Answer: C

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23. In the dichromate dianion,

A. 4 Cr-O bonds are equivalent

B. 6 Cr-O bonds are equivalent

C. All Cr-O bonds are equivalent

D. All Cr-O bonds are non-equivalent

Answer: B

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24. Which of the following oxide is acidic in nature ?

A. CrO

B. Cr_2O_3

C. CrO_3

D. CrO_2

Answer: C

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25. The inner transition element that is radioactive is

A. Pm

B. Gd

C. Lu

D. Sm

Answer: A

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26. The lanthanide contraction is responsible for the fact that

A. Zr and Y have about the same radius

B. Zr and Nb have similar oxidation state

C. Zr and Hf have about the same radius

D. Zr and Zn have the same oxidation state

Answer: C

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27. Size of lanthanoid decrease becaue of poor screening of

A. 4f

B. 3d

C. 5f

D. 4d

Answer: A

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28. The strongest base is

A. $Ce(OH)_3$

B. $Lu(OH)_3$

C. $Yb(OH)_3$

D. $Pm(OH)_3$

Answer: A

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29. The element that is not present in misch metal is

A. La

B. Iron

C. Na

D. Ce

Answer: C

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30. Most stable oxidation state of Lanthanoids

A. $+2$

B. $+3$

C. $+4$

D. $+1$

Answer: B

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31. When intimate mixture of potassium dichromate and potassium chloride is heated with conc.H_2SO_4 which of the following is produced in the form of red vapours ?

A. CrO_3

B. Cr_2O_3

C. CrO_2Cl_2

D. $CrCl_2$

Answer: C

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32. Which one of the following pairs of ions have the same electronic configuration?

A. $Cr^{3+}Fe^{3+}$

B. Mn^{2+}, Fe^{3+}

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

D. Sc^{3+}, Cr^{3+}

Answer: B

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33.

$Cr_2O_7^{2-} + X \xrightarrow{H^{\oplus}} Cr^{3+} + H_2O + \text{oxidised product of } X, X$

in the above reaction cannot be

A. $C_2O_4^{2-}$

B. Fe^{2+}

C. SO_4^{2-}

D. S^{2-}

Answer: C

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34. The reducing nature of any metal in aqueous solution depends upon

a.Enthalpy of atomisation

b. Ionisation enthalpies

c. Hydration energy

A. a & b only

B. Only b

C. b & c only

D. a,b & c

Answer: D

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35. Which of the following oxide is basic ?

A. CrO

B. Cr_2O_3

C. CrO_3

D. Cr_2O_4

Answer: A

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36. The spin only magnetic moment of transition metal ion found to be 5.92 BM. The number of unpaired electrons present in the species is :

A. 2

B. 3

C. 4

D. 5

Answer: D

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37. The correct electronic configuration of lanthanum is

A. $[Xe]5d^16s^2$

B. $[Xe]4d^15s^2$

C. $[Xe]4f^15s^2$

D. $[Xe]5f^16s^2$

Answer: A

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38. Give the general electronic configuration of actinides.

A. $(6-2)f^{1-14}(6-1)d^{1-10}6s^2$

B. $(6-2)f^{1-14}(6-1)d^{0-1}6s^2$

C. $(7-2)f^{1-14}(7-1)d^{1-10}7s^2$

D. $(7-2)f^{1-14}(7-1)d^{0-1}7s^2$

Answer: D

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39. Lanthanoid which is radioactive is

A. Promethium

B. Europium

C. Plutonium

D. Neptunium

Answer: A

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40. Which is correct

A. $Ce(OH)_3$ is weaker base than $Lu(OH)_3$.

B. $E^{\circ}_{Mn^{3+}/Mn^{2+}}$ is more positive than Fe^{3+}/Fe^{2+}

C. $Ti > Zr > Hf$ (Group 4 atomic radii)

D. Lanthanides are not separated by ion exchange method

Answer: B

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41. Lanthanides and Actinides generally differ in

A. Oxoion formation

B. Radioactive nature

C. Tendency towards complex formation

D. All of these

Answer: D

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42. Acidified $K_2Cr_2O_7$ on reaction with hydrogen peroxide give deep blue solution due to formation of

A. $Cr_2(SO_4)_3$

B. CrO_5

C. CrO_4^{2-}

D. Cr_2O_3

Answer: B

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43. Hybridisation of chromium ions in chromate and dichromate ions is respectively

A. sp^2 and sp^2

B. sp^2 and sp^3

C. sp^3 and sp^2

D. sd^3 and sd^3

Answer: D

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44. Equivalent weight of Baeyer's reagent is

A. 158

B. 31.6

C. 52.6

D. All of these

Answer: A

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45. On oxidation with $KMnO_4$ in acidic medium , SO_2 is oxidised to

A. SO_2

B. H_2SO_4

C. SO_3^{2-}

D. H_2S

Answer: B

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46. $MnO_4^{2-} + H^+ \rightarrow \text{Product}$

Product is formed

A. MnO_4^-

B. MnO_2

C. Mn

D. Both(1) & (2)

Answer: D

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47. Which is coloured because of d-d transition ?

A. $KMnO_4$

B. K_2CrO_4

C. $CoCl_3$

D. All of these

Answer: C

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48. $FeO \cdot Cr_2O_3 \xrightarrow[O_2]{Na_2CO_3} A \xrightarrow{H_2SO_4} B \xrightarrow{KCl} C$

The hybridisation of compound C and colour of its crystal is

A. sp^3 , orange red

B. sp^3, yellow

C. sp^2 , orange red

D. sp^2 , yellow

Answer: A

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49. Number of moles of ferrous sulphate oxidised by 1 mole of potassium permanganate in acidic medium is

A. $\frac{2}{5}$

B. $\frac{5}{2}$

C. $\frac{1}{5}$

D. 5

Answer: D

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50. Which of the following will not give positive chromyl chloride test?

A. $CuCl_2$

B. $NaCl$

C. $ZnCl_2$

D. $C_6H_5NH_3^+Cl$

Answer: C

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Assingnment Section B Objective Type Questions One Option Is Correct

1. The most abundant transition metal belong to

A. 3d series

B. 4d series

C. 5d series

D. 6d series

Answer: A

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2. The number of electrons exchanged when $KMnO_4$ react with H_2O_2 is equal to that of

A. s electrons in Ca (at. no. : 20)

B. p electrons in neon (at. no. : 10)

C. d electrons in chromium (at. No. : 24)

D. f electron in lanthanum (at. no. : 57)

Answer: C

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3. The yellow colour of chromates changes to orange on acidification due to formation of:

A. Cr^{3+}

B. Cr_2O_3

C. Cr_2O_7

D. CrO_4^-

Answer: C

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4. Each coinage metal has

A. 8

B. 2

C. 18

D. 32

Answer: C

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5. White vitriol, and blue vitriol are respectively

A. $ZnSO_4.7H_2O, CuSO_4.5H_2O$

B. $FeSO_4.7H_2O, ZnSO_4.7H_2O$

C. $ZnSO_4.7H_2O, FeSO_4.7H_2O$

D. $ZnSO_4.7H_2O, CuSO_4$

Answer: A

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6. The correct statement about interstitial compound is

A. Interstitial compound are formed by small atoms such as C, N, H, B etc .

B. These compounds are nonstoichiometric

C. They show difference in physical properties but similarity in chemical properties

D. All of these

Answer: D

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7. The pair having similar magnetic moment is

A. Ti^{2+}, V^{3+}

B. Cr^{3+}, Mn^{2+}

C. Mn^{2+}, Fe^{3+}

D. Fe^{2+}, Mn^{2+}

Answer: A::C

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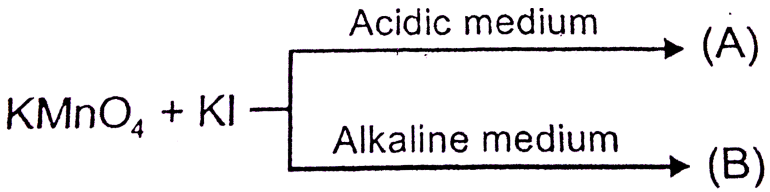
8.



The products (A) and (B) are respectively

A. KI, I_2

B. I_2, KIO_3

C. KIO_3, KIO_4

D. I_2, I_2

Answer: B

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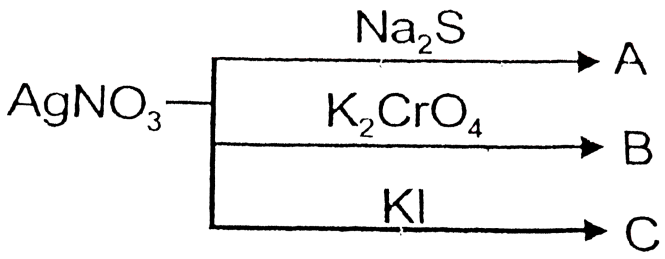

9.

The colours of ppt. A,B and C respectively are

A. Black , yellow , deep yellow

B. Black , red , yellow

C. Brown, red , white

D. Black , white , red

Answer: B

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10. Addition of NaOH on Zn^{2+} ion gives a white ppt. which on addition of excess of NaOH which dissolves . In this solution Zn exists in

A. Zn^{2+} form

B. Cationic form

C. Anionic form

D. Both (2) & (3)

Answer: C

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11. Oxidation state of mercury in amalgam , calomel and corrosive sublimate is

A. $0, \ +1, \ +2$

B. $+1, \ +1, \ +2$

C. $+1, \ +2, \ +1$

D. $0, \ +1, \ +1$

Answer: A

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12. Addition of $K_4\left[Fe(CN)_6\right]$ solution to $FeCl_3$ solution gives

A. Ferro-ferrocyanide

B. Ferro-ferricyanide

C. Ferri-ferrocyanide

D. Ferri-ferricyanide

Answer: C

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Assingnment Section C Objective Type Questions More Tha One Option Is Correct

1. Which of the following compound are coloured due to charge transfer spectra ?

A. $K_2Cr_2O_7$

B. $KMnO_4$

C. $AgBr$

D. $FeSO_4$

Answer: A::B

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2. Which of the following can be employed for the conversion of potassium manganate to potassium permanganate?

A. Cl_2

B. O_3

C. SO_2

D. KNO_3

Answer: A::B

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3. Highest oxidation state of Manganese and Osmium is shown with

A. S

B. H

C. O

D. F

Answer: C::D

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4. Which of the following metals have both valence shell and penultimate shell partially filled ?

A. Cr

B. Mo

C. Cu

D. Zn

Answer: A::B

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5. Which of the following statement is correct when a mixture of $CaCl_2$ and $K_2Cr_2O_7$ is gently warmed with conc . H_2SO_4 acid ?

A. Deep red vapours are evolved

B. The vapours when passed into NaOH solution gives a yellow solution of Na_2CrO_4

C. Chlorine gas is evolved

D. Chromyl chloride is formed

Answer: A::B::D

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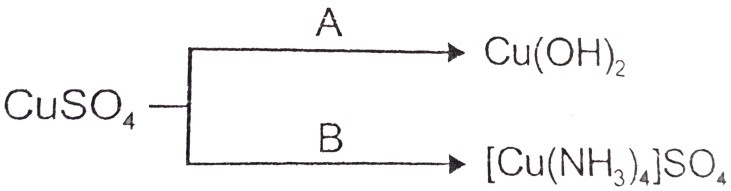
6.



A. A is NaOH and B is NH_4OH

B. Both $Cu(OH)_2$ and $\left[Cu(NH_3)_4\right]SO_4$ are pale blue precipitates

C. Blue colour of solution is due to d-d- transition

D. $Cu(OH)_2$ is paramagnetic and $\left[Cu(NH_3)_4\right]^{2+}$ is diamagnetic

Answer: A::B::C

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7. Which of the following pairs is coloured in aqueous solution?

A. Sc^{3+}, Co^{3+}

B. Ni^{2+}, Cu^{2+}

C. Ni^{2+}, Ti^{3+}

D. Sc^{3+}, Ti^{3+}

Answer: B::C

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8. Correct statement about FeO at room temperature

A. It is non-stoichiometirc and metal deficient

B. It is basic oxide

C. Its aqueous solution changes to $Fe(OH)_3$ and then to Fe_2O_3, xH_2O by atmospheric oxygen

D. It gives red colour with KCNS

Answer: A::B::C

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9. Correct statement about calomel is

A. Ionises as Hg_2^{2+} and $2Cl^-$ ions

B. Cation is diamagnetic

C. Used in medicine as purgative

D. With aqueous ammonia it turns black

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

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10. Some of the following reagents are used as primary standard

I. $KMnO_4$

II. NaOH

III . $K_2Cr_2O_7$

IV. $FeSO_4(NH_4)_2SO_4.6H_2O$

V. $H_2C_2O_4.2H_2O$

Select the primary standard

A. II,IV

B. I,II

C. I,III

D. All of these

Answer: C

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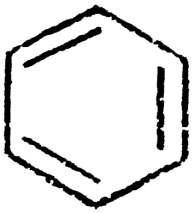
11. Incorrect statement is

A. In acidic medium MnO_4^- disproportionates to MnO_2 and MnO_4^{2-}

B. $KMnO_4$ spot can be bleached by H_2O_2

C. Alkaline $KMnO_4$ can be used to test unsaturation is



D. Eq. wt. of $KMnO_4$ in acidic medium is $\frac{M}{5}$

Answer: A::C

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Assingment Section D Linked Comprehension Type Questions Comprehension I

1. The transition element (with few exceptions) show a large number of oxidation states . The various oxidation states are related to the electronic configuration of their atoms. The variable oxidation states of a transition metal is due to the involvement of (n-1)d and outer ns electrons . For the first five elements of 3d transition series , the minimum oxidation state is equal to the number of electrons in 4s shell and the maximum oxidation state is equal to the sum of 4s and 3d electrons. The relative stability of various oxidation states of a given element can be explained on the basis of stability of d^0, d^5 and d^{10} configuration .

In 3d series, the maximum oxidation state is shown by

A. Sc(At . no. 21)

B. Cr(24)

C. Mn(At. no. 25)

D. Fe(26)

Answer: C

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2. The transition element (with few exceptions) show a large number of oxidation states . The various oxidation states are related to the electronic configuration of their atoms. The variable oxidation states of a transition metal is due to the involvement of (n-1)d and outer ns electrons . For the first five elements of 3d transition series , the minimum oxidation state is equal to the number of

electrons in 4s shell and the maximum oxidation state is equal to the sum of 4s and 3d electrons. The relative stability of various oxidation states of a given element can be explained on the basis of stability of d^0, d^5 and d^{10} configuration .

In which of the following pairs , the first species is more stable than second one

A. Ti^{3+}, Ti^{4+}

B. Mn^{2+}, Mn^{3+}

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

D. Sc^{+2}, Sc^{+3}

Answer: B

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3. The transition element (with few exceptions) show a large number of oxidation states . The various oxidation states are related to the electronic configuration of their atoms. The variable oxidation states of a transition metal is due to the involvement of (n-1)d and outer ns electrons . For the first five elements of 3d transition series , the minimum oxidation state is equal to the number of electrons in 4s shell and the maximum oxidation state is equal to the sum of 4s and 3d electrons. The relative stability of various oxidation states of a given element can be explained on the basis of stability of d^0, d^5 and d^{10} configuration .

Identify the correct statement

A. The most common oxidation state of 3d series is +2

B. The lowest oxidation state of Cr and Cu is +1 while for other it is +2

C. Ti^{4+}, Mn^{2+} are stable oxidation states

D. All of these

Answer: D

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Assingment Section D Linked Comprehension Type Questions Comprehension Ii

1. Transition metals combine with halogens at high temperature to form compounds called halides. On account of high activation energy , the reactions require high temperature to start, but once the the reaction is started , the heat of reaction is sufficient to maintain the continuity .

Metals in higher oxidation state form flourides as it is the most electronegative element . Flourides are ionic in nature . The chlorides , bromides and iodides have ionic as well as covalent character . Halides of metals is higher oxidation states are relatively unstable and hydrolysed very easily .

ΔH_f is negative for

A. Flourides

B. Bromides

C. Iodides

D. All of these

Answer: D

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2. $Cr_2O_7^{2-} \xrightarrow{pH=x} CrO_4^{2-} \xrightarrow{pH=y} Cr_2O_7^{2-}$

x and y can be :

A. 4 and 5

B. 4 and 8

C. 8 and 4

D. 8 and 9

Answer: C

3. Transition metals combine with halogens at high temperature to form compounds called halides. On account of high activation energy , the reactions require high temperature to start, but once the the reaction is started , the heat of reaction is sufficient to maintain the continuity .

Metals in higher oxidation state form flourides as it is the most electronegative element . Flourides are ionic in nature . The chlorides , bromides and iodides have ionic as

well as covalent character . Halides of metals is higher oxidation states are relatively unstable and hydrolysed very easily .

Aqueous solution of which compound will have $pH < 7$?

A. $TiCl_4$

B. $FeCl_3$

C. $CuSO_4$

D. All of these

Answer: D

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Assingment Section E Assertion Reason Type Questions

1. STATEMENT-1 : Oxidation number of Cr in K_3CrO_8 is +5

and

STATEMENT-2: It contains tetraperoxo species , i.e., $\left[Cr(O_2)_4\right]^{3-}$

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

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

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

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

Answer: A

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2. STATEMENT-1 : MnO_4^- is tetrahedral in shape .

and

STATEMENT-2: $KMnO_4$ is purple in colour .

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

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

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

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

Answer: B

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3. STATEMENT-1 : In zinc, outermost shell is completely filled

and

STATEMENT-2: Zn does not much resemblance with transition metals.

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

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

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

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

Answer: D

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4. STATEMENT-1 : Chromium atom has electronic configuration $[Ar]3d^5 4s^1$.

and

STATEMENT-2: Atomic number of chromium is 24 .

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

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

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

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

Answer: B

5. STATEMENT-1 : CrO_2Cl_2 has tetrahedral shape .

and

STATEMENT-2: CrO_3 reacts with HCl to form CrO_2Cl_2 .

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

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

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

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

Answer: B

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6. STATEMENT-1 : Common oxidation states of iron and +2 and +3 in its compound .

and

STATEMENT-2: Iron can have only +2 and +3 oxidation states in its compounds .

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

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

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

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

Answer: C

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7. K_2PtCl_6 is a well known compound whereas corresponding Ni compound is not known. Explain.

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

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

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

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

Answer: A

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8. STATEMENT-1 : Zn is not a typical transition metal.

and

STATEMENT-2: Zn is a d-block element .

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

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

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

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

Answer: B

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9. STATEMENT-1 : In $Cr_2O_7^{-2}$ bond length of all Cr-O bond is equal

and

STATEMENT-2: $Cr_2O_7^{-2}$, resonance is possible.

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

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

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

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

Answer: D

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10. STATEMENT-1 : Lanthanoids show less oxidation states than actinoids

and

STATEMENT-2: 4f subshell is dieperseated than 5f .

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

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

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

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

Answer: A

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11. STATEMENT-1 : Out of all actinoids , Th has highest melting point .

STATEMENT-2: Th has largest size among actinoids .

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

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

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

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

Answer: B

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12. STATEMENT-1 : AgBr is yellow coloured

and

STATEMENT-2: AgBr is unstable is presence of sunlight .

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

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

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

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

Answer: B

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13. STATEMENT-1 : Hg exists in liquid state at room. Temperature

and

STATEMENT-2: Hg has $(n-1)d^{10}ns^2$ E.C.

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

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

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

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

Answer: B

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14. STATEMENT-1 : CuO is called balck oxide of copper .

and

STATEMENT-2: CuO is diamagnetic

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

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

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

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

Answer: C

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15. STATEMENT-1 : $Lu(OH)_3$ is more basic than $Ce(OH)_3$

and

STATEMENT-2: Lu^{+3} has smaller size than Ce^{+3}

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

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

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

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

Answer: D

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Assingment Section F Matrix Match Type Questions

1. Match the following

Column I (Compounds)	Column II (Properties)
(A) $KFe[Fe(CN)_6]$	(p) d-d transition is possible in any of atom
(B) $KMnO_4$	(q) Charge transfer from metal to metal
(C) $Cu_2[Fe(CN)_6]$	(r) Paramagnetic
(D) AgBr	(s) Colour due to polarisation
	(t) Charge transfer from ligand to metal

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2. Match the product of given reaction in column I to the properties given in column II

Column I (Reaction)	Column II (About Product and Reaction)
(A) $K_2Cr_2O_7 + H_2O_2 \xrightarrow{\text{acidic medium}}$	(p) Change in oxidation state of Cr
(B) $K_2Cr_2O_7 + Cl^- \xrightarrow{H^+}$	(q) Blood red coloured complex
(C) $K_2Cr_2O_7 + \underset{30\%}{H_2O_2} \xrightarrow{\text{basic}}$	(r) Blue colour in etheral layer
(D) $K_2Cr_2O_7 + SO_2 \xrightarrow{H^+}$	(s) Oxidation state of Cr is 6 in product
	(t) Green colour

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3. Match the following

Column I	Column II
(A) $Co(NH_3)_6^{+2}$	(p) Paramagnetic
(B) $Fe(CN)_6^{-3}$	(q) Coloured due to d-d transition
(C) CuF_2	(r) Blue vitrol
(D) $CuSO_4 \cdot 5H_2O$	(s) Hydrogen bonding
	(t) Ionic bonding

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Assingment Section G Integer Answer Type Questions

1. What is the oxidation state of Mn in product formed by the oxidising action of $KMnO_4$ inneutral medium ?

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2. What will be oxidation state of Sc in ScC_2 ?

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3. What should be the oxidation state of iron for maximum magnetic moment ?

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4. What is the oxidation state of iron in haemoglobin ?

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5. A trivalent lanthanoid ion having yellow colour in aqueous solution have five 4f electrons . What should be number of electrons in 4f orbital of another trivalent lanthanoid ion having yellow colour in aqueous solution ?

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Assingment Section H Multiple True False Type Questions

1. STATEMENT-1: $KMnO_4$ is coloured due to d-d transition

.

STATEMENT-2: Colour due to d-d transition will be less intense .

STATEMENT-3: $Fe\left[Fe(CN)_6\right]$ will retain a brown coloured complex after a long time of its formation .

A. TFT

B. FTF

C. TTT

D. TFF

Answer: 2

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2. STATEMENT-1: Ti metal present in Zieglar Natta catalyst

STATEMENT-2: Os with +8 oxidation state exist in OsF_8

STATEMENT-3: +7 oxidation state is more stable for 4d and 5d elements compared to 3d metal

A. TTT

B. TFT

C. FTT

D. FFT

Answer: 2

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3. STATEMENT-1: U can show oxidation state +6

STATEMENT-2: Uranium is a radioactive element

STATEMENT-3: Uranium is lanthanoid

A. TTF

B. TFF

C. TTT

D. FTF

Answer: 1

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4. STATEMENT-1: VO_4^{-3} is coloured due to charge transfer

.

STATEMENT-2: Colour due to charge transfer is highly intense colour

STATEMENT-3: Fe may form Fe-Fe bond

A. FTF

B. FTT

C. TTF

D. TTT

Answer: 4

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5. STATEMENT-1: Platinum metal is called white gold

STATEMENT-2: Pt is less costly than gold .

STATEMENT-3: Pt is good catalyst in reduction process

A. TTT

B. FTF

C. TFT

D. FFT

Answer: 3

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Assingment Section I Subjective Type Questions

1. Explain by giving equation for the reaction :

(i) Mn^{3+} disproportionates to Mn^{2+} and MnO_2 in acidic medium.

(ii) $KMnO_4$ heated with KOH

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2. Zn^{2+} salts appears acidic due to hydrolysis. Identify acid and base in the following reaction

$$\left[Zn(H_2O_4\right]^{2+} + H_2O \rightarrow \left[Zn(H_2O)_3OH\right]^{+} + H_3O^{+}$$

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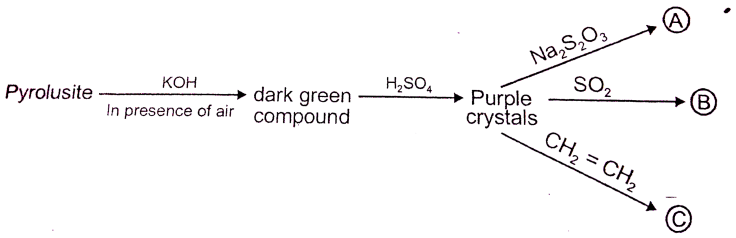

3.

Identify A, B and C and write chemical equtions.

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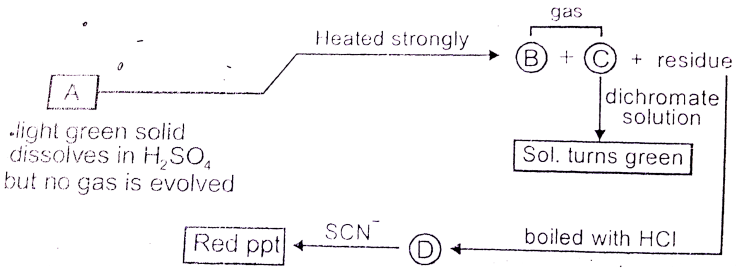

4.

Identify A,B,C ,D in the flow diagram and write equations .

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5. Write the equations .

(i) Acidified solution of $K_2Cr_2O_7$ turns green when sodium sulphite is added to it.

(ii) Potassium ferricyanide is added to ferrous sulphate .

(iii) Silver chloride is treated with aqueous sodium cyanide .

(iv) Zinc is exposed to moist air .

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6. Explain the following

(i) A little acid is always added in the preparation of aqeous ferrous sulphate solution

(ii) Aqueous solution of mercuric chloride and stannous

chloride cannot exist together .

(ii) Ferric iodide is very unstable but ferric chloride is not.

(iv) Hg^{2+} and Hg_2^{2+} salts are colourless generaly .

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7. (a). $CuSO_4.5H_2O \xrightarrow{100^\circ} (A) \xrightarrow{230^\circ} (B) \xrightarrow{800^\circ} (C) + (D)$

(b). $AgNO_3 \xrightarrow{redhot} (E) + (F) + O_2$

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Assingment Section J Aakash Challengers Questions

1. $KMnO_4$ dissollution in concentration H_2SO_4 results in explosion due to

A. Formation of MnO which explode

B. Formation of Mn_2O_7 which explode

C. Formation of MnO_2 which explode

D. Formation of $MnSO_4$ which explode

Answer: B

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2. When K_2MnO_4 is added in solution of NH_4Cl then

A. Green colour will appear

B. Yellow colour will appear

C. Pink colour will appear

D. Colour will appear

Answer: B

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3. Which of the following lanthanoids has highest tendency to form complexes ?

A. Ce^{+3}

B. Pm^{+2}

C. Lu^{+3}

D. Eu^{+2}

Answer: C

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4. What will the structure of CrO_5 in presence of pyridine ?

A. Butterfly

B. Square pyramidal

C. Pentagonal pyramidal

D. Cannot be predicted

Answer: C

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5. Choose the correct statement regarding bonding in $FeCl_3$

(I) It contains $2c - 2e^-$ bond

(II) It contains $3c - 2e^-$ bond

(III) It contain co-ordinate bond

A. (I),(II)

B. (I),(III)

C. (II),(III)

D. (I),(II) &(III)

Answer: B

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6. The hybridisation of Cu in $(NH_4)_2[CuCl_4]$ and $Cs_2[CuCl_4]$ is

A. dsp^2 in both

B. dsp^2 and sp^3 respectively

C. sp^3 and dsp^2 respectively

D. sp^3 in both

Answer: B

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7. Stability of the complex may depend on

A. Ionisation energy

B. Hydration energy

C. Sublimation energy

D. All of these

Answer: D

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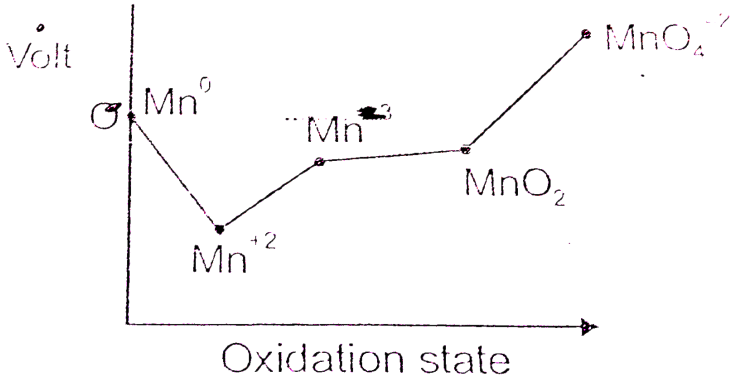
8. In this diagram , the most stable oxidation is



A. Mn^0

B. Mn^{+2}

C. MnO_4^{-2}

D. Mn^{+3}

Answer: B

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9. The correct regarding $CuCl_5^{-3}$ compound is

A. Hybridisation is sp^3d

B. Axial bond length is larger than equitorial bond length

C. Equatorial bond length is longer than axial bond length

D. Both (1) & (3)

Answer: D

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10. What will be the hybridisation of $Ni(CN)_5^{-3}$?

A. sp^3d^2

B. sp^3d

C. dsp^3

D. d^2sp^3

Answer: C