

CHEMISTRY

JEE (MAIN AND ADVANCED) CHEMISTRY

D & F BLOCK ELEMENTS

Level I Exercise

1. Which of the following statements concerning transition elements is not true?

- A. They are all metals
- B. They easily form complexes
- C. Compounds containing their ions are coloured
- D. They show multiple oxidation states always differing by two units.

Answer: D



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2. Which element has pseudo inert gas electronic configuration ?

A. 46

B. 45

C. 47

D. 48

Answer: A



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3. The highly stable pair of ions are

A. Fe^{2+} and Fe^{3+}

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

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

D. Fe^{3+} and Fe^{4+}

Answer: C



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4. Which of the following ion has three unpaired d-electrons

A. Ti^{2+}

B. V^{3+}

C. Cr^{3+}

D. Mn^{2+}

Answer: C



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5. Transition metal " X " has a configuration $[Ar]3d^4$ in its +3 oxidation state . The atomic number of the metal is

- A. 25
- B. 26
- C. 32
- D. 19

Answer: A



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6. The number of 'd' electrons in Fe^{2+} is not equal to that of

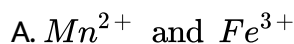
- A. s-electrons in Mg
- B. p-electrons in Ne
- C. p-electrons in Ne
- D. d-electrons in Fe

Answer: C



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7. The pair of ions which do not have same number of unpaired electrons is



Answer: D



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8. (A): Outermost electronic configuration of Pt is $5d^9s^1$

(R) : Pt in its ion attains pseudo inert gas configuration The correct

answer is

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not correct explanation of (A)
- C. (A) is true but (R) is false
- D. (A) is false but (R) is true

Answer: C



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9. (A): Elements of second and third transition series have nearly same atomic radii

(R): Lanthanide contraction is observed in the elements from atomic number 58 to 71.

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not correct explanation of (A)
- C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: A



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10. Identify the correct statements among the following

- I) The transition elements have partially filled (n-1) d orbitals.
- II) Cu is a better conductor of electricity than that of Ag.
- III) Sc^{+3} , Zn^{+2} are diamagnetic whereas Ti^{+4} is paramagnetic.
- IV) Transitional elements are less electro-positive than alkali metals

A. I, II only

B. I, II, III only

C. I, IV only

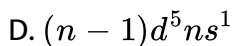
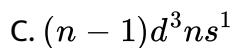
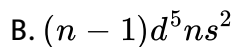
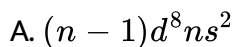
D. I, III only

Answer: C



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

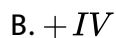
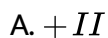


Answer: B



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12. The common oxidation state of transition elements is



C. $+VI$

D. $+VII$

Answer: A



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13. Which of the following transition elements exhibit $+8$ oxidation state

A. Cu and Zn

B. Ru and Os

C. W and Pb

D. Ag and Au

Answer: B



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14. Manganese exhibits oxidation states from

A. $+II$ to $+VII$

B. $+I$ to $+VI$

C. $+I$ to $+V$

D. $+III$ to $+V$

Answer: A



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15. The most stable oxidation state of Iron is

A. $+II$

B. $+III$

C. $+I$

D. $+VI$

Answer: B



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16. The maximum oxidation state in 3d series elements is shown by

A. Cu

B. V

C. Mn

D. Fe

Answer: C



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17. The transition element that has stable configuration in +1 oxidation state is

A. Cu

B. Zn

C. Sc

D. Mn

Answer: A



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18. Divalent Manganese is more stable due to

A. $3d^4$ configuration

B. $3d^2$ configuration

C. $3d^5$ configuration

D. $3d^3$ configuration

Answer: C



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19. The oxidation state of nickel in $[Ni(CO)_4]$ is _____

A. $+II$

B. zero

C. $+III$

D. $+VIII$

Answer: B



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20. The element which has half-filled d-orbitals in its '+1' oxidation state is

A. Mn

B. Cr

C. Zn

D. Fe

Answer: B



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21. Gold can exhibit the oxidation states

A. $+I$ and $+III$

B. $+II$ and $+III$

C. $+I$ and $+III$

D. $+II$ and $+IV$

Answer: C



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22. The electronic configuration of a transition element is $[Ar]4s^23d^3$.

The possible oxidation states are

A. +1 + 2, and + 3

B. +2 and + 3

C. +2, + 3, + 4 and + 5

D. +2 and + 5

Answer: C



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23. The highest oxidation state is exhibited by the transition metal with electronic configuration

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

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

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

D. $(n - 1)d^6ns^2$

Answer: D



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24. The transition element having highest oxidation state belongs to which group?

A. VIII

B. VII_B

C. V_B

D. IV_B

Answer: A



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25. Coloured complexes absorb radiation in the

- A. visible region
- B. infrared region
- C. U.V. region
- D. far IR region

Answer: A



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26. Coloured ion among the following is

- A. Zn^{2+}
- B. Mn^{2+}
- C. Cu^{1+}
- D. Ti^{4+}

Answer: B



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27. In aqueous solution which of the following colour is exhibited by Nici,

A. pink

B. green

C. green

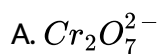
D. yellow

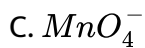
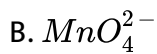
Answer: B



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28. The ion which exhibits orange red colour in aqueous solution is



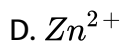
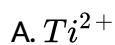


Answer: A



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29. The following ion is colourless in aqueous solution ?

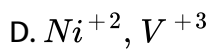
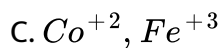
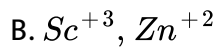
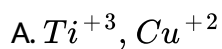


Answer: D



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30. Which of the following pairs of ions are colourless?



Answer: B



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31. The following ion exhibits colour in aqueous solution ?



Answer: C



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32. (A): Sc^{+3} ion in aqueous solutions is colorless

(R) : Ions with d⁰ configuration are colorless

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. (A) is false but (R) is true

Answer: A



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33. The atomic number of an element 'M' is 26. How many electrons are present in the M-shell of the element in its M^{3+} state ?

- A. 5
- B. 14
- C. 12
- D. 13

Answer: D



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34. Element furnishing coloured ions in the aqueous medium is

- A. Zn
- B. Hg
- C. Cu
- D. Al

Answer: C



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35. Hydrated Cu^{2+} ions absorb light of colour and transmit light of colour

- A. red and blue
- B. green and purple
- C. purple and red
- D. blue and red

Answer: A



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36. CrO_4^{2-} and MnO_4^-

- A. presence of unpaired electrons in 'd' orbitals of Cr and Mn
- B. charge transfer phenomenon
- C. d-d electron transition
- D. close packing crystal structure

Answer: B



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37. The colour of $[Ti(H_2O)_6]^{3+}$ is due to

- A. transfer of electron from Titanium to another atom of Titanium
- B. presence of water molecules
- C. d-d transition
- D. intra molecular vibration

Answer: C



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38. Transition metal which forms green compounds in its $+3$ oxidation state and orange red compounds in its $+6$ oxidation state is

- A. Cobalt
- B. Chromium
- C. Iron
- D. Nickel

Answer: B



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39. Complementary colour of green light of wavelength $5000\text{\AA}$ is

- A. purple
- B. blue
- C. red

D. grey

Answer: A



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40. Ti^{3+} is purple but Ti^{4+} is colourless. This is because

A. d^1 configuration of Ti^{3+}

B. d^0 configuration of Ti^{3+}

C. d^3 configuration of Ti^{3+}

D. d^{10} configuration of Ti^{3+}

Answer: A



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41. A transitional metal X^{+2} in its hydrated state has six 3d electrons.

The colour of ion is expected as

A. Green

B. Pink

C. Blue

D. Yellow

Answer: A



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42. (A) : Transition metals form colored ions

(R): They have completely filled d-orbitals in the nth shell.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of

(A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: C



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43. The formula to calculate paramagnetic moment of a substance is

A. $\mu_s \sqrt{4S + 2} B. M$

B. $\mu_s = \sqrt{n(n + 2)} B. M$

C. $\mu_s = \sqrt{n(n + 4)} B. M$

D. $\mu_s = \sqrt{L(L + 2)}$

Answer: B



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44. The value of B.M in SI units is

A. $9.273 \times 10^{-23} J. T^{-1}$

B. $9.273 \times 10^{24} J. T^{-1}$

C. $9.273 \times 10^{-24} J. T^{-1}$

D. 9.273×10^{23}

Answer: C



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45. Magnetic moment of diamagnetic substance in Bohr magnetons is

A. 1.73

B. 2.83

C. 2.83

D. 0

Answer: D



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46. Which of the following set of elements are Ferromagnetic in nature

A. Zn, Cd and Hg

B. Cu, Ag and Au

C. Fe, Co and Ni

D. Sc, Ti and U

Answer: C



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47. Substances which are repelled by the external magnetic field are called

- A. diamagnetic
- B. paramagnetic
- C. ferromagnetic
- D. antiferromagnetic

Answer: A



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48. The following is paramagnetic

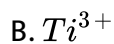
- A. CaCl_2
- B. CuCl_2
- C. ZnCl_2
- D. NaCl

Answer: B



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49. The following ion exhibits highest magnetic moment?



Answer: D



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50. The calculated magnetic moment of Cu^{2+} ion

A. 1.73 B.M.

B. zero

C. 2.6 B.M.

D. 3.4 B.M.

Answer: A



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51. Ferrous ion changes to 'X' ion, on reacting with acidified hydrogen peroxide. The number of d-electrons present in 'X' and its magnetic moment are

A. 6 and 6.93 B.M.

B. 5 and 5.92 B.M.

C. 5 and 4.9 B.M.

D. 4 and 5.92 B.M.

Answer: B



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52. (A): The spin only magnetic moment of Sc^{+3} 1.73 BM

(R) : The spin only magnetic moment (in BM) of an ion is equal to

$$\sqrt{n(n+2)}$$

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the. correct p.xphmation of (A)
- C. (A) is true but (R) is false
- D. (A) is false but (R) is true

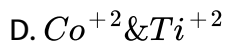
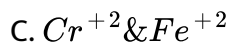
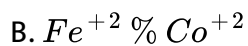
Answer: D



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53. Which of the following pair of transition metal ions, have the same calculate values of magnetic moment ?

A. Ti^{+2} & V^{+2}



Answer: B



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54. Which one of the following has diamagnetism?

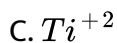
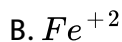


Answer: D



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55. Which of the following ions has the maximum magnetic moment



Answer: A



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56. The spin only magnetic moment of Ni^{2+} in aqueous solution would be

A. 1.73

B. 2.84BM

C. 4.9BM

D. 0

Answer: B



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57. The magnetic moment of Cr^{3+} is similar to that of



Answer: D



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58. The magnetic moment of an ion in its $+3$ oxidation state is 3.85 BM.

The number of unpaired d-electrons present in it are

A. 2

B. 3

C. 4

D. 5

Answer: B



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59. The ion with highest magnetic moment is

A. V^{3+}

B. Cr^{3+}

C. Fe^{3+}

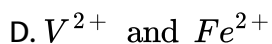
D. Co^{3+}

Answer: C



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60. The pair of ions which do not have diamagnetic nature



Answer: D



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61. The magnetic moment of an ion is $\sqrt{24}$ B.M. Then that ion may be



D. Cu^{2+}

Answer: B



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62. The highest degree of paramagnetism is shown by

A. $CoCl_2 \cdot H_2O$

B. $MnSO_3 \cdot 4H_2O$

C. $FeCl_2 \cdot 4H_2O$

D. $NiCl_2 \cdot 6H_2O$

Answer: B



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63. M^{3+} ion of the first transition series metal 'M' has a magnetic moment 1.73 BM. The atomic number of the metal 'M' is

- A. 21
- B. 24
- C. 29
- D. 22

Answer: D



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64. M^{x+} ion has magnetic moment 2.84 BM. Then 'x' is (Z of M = 23)

- A. 3
- B. 2
- C. 4
- D. 1

Answer: A



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65. The value of paramagnetic moment of Ti^{3+} ion in Bohr magnetons is

A. 273×10^{-24}

B. 16.042×10^{-24}

C. 26.34×10^{-24}

D. 16.042×10^{-27}

Answer: B



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66. What is the correct order of spin only magnetic moment (in BM) of

Mn^{+2} , Cr^{+2} and V^{+2} ?

A. $Mn^{+2} > V^{+2} > Cr^{+2}$

B. $V^{+2} > Cr^{+2} > Mn^{+2}$

C. $Mn^{+2} > Cr^{+2} > V^{+2}$

D. $Cr^{+2} > V^{+2} > Mn^{+2}$

Answer: C



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67. In which of the following 'd' subshells are degenerate

A. $Cu_{(aq)}^{2+}$

B. $Fe_{(aq)}^{2+}$

C. $Fe_{(aq)}^{3+}$

D. $Cr_{(aq)}^{1+}$

Answer: D



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68. Metals constitute brass are

- A. Zn and Cu
- B. Cu and Sn
- C. Cu and Sn
- D. eu, Zn and Sn

Answer: A



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69. Bronze is an alloy of

- A. Cu + Sn
- B. Cu + Zn
- C. Pb + Sn + Zn

D. Pb + Zn

Answer: A



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70. The metal not present in german silver is

A. Ag

B. Cu

C. Ni

D. Zn

Answer: A



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71. Steels are generally prepared by----- method

A. Compressed method

B. Oxidation

C. Quenching

D. Electolytic deposition

Answer: C



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72. Percentage of carbon in the steels is nearly

A. 0.03

B. 0.02

C. 0.002

D. 0.1

Answer: B



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73. Which one of the following is used to remove moisture from ammonia?

- A. Type metal
- B. Devarda's metal
- C. Wood's metal
- D. Solder metal

Answer: B



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74. Which among the following is an example of Ferrous alloy

- A. Wood's metal
- B. Type metal
- C. Invar

D. Solder metal

Answer: C



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75. Which of the following alloys does not contain copper

A. Devarda alloy

B. Aluminium bronze

C. German silver

D. Magnalium

Answer: D



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76. Gun metal is an alloy of

- A. Cu and Fe
- B. Cu,Sn and Zn
- C. Ni,Fe and Cr
- D. Al and Mg

Answer: B



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77. Which of the following is ferrous alloy?

- A. German Silver
- B. Gunmetal
- C. Nichrome
- D. Devarda's alloy

Answer: C



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78. (A): Transition elements form alloys easily

(R) : Transition elements have high melting points

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true and (R) is not the correct explanation of (A)
- C. (A) is true but (R) is false
- D. (A) is false but (R) is true

Answer: B



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79. Transition elements form alloys easily because they have

- A. same number of shells
- B. same electronic configuration

C. nearly same atomic size

D. same atomic weight

Answer: C



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80. The common metal present in German Silver, Bell metal and Brass is

A. Fe

B. Cu

C. Zn

D. Sn

Answer: B



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81. The correct statement among the following is

- A. The colour of $Cr_2O_7^{2-}$ -ion is due to d-d transition of unpaired electrons
- B. Transition elements form a large number of alloys, because of similar boiling points
- C. Bronze is an alloy of Copper and Zinc
- D. Salt of Fe^{2+} ion has greenish colour

Answer: D



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82. Alloy formation ability of transition elements is due to

- A. same crystalline structures
- B. same atomic radii

C. similar chemical properties

D. anyone of these properties

Answer: D



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83. The alloy containing highest percentage composition of copper is

A. German silver

B. Aluminium Bronze

C. Bell metal

D. Brass

Answer: B



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84. Which of the following is used for sharply defined castings

- A. Soldermetal
- B. Wood's metal
- C. Type metal
- D. Devarda's alloy

Answer: C



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85. Identify the correct statements among the following

- I) Both Cr and Cu show +1 oxidation state
- II) The complementary colour of absorbed green colour of visible radiation is purple.
- III) Ni^{+2} ion in its hydrated state exhibits green colour
- IV) Devarda's alloy contains least percentage of 'Zn'

A. All

B. I,II,III only

C. I,IV only

D. I,III only

Answer: A



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86. The percentage of copper, tin and zinc metals present in 'Gun metal' respectively are

A. 88,2,10

B. 88,10,2

C. 80,20,Zero

D. 80,zero,20

Answer: B



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87. Gun metal is an alloy of

- A. Cu and Fe
- B. Cu, Sn & Zn
- C. Ni, Fe and Cr
- D. Al and Mg

Answer: B



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88. Alloy used for making ball mills

- A. Nickel steel
- B. Manganese steel
- C. Tungsten steel

D. Chrome steel

Answer: B



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89. Percentage of silver in the alloy of German silver

A. 1.5

B. 2.5

C. 10

D. zero

Answer: D



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90. Which of the following is ferrous alloy?

A. German Silver

B. Gun metal

C. Nichrome

D. Devarda's alloy

Answer: C



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91. Which of the following is an interstitial compound

A. NH_3

B. $PdCl_2$

C. PdH

D. SiC

Answer: C



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92. The type of bond expected to be formed atoms between of two elements in interstitial compounds is

A. Covalent

B. Ionic

C. Metallic

D. None

Answer: D



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93. Which of the following is not the property of interstitial compound

A. They have high M.P, higher than those of pure metals

B. They are less harder than diamond

C. They retain metallic conductivity

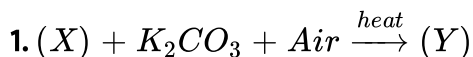
D. Their chemical reactivity is very high

Answer: D



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Level II Lecture Sheet Exercise I Single One Or More Than One Correct Answers



$(Y) + Cl_2 \rightarrow (Z)$ Pink which of the following is correct ?

A. X back , MnO_2 Y = Blue, K_2CrO_4 , $Z = KMnO_4$

B. X=green Cr_2O_3 Y=yellow K_2CrO_4 , ZK_2CrO_7

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

D. X = black , Bi_2O_3 , Y = Colourless $KBiO_2$, $Z = KBiO_2$

Answer: C



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2. Aufbau law is not valid [ut

A. *Cu*

B. *Cr*

C. both

D. Fe and Ag

Answer: C



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3. Identify the incorrect 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: C



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4. Which of the following properties would you not expect copper to exhibit:

A. Malleability

B. Low thermal conductivity

C. Low electrical conductivity

D. Ductility

Answer: B::C



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

- A. Very high ionisation energy
- B. weak metallic bonds
- C. high heat of hydration
- D. high heat of sublimation

Answer: B



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6. Which statements about mercury are correct?

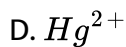
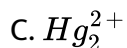
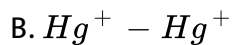
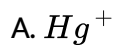
- A. Hg is a liquid metal
- B. Hg forms two series of salts
- C. Hg forms no amalgam with iron and platinum
- D. Anhydrous Hg does not show variable valency

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



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7. Mercurous ion can be represented as



Answer: B::C



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8. Transition elements with $4s^1$ configuration are:



B. Mn

C. Ni

D. Cu

Answer: A::D



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9. Identify the correct statements :

A. Iron is the most abundant transition metal

B. Cast iron is the purest form of iron

C. The most stable oxidation state of iron is +3

D. Iron does not form amalgam with mercury

Answer: A::C::D



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10. An element of 3d-transition series shows 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 covalent $x < y$
- D. Compounds in oxidation state y are covalent $y < x$

Answer: B::C



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11. Which of the following forms interstitial compounds(s)?

- A. Fe
- B. Ni
- C. Co
- D. None to these

Answer: A::B::C



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12. The stable oxidation state of Mn are

A. +2

B. +7

C. +3

D. +5

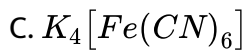
Answer: A::B



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13. Which of the following compounds is coloured

A. Na_2CuCl_4



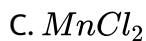
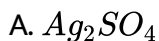
D. All the above

Answer: B



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14. Which of the following compounds is expected to be coloured :

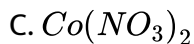
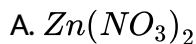


Answer: B::C



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15. The aqueous solution of the following salt will be coloured in the case of :

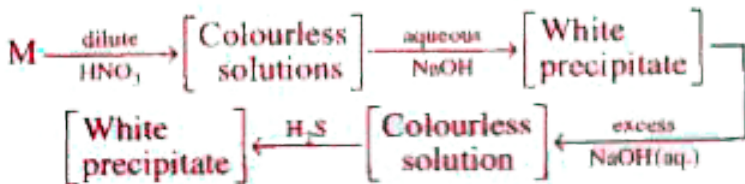


Answer: C::D



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



A. Mg

B. Pb

C. Zn

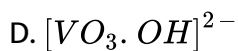
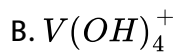
D. Sn

Answer: C



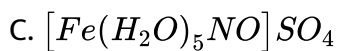
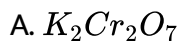
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17. Each of the following ion contains vanadium the + V oxidation state except



Answer: C

18. Which of the following are not coloured due to charge transfer



Answer: C::D

19. Oxides of which of the following metals show oxidation state of +8 ?



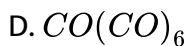
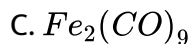
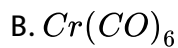
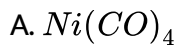
D. Zn

Answer: A::B



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20. Select the compounds having metal in zero oxidation state

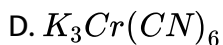
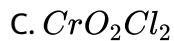
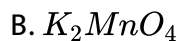


Answer: A::B::C::D



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21. Among the following , identify the species with an atom in + 6 oxidation state



Answer: B::C



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22. The oxidation state(s) of copper is (are)



Answer: A::B



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23. Duraluminium an alloy contains :

A. Mg

B. Cu

C. Al

D. Mn

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



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24. Manganese steel contains

A. Fe

B. C

C. Mn

D. Cr

Answer: A::B::C



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25. The stainless steel developed in India contains the following special components

A. Cobalt

B. Chromium

C. Manganese

D. Aluminium

Answer: B



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26. Which of the following is(are) alloy(s) not containing copper?

- A. Bell metal
- B. Brass
- C. Steel
- D. Duraluminium

Answer: C



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27. Which of the following statement(s) is (are) correct. When a mixture of $NaCl$ and $K_2Cr_2O_2$ is gently warmed with conc. H_2SO_4

- A. A deep red vapours is 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::C::D



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28. K_2MnO_4 is formed when :

- A. Cl_2 is passed into $KMnO_4$ solution
- B. Manganese dioxide is fused with potassium hydroxide in air
- C. Fomnaldehyde reacts with potassium pennanaganate in presence of a strong alkali
- D. Potassium pennanaganate reacts with conc H_2SO_4

Answer: B::C



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29. Which of the following is (are) correct:

- A. Calomel is mercuric chloride
- B. Calomel is widely used as an antiseptic
- C. Calomel is used medically as purgative
- D. Calomel is freely soluble in water.

Answer: C



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30. Which statement (s) is (are) incorrect:

- A. $Fe(CO)_5$ reacts with Br_2Cl_4
- B. Carbonyl complexes are usually formed with transition metals
- C. All transition metals form mono-metallic carbonyls

D. The decomposition of $Ni(CO)_4$ to give Ni is used in the extraction of Ni by Mond's process

Answer: C



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31. If, in an ammonical solution, salts which produce a black precipitate when H_2S is passed through themselves, may be :

- A. A nickel salt
- B. A mercury salt
- C. A cobalt salt
- D. A lead salt

Answer: A::C::D



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32. Which of the following metals will not react with solution of $CuSO_4$?

A. Fe

B. Zn

C. Mg

D. Ag

Answer: A::B::C



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33. Which of the following statement(s) is (are) true for Mohr's salt ?

A. It does not decolourises $KMnO_4$ solution

B. It is a double salt

C. Oxidation state of Fe is +3

D. It is a secondary standard solution

Answer: B



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34. CrO_4^{2-} (yellow) changes to $Cr_2O_7^{2-}$ (orange) in $p^H = y$. Hence x and y are

A. 6,8

B. 6,5

C. 8,6

D. 7,7

Answer: A



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35. The catalyst used in the manufacture of sulphuric acid by contact process is

A. $NO(g)$

B. V_2O_5

C. Mo

D. Platinised asbestos

Answer: B::D



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36. Iodine is liberated on adding potassium iodide solution to solution(s) of

A. $ZnCl_2$

B. $FeCl_2$

C. $CuSO_4$

D. $AlCl_3$

Answer: C



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37. Select the wrong statement(s) :

- A. Iron does not form amalgam with mercury
- B. Hg vapours are poisonous
- C. Hg is divalent in mercurous compounds
- D. Oxy-salts of mercury are thermally unstable

Answer: A::B::C



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38. Which of the following statement(s) is (are) correct ?

- A. $HgCl_2$ dissolves in hot water
- B. $HgCl_2$ gives HCl when treated with sulphuric acid
- C. $HgCl_2$ gives yellow precipitate with NaOH

D. gives white ppt with ammonium $HgCl_2$ hydroxide

Answer: A::C::D



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39. $CuCN$ reacts with $FeCl_3$ to give

A. $CuCl_2$

B. $Cu(CN)_2$

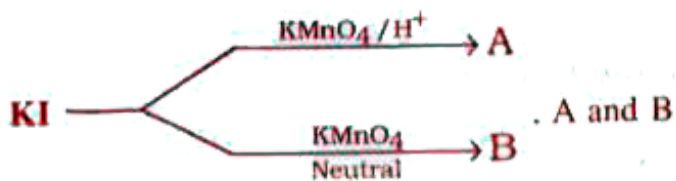
C. $(CN)_2$

D. All

Answer: C

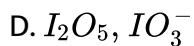
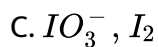
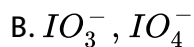
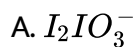


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40.

respectively in the given reactions



Answer: A



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41. Transition elements form complexes due to

A. d-d transition

- B. charge transfer
- C. Variable oxidation state
- D. small size and high charge

Answer: D



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42. The complex forming ability of a transition metal depends upon

- A. availability of vacant d-orbital
- B. high ionisation potential
- C. small size of cation or high charge density
- D. variable oxidation states

Answer: A::C::D



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43. Which of the following statement is incorrect?

A. $\text{La}(\text{OH})_3$ is less basic than $\text{Lu}(\text{OH})_3$

B. In lanthanide series ionic radius of decreases from La^{3+} to Lu^{3+} ion

C. La is actually an element of transition series rather than lanthanides

D. Atomic radius of Zr and Hf are same because of lanthanide contraction

Answer: A



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44. Lanthanides are separated best by

A. Fractional crystallization

- B. solvent extraction
- C. Complex formation using EDTA
- D. Ion exchange resins

Answer: D



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45. Which of the following statements regarding Ni and Pt are correct

- A. Ni^{2+} is more stable than Pt^{2+}
- B. Pt^{4+} is more stable than Ni^{4+}
- C. Pt does not form amalgams
- D. both are used in hydrogenation

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



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46. Identify incorrect statement

- A. Lanthanides do not form oxoions
- B. Lanthanides and actinides are tripositive
- C. Trivalent sulphates of f-block are water soluble
- D. Trivalent fluorides of f-block elements are water soluble

Answer: A::D



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47. Which of the following is true for Mohr's salt

- A. Decolourises $KMnO_4$ acidic medium
- B. It is a double salt
- C. It gives red colouration with thiocyanate
- D. Used as a primary standard

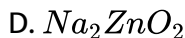
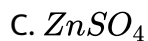
Answer: A::B::C::D



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Level II Lecture Sheet Exercise II Linkd Comperhension Type Questions

1. A metal sulphide A gives gas B with rotten egg smell and a colourless sulphate C, when treated with dil H_2SO_4 . B reacts with $K_2Cr_2O_7 / H^+$ to form D, a white grey element. D burns in oxygen to yield E a colourless gas. If B is added to E, it gives D and a colourless liquid, which turns anhydrous $CuSO_4$ blue. C gives precipitate with $NH_{3(aq)}$ or NaOH, which dissolves in excess of NaOH



Answer: C



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2. A metal sulphide A gives gas B with rotten egg smell and a colourless sulphate C, when treated with dil H_2SO_4 . B reacts with $K_2Cr_2O_7 / H^+$ to form D, a white grey element. D burns in oxygen to yield E a colourless gas. If B is added to E, it gives D and a colourless liquid, which turns anhydrous $CuSO_4$ blue. C gives precipitate with $NH_3(aq)$ or NaOH, which dissolves in excess of NaOH

A. Zn

B. Cu

C. S

D. Ba

Answer: C



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3. A metal sulphide A gives gas B with rotten egg smell and a colourless sulphate C, when treated with dil H_2SO_4 . B reacts with $K_2Cr_2O_7/H^+$ to form D, a white grey element. D burns in oxygen to yield E a colourless gas. If B is added to E, it gives D and a colourless liquid, which turns anhydrous $CuSO_4$ blue. C gives precipitate with $NH_{3(aq)}$ or NaOH, which dissolves in excess of NaOH

A. H_2S

B. SO_3

C. SO_2

D. CS_2

Answer: C



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4. 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°C . It is used in the preparation of potassium permanganate and in the production of Cl_2 gas. Over half a million tonnes per year of MnO_2 is used in dry batteries. In the laboratory, MnO_2 is made by :

A. heating Mn in O_2

B. oxidising Mn^{2+} in air

C. electrolytic oxidation of MnO_4

D. Precipitating MnO_2 from solution when performing titration of $KMnO_4$

Answer: D



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5. 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 530^0 C. It is used in the preparation of potassium permanaga-nate and in the production of Cl_2 gas. Over half a million tonnes per year of MnO_2 is used in dry batteries

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 K_2MnO_4

Answer: B



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6. 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 530^0 C. It is used in the preparation of potassium permanaga-nate and in the production of Cl_2 gas. Over half a million tonnes per year of MnO_2 is used in dry batteries MnO_2 dissolve in concentrated HCl to form :

A. Mn^{4+} ion and Cl_2

B. Mn^{2+} ion and Cl_2

C. $[MnCl_2]^{-2}$ and Cl_2

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

Answer: B



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7. 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 $K_3[Fe(CN)_6]$

Anhydrous $FeCl_2$ is made by

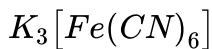
- A. heating Fe with dilute HCl
- B. heating Fe with gaseous HCl
- C. Reacting Fe with conc. HCl
- D. Heating Fe with Cl_2 gas

Answer: A

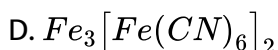
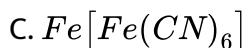
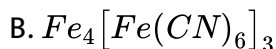
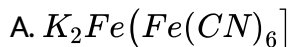


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8. Iron (+II) is one of the most important oxidation states, and salts are called ferrous salts. Most of the Fe (+II) salts are pale green and contain $[Fe(H_2O)_6]^{2+}$ ion. Fe (+II) compounds are easily oxidised by air. and so are difficult to obtain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



Anhydrous $FeCl_2$ is made by



Answer: D



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9. 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 $K_3[Fe(CN)_6]$

Anhydrous $FeCl_2$ is made by

A. I,II,III correct

B. I, III correct

C. II,III correct

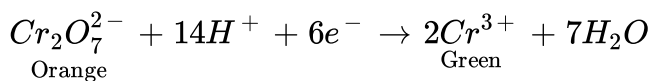
D. Only I correct

Answer: A

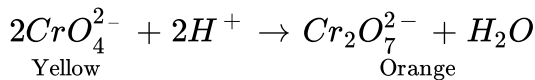
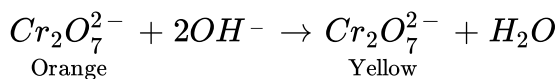


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10. $K_2Cr_2O_7$ acts as a good oxidizing agent in acidic medium

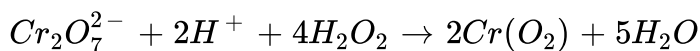


In alkaline solution, orange colour of $Cr_2O_7^{2-}$ changes to yellow colour due to formation of $Cr_2O_4^{2-}$ and again yellow colour changes to orange colour on changing the solution to acidic medium



Cr_4^{2-} and $Cr_2O_7^{2-}$ exist in equilibrium at pH = 4 and are interconvertible by altering the pH of the solution. When heated with H_2SO_4 and metal

chloride $K_2Cr_2O_7$ gives vapour of chromyl chloride (CrO_2Cl_2). Chromyl chloride (CrO_2Cl_2) when passed into aqueous NaOH solution, yellow colour solution of CrO_4^{2-} is obtained. This on reaction with lead acetate gives yellow ppt. $PbCrO_4$. When H_2O_2 is added to an acidified solution of dichromate ion, a complicated reaction occurs. The products obtained depend on the pH and concentration of dichromate.



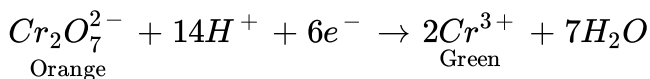
A deep blue-violet coloured peroxo compound, $CrO(O_2)_2$, ' called chromic peroxide is formed. This decomposes rapidly in aqueous solution into Cr^{3+} and oxygen.

What happens when a solution of potassium chromate is treated with an excess of dilute nitric acid?

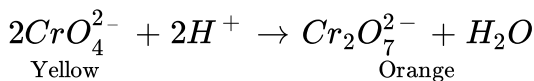
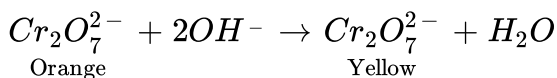
- A. Cr^{3+} and $Cr_2O_7^{2-}$ are formed
- B. $Cr_2O_7^{2-}$ is reduced to +3 state of Cr
- C. CrO_4^{2-} reduced to +3 state of Cr
- D. CrO_4^{2-} is reduced to 0 state of Cr

Answer: B

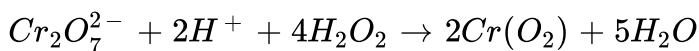
11. $K_2Cr_2O_7$ acts as a good oxidizing agent in acidic medium



In alkaline solution, orange colour of $Cr_2O_7^{2-}$ changes to yellow colour due to formation of $Cr_2O_4^{2-}$ and again yellow colour changes to orange colour on changing the solution to acidic medium



Cr_4^{2-} and $Cr_2O_7^{2-}$ exist in equilibrium at pH = 4 and are interconvertible by altering the pH of the solution. When heated with H_2SO_4 and metal chloride $K_2Cr_2O_7$ gives vapour of chromyl chloride (CrO_2Cl_2). Chromyl chloride (CrO_2Cl_2) when passed into aqueous NaOH solution, yellow colour solution of CrO_4^{2-} is obtained. This on reaction with lead acetate gives yellow ppt. $PbCrO_4$. When H_2O_2 is added to an acidified solution of dichromate ion, a complicated reaction occurs. The products obtained depend on the pH and concentration of dichromate.



A deep blue-violet coloured peroxo compound, $CrO(O_2)_2$, ' called chromic peroxide is formed. This decomposes rapidly in aqueous solution into Cr^{3+} and oxygen.

Which of the following statements is wrong when a mixture of NaCl and $K_2Cr_2O_7$ is gently warmed with conc. H_2SO_4 ?

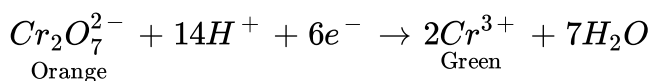
- A. Deep red vapour is evolved
- B. The vapour when passed through NaOH solution gives a yellow solution of Na_2CrO_4
- C. Chlorine gas is formed
- D. Chromyl chloride is formed

Answer: C

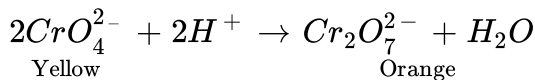
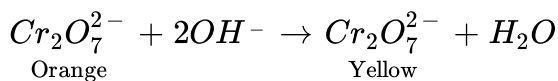


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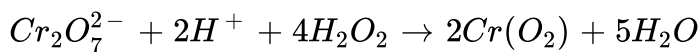
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In alkaline solution, orange colour of $Cr_2O_7^{2-}$ changes to yellow colour due to formation of $Cr_2O_4^{2-}$ and again yellow colour changes to orange colour on changing the solution to acidic medium

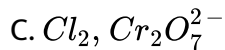
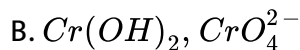
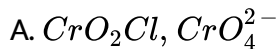


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A deep blue-violet coloured peroxo compound, $CrO(O_2)_2$, ' called chromic peroxide is formed. This decomposes rapidly in aqueous solution into Cr^{3+} and oxygen.

CrO_3 on reaction with HCl and the product on reaction with NaOH(aq) give respectively



Answer: A



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13. Transition metal and their compounds are used as catalysts 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 : $SO_2 + \frac{1}{2}O_2 \xrightarrow{V_2O_5} SO_3$

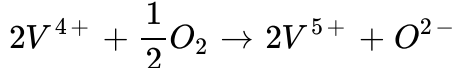
It is thought that the actual oxidation process takes place in two stages.

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

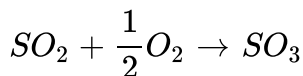
' At the same time, V^{5+} is reduced to V^{4+}



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



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



Catalytic activity of transition metals depends on

- A. they have completely filled s-subshell
- B. they have a comparable size due to poor shielding of d-subshell
- C. they introduce an entirely new reaction mechanism with a lower activation energy
- D. they have variable oxidation states differ by two units

Answer: C



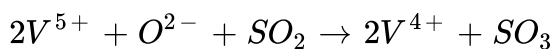
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14. Transition metal and their compounds are used as catalysts in industry and in biological system. For example, in the Contact Process, vanadium compounds in the + 5 state (V_2O_5 or VO_3^-) are used to oxidise SO_2 to SO_3 : $SO_2 + \frac{1}{2}O_2 \xrightarrow{V_2O_5} SO_3$

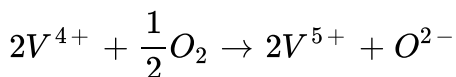
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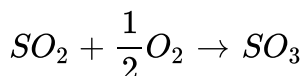
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In the second step V^{5+} is regenerated from V^{4+} by oxygen :



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



Catalytic activity of transition metals depends on

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

Answer: D



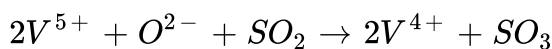
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15. Transition metal and their compounds are used as catalysts in industry and in biological system. For example, in the Contact Process, vanadium compounds in the + 5 state (V_2O_5 or VO_3^-) are used to oxidise SO_2 to SO_3 : $SO_2 + \frac{1}{2}O_2 \xrightarrow{V_2O_5} SO_3$

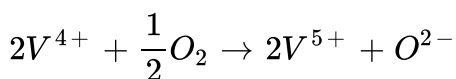
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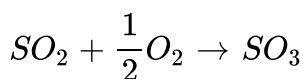
' At the same time, V^{5+} is reduced to V^{4+}



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



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



Catalytic activity of transition metals depends on

A. their ability to exist in different oxidation states

B. the size of the metal atoms

C. the number of empty atomic orbitals available

D. none of these

Answer: A



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16. Transition metal and their compounds are used as catalysts 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 : $SO_2 + \frac{1}{2}O_2 \xrightarrow{V_2O_5} SO_3$

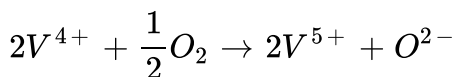
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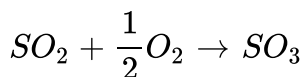
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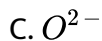
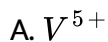
In the second step V^{5+} is regenerated from V^{4+} by oxygen :



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



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



Answer: B

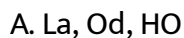


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17. Since all lanthanides and actinides belong to group IIIB or 3rd group they have common oxidation state of +3 as the most stable state. In addition to +3, they also show +2 and +4 states also. M+2 states they are good reducing agents. Actinides show higher oxidation states of +5, +6 and +7. For them +3 state is not the most stable state especially for the first four elements

Based upon the information above answer the following questions

Lanthanides which show powerful reducing action in +2 state



B. Er,Lu,Eu

C. Th,Yb,Ce

D. Nd,Sm,Tb

Answer: A



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18. Since all lanthanides and actinides belong to group IIIB or 3rd group they have common oxidation state of +3 as the most stable state. In addition to +3, they also show +2 and +4 states also. M+2 states they are good reducing agents. Actinides show higher oxidation states of +5, +6 and +7. For them +3 state is not the most stable state especially for the first four elements

Based upon the information above answer the following questions

Lanthanides which show powerful reducing action in +2 state

A. Ce,Tb and Eu

B. Eu,Yb,Pm

C. Ce,Tb and Pm

D. Eu,Yb and Tb

Answer: B



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19. Since all lanthanides and actinides belong to group IIIB or 3rd group they have common oxidation state of +3 as the most stable state. In addition to +3, they also show +2 and +4 states also. M+2 states they are good reducing agents. Actinides show higher oxidation states of +5, +6 and +7. For them +3 state is not the most stable state especially for the first four elements

Based upon the information above answer the following questions

Actinides which show higher oxidation state +5, +6 and +7 states and respectively are

A. Th,Pa and Am

B. Am,Cm and U

C. Pa,U and Ac

D. Pa,U and Np

Answer: D



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Level II Lecture Sheet Exercise II Match Of Following Questions

1. Match the following questions

COLUMN - I

- A) NiSO_4 and VO^+
- B) TiCl_4 and ZnSO_4
- C) $\text{MnCl}_{3(\text{aq})}$ and $\text{CoCl}_{3(\text{aq})}$
- D) FeCl_3 and MnSO_4

COLUMN - II

- p) Same magnetic moment
- q) Nearly similar colour
- r) Same oxidation state
- s) Same outer electronic configuration



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2. Match the following questions

COLUMN - I

- A) Tc
- B) Hg
- C) Zn
- D) Es

COLUMN - II

- p) Transition element
- q) Not found in nature
- r) Last element of third transition series
- s) Used in galvanization of iron



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3. Match the following questions

COLUMN - I

- A) Zn, Cd, Hg
- B) Fe, Co, Ni
- C) Cu, Ag, Au
- D) Au, Pt, Hg

COLUMN - II

- p) Ferromagnetic metals
- q) Coin metal
- r) Noble metals
- s) Non transition metals



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4. Match the following questions

COLUMN - I

- A) Ni^{2+}
- B) Ti
- C) Misch metal
- D) Hg

COLUMN - II

- p) Alloy
- q) Diamagnetic character
- r) $3d^2$
- s) $\sqrt{8}$ B.M. (Magnetic moment)



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5. Match the following questions

COLUMN - I

(Alloys)

- A) Fe, Cr, V
- B) Cu, Zn & Ni
- C) Cu, Sn & Zn
- D) Fe, Cr & Ni

COLUMN-II

(Composition)

- p) Chrome steel
- q) German silver
- r) Gun metal
- s) Stainless steel

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6. Match the following questions

COLUMN - I

- A) K_2MnO_4
- B) $KMnO_4$
- C) $K_2Cr_2O_7$
- D) K_2CrO_4

COLUMN - II

- p) Transition element in +6 state
- q) Oxidising agent in acid medium
- r) manufactured from pyrolusite ore
- s) manufactured from chromite ore

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7. Match the following questions

COLUMN - I	COLUMN - II
A) Cu^{2+}	p) Form amphoteric oxide
B) Zn^{2+}	q) Diamagnetic and colourless compounds
C) Cr^{3+}	r) Form complex with NH_3
D) Sc^{3+}	s) Form complex with KCN



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8. Match the following questions

COLUMN - I	COLUMN - II
A) Fe	p) Do not form amalgam
B) Pt	q) Element of VIII group
C) Mo	r) Used in biological oxidation of H_2O to O_2
D) Mn	s) Used in X-ray tube



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9. Match the following questions

COLUMN - I

(ppt)

- A) PbSO_4
- B) Ag_2CrO_4
- C) $\text{Cu}(\text{OH})_2$
- D) Ag_3PO_4

COLUMN - II

(Solubility)

- p) Ammonium Acetate
- q) Dil HNO_3
- r) Ammonium solution
- s) Na_2CO_3 solution



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Level II Lecture Sheet Exercise IV Integer Answer Type Questions

1. A metal ion from the first transition has a magnetic moment of 3.87 B.M. How many unpaired electrons are expected to be present in the ion



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2. The brown ring complex is formulated as $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}^+]\text{SO}_4$ The Oxidation state of Fe is X what is the value of X?



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3. How many moles of $KMnO_4$ are required to oxidise 10 moles of ferrous oxalate in acidic medium



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4. When potassium dichromate is heated to a white heat, it decomposes to give potassium chromate, chromic oxide and oxygen gas. The number of moles of oxygen gas liberated in the decomposition process are



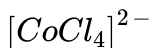
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5. How many electrons are involved in reduction of $KMnO_4$ in basic reduction?



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6. How many unpaired electrons are present in the central metal ion



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7. Number of dative bonds around Mg^{2+} ion in chlorophyll is



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8. Maximum number of oxygen molecules bond around a heamoglobin is
(are)



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9. Number of Cr-O sigma bonds in dichromate in $Cr_2O_7^{2-}$ is



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10. Permanganate ion oxidises manganous ion to manganese dioxide in presence of zinc oxide as catalyst as $MnO_4^- + Mn^{2+} + H_2O \rightarrow MnO_2 + H^+$. The number of H^+ ion added to the product side in the balanced ionic equation is



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Practice Sheet 1 Single Or More Than One Option Questions

1. Metals which do not form amalgam

A. Fe

B. Zn

C. Ni

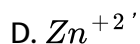
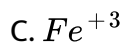
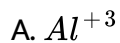
D. Au

Answer: A



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2. Oxide of metal cation which is not amphoteric ?



Answer: C



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3. The metal that has the highest melting point and used in making hard steel is



D. W

Answer: D



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4. Ionisation energies of Ni and Pt in KJ/mol are given below

	$IE_1 + IE_2$	$IE_3 + IE_4$
Ni	2.49	8.80
Pt	2.60	6.70

So the correct statment is

- A. Ni(II) compounds tend to be thermodynamically more stable than Pt(II)
- B. Pt(IV) compounds tend to be more stable than Ni(IV)
- C. a & b both
- D. None of these

Answer: C



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5. VO_4^{-} , CrO_4^{-2} and MnO_4^{-2} are pale yellow strong yellow and intense purple respectively in aqueous solution. The darkening colour is due to

- A. Charge transfer
- B. d-d transition
- C. Half filled d-dub shells
- D. Half filled d-dub shells

Answer: A



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6. The ratio of magnetic moments of Fe(III) & Co(II) is

- A. $\sqrt{5} : \sqrt{7}$
- B. $\sqrt{35} : \sqrt{15}$

C. 7:3

D. $\sqrt{24}:\sqrt{15}$

Answer: B



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7. A transition metal exists in its highest oxidation state. It is expected to behave as

A. A chelating agent

B. A central metal in a coordination compound

C. An oxidising agent

D. A reducing agent

Answer: C



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8. AgF, AgCl, NaCl, NaBr, NaI are colourless but AgBr and AgI are coloured because

- A. Ag^+ polarizes Br^- and I^- and not able to polarize Cl^- and F^-
- B. AgBr has unpaired electron
- C. AgBr has defects
- D. All of these

Answer: A



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9. Which is not an interstitial compound

- A. Tin
- B. Fe_2O_3
- C. Mn_2C_3
- D. W_2C

Answer: B



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10. Which of the following oxides of chromium is amphoteric in nature

A. CrO

B. Cr_2O_3

C. CrO_3

D. CrO_3

Answer: B



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11. Correct order of MP in transition element is

A. $W > Mo > Cr$

B. $Cr > Fe > Mn$

C. $Cu > Au > Ag$

D. $V > Cr > Ti$

Answer: A::B::C



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12. Cu^+ ion is not stable in aqueous solution because of disproportionation reaction. E° value for the disproportionation of Cu^+ is :

$$\left(E^\circ_{Cu^{2+}/Cu^+} = +0.15V, E^\circ_{Cu^+/Cu} = +0.34V \right)$$

A. $Cu^{+2}_{(aq)}$ is more stable than $Cu^+_{(aq)}$

B. $Cr^{+2}_{(aq)}$ can form interstitial compounds in aqueous solution

C. The equilibrium constant for $Cu^+_{(aq)} \rightleftharpoons Cu^{+2}_{(aq)} + Cu$ is very high

D. The equilibrium constant for $Cu^+_{(aq)} \rightleftharpoons Cu^{+2}_{(aq)} + Cu$ is very low

Answer: A::C::D



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13. Which of the following statements are correct about Zn, Cd & Hg ?

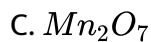
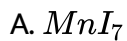
- A. They exhibit high enthalpies of atomization as the d-subshell is full
- B. Zn, Cd do not show variable valency while Hg shows +1 and +2 oxidation states
- C. Compounds of Zn, Cd and Hg are paramagnetic in nature
- D. Zn, Cd and Hg are called soft metals

Answer: B::D



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14. The unstable compounds are

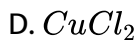
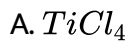


Answer: A::D



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15. Which of these are liquids at room temperature

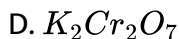
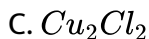
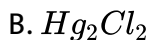
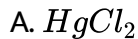


Answer: A::C



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16. The diamagnetic compounds are



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



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Practice Sheet 1 Linked Comprehension Type Questions

1. The elements of the first transition series of the d-block are given below

Sc Ti V Cr Mn Fe Co Ni Cu Zn

Y Zr Nb Mo Tc Ru Rh Pd Ag Cd

La Hf Ta W Re Os Ir Pt Au Hg

In any transition series as we move from left to right, the d-orbitals are

progressively filled and their properties vary accordingly

Which element do you expect to have the smallest atomic radius

A. Sc

B. Zn

C. La

D. Hg

Answer: B



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2. The elements of the first transition series of the d-block are given below

Sc Ti V Cr Mn Fe Co Ni Cu Zn

Y Zr Nb Mo Tc Ru Rh Pd Ag Cd

La Hf Ta W Re Os Ir Pt Au Hg

In any transition series as we move from left to right, the d-orbitals are progressively filled and their properties vary accordingly

Which element has the highest melting point?

A. La

B. W

C. Os

D. Pt

Answer: B



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3. The elements of the first transition series of the d-block are given below

Sc Ti V Cr Mn Fe Co Ni Cu Zn

Y Zr Nb Mo Tc Ru Rh Pd Ag Cd

La Hf Ta W Re Os Ir Pt Au Hg

In any transition series as we move from left to right, the d-orbitals are progressively filled and their properties vary accordingly

Which of the following is the correct order of second ionisation energy

A. $V > Cr > Mn$

B. $V < Cr < Mn$

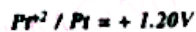
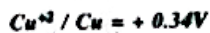
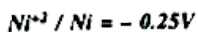
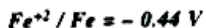
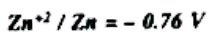


Answer: C



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The E^0 values are



4.

The most unreactive metal is

A. Zn

B. Fe

C. Ni

D. Pt

Answer: D



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The E° values are

$$\text{Zn}^{+2} / \text{Zn} = -0.76 \text{ V}$$

$$\text{Fe}^{+2} / \text{Fe} = -0.44 \text{ V}$$

$$\text{Ni}^{+2} / \text{Ni} = -0.25 \text{ V}$$

$$\text{Cu}^{+2} / \text{Cu} = +0.34 \text{ V}$$

$$\text{Ag}^+ / \text{Ag} = +0.80 \text{ V}$$

$$\text{Mn}^{+2} / \text{Mn} = -1.21 \text{ V}$$

$$\text{Pt}^{+2} / \text{Pt} = +1.20 \text{ V}$$

5.

The element that does not displace hydrogen from dilute acids is

A. Zn

B. Mn

C. Cu

D. Fe

Answer: C

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The E^0 values are

$$\text{Zn}^{+2} / \text{Zn} = - 0.76 \text{ V}$$

$$\text{Fe}^{+2} / \text{Fe} = - 0.44 \text{ V}$$

$$\text{Ni}^{+2} / \text{Ni} = - 0.25 \text{ V}$$

$$\text{Cu}^{+2} / \text{Cu} = + 0.34 \text{ V}$$

$$\text{Ag}^+ / \text{Ag} = + 0.80 \text{ V}$$

$$\text{Mn}^{+2} / \text{Mn} = -1.21 \text{ V}$$

$$\text{Pt}^{+2} / \text{Pt} = + 1.20 \text{ V}$$

6.

The metal that doesnot displace Cu from the CuSO_4 solution

A. Zn

B. Fe

C. Mg

D. Ag

Answer: D



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Practice Sheet 1 Match The Following Questions

1. Match of the following questions

COLUMN - I (Metals)

- A) Cd
- B) Rh
- C) Fm
- D) Gd

COLUMN - II (Characteristic)

- p) d-block metal
- q) Transition metal
- r) Inner transition metal
- s) Lanthanide
- t) Actinide



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2. Match of the following questions

COLUMN - I (Property)

- A) Highest oxidation state
- B) Highest density
- C) Elements with maximum unpaired electrons
- D) Radioactive transition element

COLUMN - II (Transition elements)

- p) Cr
- q) Os
- r) Tc
- s) Ru



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3. The sum of ns and (n-1)d electrons in Tc are



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1. The oxidation state of CrO_3



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2. The number of transition metals in the alloy Alnico is



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3. How many of the following the second element has higher density than the first one?

1) Ag, Au 2) Hf, Zr, 3) Zn, Hg 4) Na, Cu 5) Ca, Co 6) Ta, Nb



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4. The oxidation number of the metal in Zeisel's salt is



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5. The number of unpaired in the central metal ion of brown ring complex is



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Practice Sheet 2 Single Or More Than One Option Questions

1. Which the following statements is wrong ?

- A. An acidified solution of $K_2Cr_2O_7$ liberates iodine from iodides
- B. In acidic solution dichromate ions are converted to chromate ions
- C. Ammonium dichromate on heating undergoes exothermic decomposition to give Cr_2O_3
- D. Potassium dichromate is used as titrant for Fe^{+2} ions

Answer: B



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2. 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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3. When conc. H_2SO_4 is added to solution of potassium dichromate

- A. A yellow solid of chromate separates out
- B. A yellow solid of Cr (VI) oxide separates out
- C. A purple red solid of chromate separates out
- D. A purple red solid of Cr (VI) oxides separates out

Answer: D



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4. Which one of following does not decolourise an acidified $KMnO_4$ solution ?

A. SO_2

B. $FeCl_3$

C. H_2O_2

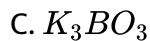
D. $FeSO_4$

Answer: B



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5. $KMnO_4$ is iso structural with



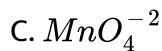
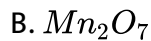
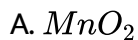
D. None

Answer: A::B



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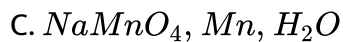
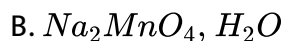
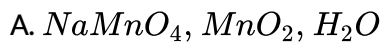
6. When conc. H_2SO_4 reacts with $KMnO_4$ an explosive compounds is obtained which is



D. None

Answer: B

7. When Na_2MnO_4 is kept in strongly acidic solution the products obtained are



Answer: A

8. Addition of $K_4[Fe(CN)_6]$ solution to $FeCl_3$ solution give

A. Ferro-Ferricyanide

B. Ferric-Ferrocyanide

C. Ferric-Ferricyanide

D. None

Answer: B



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9. The brown ring complex compound is formulated as

$[Fe(H_2O)_5NO]SO_4$ The oxidation states of iron is

A. +1

B. +2

C. +3

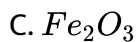
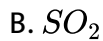
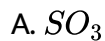
D. +4

Answer: A



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10. Ferrous sulphate on heating gives



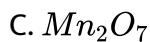
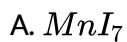
D. All

Answer: D



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11. The unstable compounds are



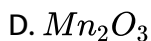
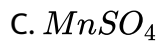
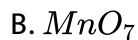
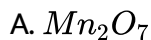
Answer: A::D



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12. An explosion takes place when conc. H_2SO_4 is added to $KMnO_4$

Which of the following is formed



Answer: A



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13. Pick out the correct statements

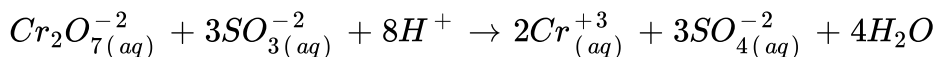
- A. MnO_2 dissolves in conc.HCl but does not form Mn^{+} ions
- B. Decomposition of acidic $KMnO_4$ is not catalysed by sunlight
- C. MnO_4^{-2} is strongly oxidising and stable only in very stron alkali. In dilute alkali water or acidic solutions it disproportionetes
- D. $KMnO_4$ does not act as oxidizing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

Answer: A::C



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14. Choose correct statements 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 $3SO_3^{-2}$ is increased by two
- D. The oxidation number of per Cr-atom is decreased by three

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



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15. Transition elements act as good catalysts because

- A. Presence of partially filled d-orbitals
- B. Forms H-bonding easily
- C. Transition elements show variable oxidation state
- D. Easy inter convertibility of oxidation states due to low oxidation
al~d reduction potential

Answer: A::C::D



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16. In which of the following compound(s), the colour is due to the charge transfer spectra



Answer: A::B::D



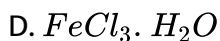
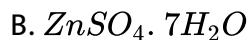
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Practice Sheet 2 Linked Comprehension Type Questions

1. A hydrated metallic salt(A), light green in colour on earful heating gives a white anhydrous residue(B). (B) is soluble in water and its aqueous solution reacts with NO to give a dark brown compound (C). (B) gives a brown residue (D) and a mixture of two gases (E) and (F). The gaseous mixture when passed through an acidified $KMnO_4$ solution discharges the pink colour and when passed through acidified $BaCl_2$ solution gave

a white precipitate.

A may be



Answer: A

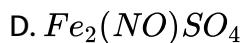
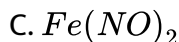


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2. A hydrated metallic salt(A), light green in colour on earful heating gives a white anhydrous residue(B). (B) is soluble in water and its aqueous solution reacts with $NaOH$ to give a dark brown compound (C). (B) gives a brown residue (D) and a mixture of two gases (E) and (F). The gaseous mixture when passed through an acidified $KMnO_4$ solution discharges the pink colour and when passed through acidified $BaCl_2$ solution gave

a white precipitate.

C may be



Answer: A

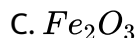
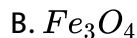
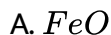


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3. A hydrated metallic salt(A), light green in colour on earful heating gives a white anhydrous residue(B). (B) is soluble in water and its aqueous solution reacts with No to give a dark brown compound (C). (B) gives a brown residue (D) and a mixture oftwo gases (E) and (F). The gaseous mixture when passed through an acidified $KMnO_4$ solution discharges the pink colour and when passed through acidified $BaCl_2$ solution gave

a white precipitate.

C may be



D. None to these

Answer: C



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4. 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 $K_3[Fe(CN)_6]$

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

- A. $K_2Fe(Fe(CN)_6)$
- B. $Fe_4[Fe(CN)_6]_3$
- C. $Fe[Fe(CN)_6]$
- D. $Fe_3[Fe(CN)_6]_2$

Answer: D

6. $FeSO_4$ 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 tube. If the mixture gets hot is shaken

I) The brown colour disappear

II) No is evolved

III) A yellow solution of $Fe_2(SO_4)_3$ is formed

A. I,II,III correct

B. I,III correct

C. II,III correct

D. Only I correct

Answer: A

Practice Sheet 2 Match The Following Questions

1. Match the following questions

COLUMN - I

- A) $\text{Fe}^{+2} + \text{K}_4[\text{Fe}(\text{CN})_6]$
- B) $\text{Fe}^{+2} + \text{K}_3[\text{Fe}(\text{CN})_6]$
- C) $\text{Fe}^{+3} + \text{NH}_4\text{SCN}$
- D) $\text{Fe}^{+3} + \text{K}_3[\text{Fe}(\text{CN})_6]$

COLUMN - II

- p) Prussian blue ppt
- q) Blood red colour
- r) Pale blue ppt
- s) Brown colour solution



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2. Match the following questions

COLUMN - I (Compounds)

- A) K_2MnO_4
- B) KMnO_4
- C) $\text{K}_2\text{Cr}_2\text{O}_7$
- D) K_2CrO_4

COLUMN - II (Property)

- p) Transition element in +6 state
- q) Oxidising agent in acidic medium
- r) Manufactured from pyrolusite ore
- s) Manufactured from chromite ore



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Practice Sheet 2 Integer Answer Type Questions

1. The no. of chloride ions co-ordinated to Fe^{+3} ion is hydrated $FeCl_3 \cdot 6H_2O$



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2. The oxidation state of Cr is K_3CrO_8



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3. In alkaline medium $KMnO_4$ can be converted into MnO_3 . The decrease in oxidation state is n so equivalent mass of $KMnO_4 = \frac{\text{Molar mass}}{n}$, what is n ?



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4. How many of the following cannot displace H_2 from dil. HCl?

Cu, Zn, Ni, Fe, Ag, Au, Pt, Hg, Cd

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5. How many of the following are correct about the stability of oxidation states of Mn

i) $Mn(II) > Mn(VII)$ (acidic solution)

(ii) $Mn(II) < Mn(IV)$ (alkaline solution)

(iii) $Mn(VI) > Mn(IV)$ (acidic solution)

(iv) $Mn(VI) > Mn(VIII)$ (strong alkaline solution)

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6. The co-ordination number of the metal in sodium nitro prusside is

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Practice Sheet 3 Single Or More Than One Option Questions

1. From sodium argento cyanide $\text{Na}[\text{Ag}(\text{CN})_2]$, silver is precipitated by adding a powder of

- A. Tin
- B. Zinc
- C. Mercury
- D. Calcium

Answer: B



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2. Which of the following ions is coloured?

- A. Cu^+
- B. Cu^{+2}
- C. Ti^{+2}
- D. V^{+3}

Answer: B



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3. The reactivity of copper is low because of its

- A. High enthalphy of sublimation and low ionization energy
- B. High enthalphy of sublimation and high ionization energy
- C. Low enthalphy of sublimation and high ionization energy
- D. Low enthalphy of sublimation and low ionization energy

Answer: B



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

- A. Basic nature of $CuSO_4$ solution
- B. Acidic nature of $CuSO_4$ solution
- C. $CuSO_4$ oxidizes CrO_4^{-2} to $Cr_2O_7^{-2}$
- D. This is the typical property of $CuSO_4$

Answer: B



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5. Gold dissolves in aquaregia forming

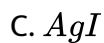
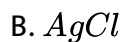
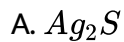
- A. $Au(NO_3)_2$
- B. $AuCl_3$
- C. $H[AuCl_4]$
- D. $AuNO_3$

Answer: C



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6. Which one is least soluble in water ?

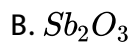


Answer: A



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7. The least stable oxide at room temperature is



D. Ag_2O

Answer: D



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8. Which compound is deliquescent ?

A. Hg_2Cl_2

B. $HgCl_2$

C. $ZnCl_2$

D. $CdCl_2$

Answer: C



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9. $HgCl_2$ is reduced to Hg_2Cl_2 by

A. CH_3COOH

B. CCl_4

C. HCOOH

D. NH_3

Answer: C



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10. The metal present in insulin is

A. Cu

B. Fe

C. Zn

D. Mg

Answer: C



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11. The metal oxide (s) which decompose on heating is (are)

A. ZnO

B. Al_2O_3

C. Ag_2O

D. HgO

Answer: C::D



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12. The aqueous solution of the following salt will be coloured in the case of :

A. $\text{Zn}(\text{NO}_3)_2$

B. LiNO_3

C. $\text{Co}(\text{NO}_3)_2$

D. $CrCl_3$

Answer: C::D



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13. Iodine is liberated on adding potassium iodide solution to solution(s) of

A. $ZnCl_2$

B. $FeCl_3$

C. $CuSO_4$

D. $AlCl_3$

Answer: B::C



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14. 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. None of these

Answer: A::B



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15. Which of the following statements are correct ?

- A. $HgCl_2$ dissolves in hot water
- B. $HgCl_2$ give HCl when treated with H_2SO_4
- C. $HgCl_2$ gives yellow precipitate with $NaOH$
- D. $HgCl_2$ gives white precipitate with NH_4OH

Answer: A::C::D



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16. Which of the following are amphoteric oxides?

A. CuO

B. ZnO

C. Cr_2O_3

D. MnO_2

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



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Practice Sheet 3 Linked Comprehension Type Questions

1. When a metal rod M is dipped into an aqueous colourless concentrated solution of compound N, the solution turns light blue. Addition of aqueous NaCl to the blue solution gives a white precipitate 'O'. Addition of aqueous NH_3 dissolves 'O' gives an intense blue solution

The metal rod M is

A. Fe

B. Cu

C. Ni

D. Co

Answer: B

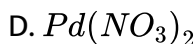
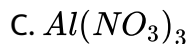
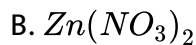
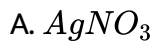


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2. When a metal rod M is dipped into an aqueous colourless concentrated solution of compound N, the solution turns light blue. Addition of aqueous NaCl to the blue solution gives a white precipitate 'O'.

Addition of aqueous NH_3 dissolves 'O' gives an intense blue solution

The compound N is

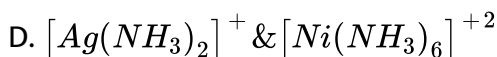
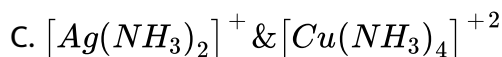
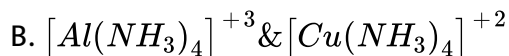
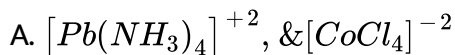


Answer: A



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3. The final solution contains



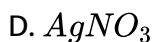
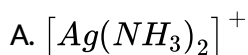
Answer: C



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4. A colourless inorganic compound(A) is soluble in water, alcohols, amines. On strong heating (A) gives a brown gas (B) and a grey residue (C) on dissolution of(A) in NH_3 a solution (D) is formed which reduces aldehydes to form silvermirror. $FeSO_4$ reduces solution of (A) in water aqueous solution of(A) also gives a brick red precipitate (E) with K_2CrO_4 solution

A is



Answer: D

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5. A colourless inorganic compound(A) is soluble in water, alcohols, amines. On strong heating (A) gives a brown gas (B) and a grey residue (C) on dissolution of(A) in NH_3 a solution (D) is formed which reduces aldehydes to form silvermirror. $FeSO_4$ reduces solution of (A) in water aqueous solution of(A) also gives a brick red precipitate (E) with K_2CrO_4 solution

C is

A. Ag

B. Ag_2O

C. Ag_3N

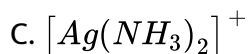
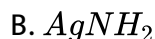
D. None of these

Answer: A

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6. A colourless inorganic compound(A) is soluble in water, alcohols, amines. On strong heating (A) gives a brown gas (B) and a grey residue (C) on dissolution of(A) in NH_3 a solution (D) is formed which reduces aldehydes to form silvermirror. $FeSO_4$ reduces solution of (A) in water aqueous solution of(A) also gives a brick red precipitate (E) with K_2CrO_4 solution

D is



D. None of these

Answer: D



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Practice Sheet 3 Match The Following Questions

1. Match the following questions

COLUMN - I

- A) Cu + dil HNO_3
- B) Cu + conc. HNO_3
- C) Zn + dil. HNO_3
- D) Zn + conc. HNO_3

COLUMN - II

- p) NO
- q) NO_2
- r) N_2O
- s) $\text{Cu}(\text{NO}_3)_2$
- t) $\text{Zn}(\text{NO}_3)_2$



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2. Match the following questions

COLUMN - I

- A) Cu^{+2}
- B) Zn^{+2}
- C) Cr^{+3}
- D) Ag^+

COLUMN - II

- p) Form amphoteric oxide
- q) Diamagnetic and colourless compounds
- r) Form complex with NH_3
- s) White oxide but on heating became yellow



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Practice Sheet 3 Interger Answer Type Questions

1. How many of the following will give O_2 on heating ?

KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$, ZnO , Na_2O , PbO_2 , Pb_3O_4 , $\text{Pb}(\text{NO}_3)_2$, NH_4NO_3

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2. How many of the following correctly matched

Ore	-	Metal
1) Azunite	-	Cu
2) Pyrargerite	-	Ag
3) Pyrolusite	-	Cu
4) Sidderite	-	Fe
5) Braunite	-	Mn
6) Talc	-	Ca
7) Feldspar	-	Al

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3. The oxidation number of Mn in the product of alkaline oxidative fusion of MnO_2 is



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4. How many of the following are iso structural ?

$FeSO_4, 7H_2O, CuSO - 4.5H_2O, MnSO_{4.4}H_2O, ZnSO_4, 7H_2O, MgSO_4, 7H_2O$



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5. How many of the following are water soluble ?

$Agf, AgCl, AgB, Agl, CaF_2, CaCl_2, CaBr_2, Cal_2$



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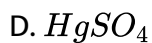
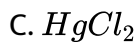
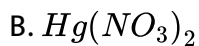
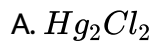
6. The number of water molecules directly bonded to the metal centre is

$CuSO_{4.5}H_2O$ is



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1. Which of the following is called calomal ?



Answer: A



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2. The colour of FeF_3 is

A. Brown

B. Red brown

C. Lighg green

D. white

Answer: A



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3. Number of moles of $K_2Cr_2O_7$ reduced by one mole of Sn^{2+} ions is

A. $\frac{1}{3}$

B. 3

C. $\frac{1}{6}$

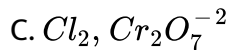
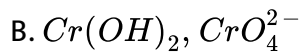
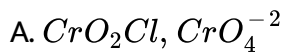
D. 6

Answer: A



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4. Cr_2O_{23} on reaction with HCl and the product on reaction with $NaOH(aq)$ give respectively

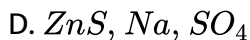
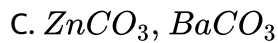
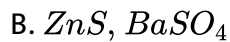
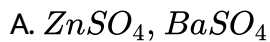


Answer: B



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5. Lithopone is a mixture of

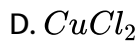
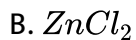
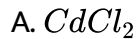


Answer: C



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6. H_2S does not produce metallic sulphide with

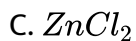
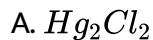


Answer: C



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7. Which compound is deliquescent ?



D. $CdCl_2$

Answer: C



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8. Which is coloured species ?

A. MnO_4^-

B. TeO_4^-

C. ReO_4^-

D. All

Answer: A



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9. In the reaction $2CuCl_2 + 2H_2O + SO_2 \rightarrow A + H_2SO_4 + 2HCl$, A is

A. $CuCl_2$

B. Cu

C. $CuSO_4$

D. Cus

Answer: A



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10. An aqueous solution of $[Ti(H_2O)_6]^{+3}$ appears

A. greenish-yellow in colour

B. blue in colour

C. violet in colour

D. Purple in colour

Answer: D



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11. Acidified $K_2Cr_2O_7$ changes to green on reactions with

A. SO_2

B. $FeSO_4$

C. KI and then adding hypo

D. $NaCl + conc. H_2SO_4$

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



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12. Two of the constituents of German silver are

A. Ag

B. Fe

C. Zn

D. Ni

Answer: C::D



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13. Select the wrong statements

- A. Hg from an amalgam with iron
- B. Hg vapours are non-poisonous
- C. Hg is monovalent in mercurous compounds
- D. Oxysalts of mercury are thermally stable

Answer: A::B::C



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14. Which of the following become passive with when dropped into conc, HNO_3 ?

A. Cu

B. Fe

C. Cr

D. Al

Answer: B::C::D



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15. Coagulation of blood takes place by

A. Ferric alum

B. Potash alum

C. Chrom alum

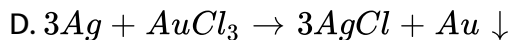
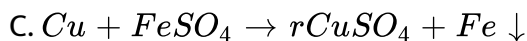
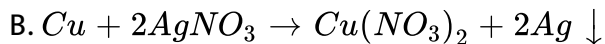
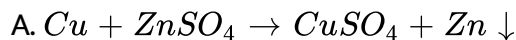
D. None of these

Answer: A::B::C



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16. Which one of the following reactions cannot occur ?



Answer: A::C::D



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Practice Sheet 4 Linked Comprehension Type Questions

1. The process of corrosion of iron is known as rusting. Rust appears to be a hydrated ferric oxide $Fe_2O_3 \cdot xH_2O$, Both O_2 & H_2O are required for rusting. Iron can be protected from the rusting by use of following compounds.

i) Applying paints, lacquers and enamels on the surface of iron ii) By forming a firm and coherent protective coating of ferrous ferric oxide. This is done by passing steam over hot iron

iii) By coating a thin film of Zinc, Tin, Nickel, chromium, aluminium etc, on the surface of iron If plated with Zinc, the reaction of products of Zinc with O_2 and H_2O form a coating which sticks to the surface and thereby protects iron

Zinc protects iron from corrosion because

A. It is an active metal

B. A sticky coating is formed on its surface on exposure to air

C. It is not affected by atmosphere

D. It has lower oxidation potential than iron

Answer: B



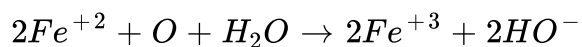
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2. Corrosion is an electrochemical process . It involves

A. Loss of electrons by Iron, $Fe \rightarrow Fe^{+2} + 2e^-$. ie, Iron acts as an anode

B. Impurities act as a cathode. Elements are used in forming hydroxyl ions $H_2O + O + 2e^- \rightarrow 2OH^-$

C. Ferrous ions are oxidised to ferric ions in presence of dissolved oxygen



D. All the above reactions

Answer: D



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3. For prevention of rusting of iron, which is used in paints ?

A. PbO

B. PbO_2

C. Pb_3O_4

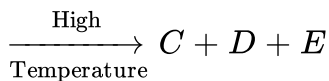
D. $PbSO_4$

Answer: C



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4. Light green (Compound A) $\xrightarrow{\Delta}$ White Residue (B)



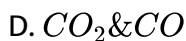
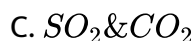
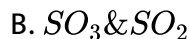
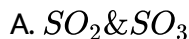
i) D & E are two acidic gases

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, with 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

'D' & 'E' are

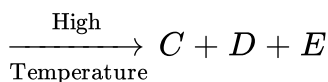


Answer: B



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5. Light green (Compound A) $\xrightarrow{\Delta}$ White Residue (B)



i) D & 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, with 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

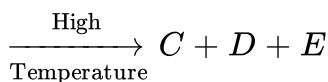
- A. Mercuric oxide
- B. Basic mercuric (II) sulphite
- C. Basic mercury (II) sulphate
- D. Mercurous oxide

Answer: C



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6. Light green (Compound A) $\xrightarrow{\Delta}$ White Residue (B)



i) D & 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, with 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. Boile . Conc. HCl

Answer: D



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Practice Sheet 4 Match The Following Questions

1. Match of the following questions

COLUMN - I (Compound)

- A) Haemite
- B) Kipp's base
- C) Lunar caustic
- D) Nessler's reagent

COLUMN - II (Formula)

- p) AgNO_3
- q) Fe_2O_3
- r) Alkaline solution + K_2HgI_4
- s) $\text{FeS} + \text{H}_2\text{SO}_4$



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2. Match of the following questions

COLUMN - I (Conversion)

- A) $\text{H}_2\text{S} \longrightarrow \text{S}$
- B) $\text{SO}_2 \longrightarrow \text{H}_2\text{SO}_4$
- C) $\text{HCl} \longrightarrow \text{Cl}_2$
- D) $\text{NH}_4\text{Cl} \longrightarrow \text{N}_2$

COLUMN - II (Reagent)

- p) CuSO_4
- q) $\text{K}_2\text{Cr}_2\text{O}_7$
- r) FeCl_3
- s) KMnO_4



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Practice Sheet 4 Integer Answer Type Questions

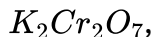
1. How many maximum bonds are equivalent in the dichromates dianion ?



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2. How many of the following reagents can oxidise aqueous iodide to iodine.

Acidified



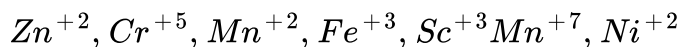
Alkaline

$KMnO_4$, $CuSO_4$, H_2O_2 , Cl_2 , O_3 , $FeCl_3$, HNO_3 and $Na_2S_2O_3$



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3. The no. of species having a magnetic of zero among



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4. Perchromic acid (CrO_5) in ether will decomposes readily in the presence of H_2SO_4 to form oxygen will produce in this process



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5. How many of the following alloys contain 'Al' metal

Magnalium , Duralumin , Brass , Bronze , Rolled gold , Nickeloy, Nickel steel, Invar, Alnico, Solder



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6. Dimethyl glyoxime form a square planar complex with Ni^{+2} . This complex contain how many number of unpaired electrons ?



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Practice Sheet 5 Single Or More Than One Option Qustions

1. Lanthanides like Eu and Yb can form hydrides like EuH_2 and YbH_2 .

These hydrides are

A. Ionic hydrides

B. Covalent hydrides

C. Metallic hydrides

D. Intermediate hydrides

Answer: A



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2. Lanthanoid contraction implies

A. Decrease in density

B. Decrease in mass

C. Decrease in ionic radii

D. Decrease in radioactivity

Answer: C



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3. If the lanthanoid element with x f electrons has a pink colour, then the lanthanoid with $(14-x)$ f electrons will have the colour as

- A. Blue
- B. Red
- C. green
- D. Pink

Answer: D



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4. The electronic configuration of actinoides cannot be assigned with degree of certainty because of

- A. Overlapping of inner orbitals
- B. Free moment of electrons over all the orbitals movement
- C. Small energy difference between 5f and 6d levels

D. None of the above

Answer: C



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5. The sum of the first three ionization energies of the lanthanoides Ce, Eu, Gd, Yb, Lu is

A. $Ce > E > Fe > Yb > Lu$

B. $Yb > Lu > Eu > Gd > Ce$

C. $Yb > Eu > Gd > Ce$

D. $Yb > Eu > Lu > Gd > Ce$

Answer: C



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6. The reason for the stability of Gd^{3+} ion is

- A. 4f sub shell half-filled
- B. 4f sub shell completely filled
- C. possesses the electronic configuration of noble gases
- D. 4f sub shell empty

Answer: A



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7. The +3 ion of which one of the following has half filled 4f subshell ?

- A. La
- B. Nd
- C. Gd
- D. Ac

Answer: C



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8. Lanthanide for which +2 and +3 oxidation states are common is

A. La

B. Nd

C. Ce

D. Eu

Answer: D



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9. What is Misch metal ? Given its composition and use.

A. An alloy of Al

B. A mixture of chromium and $PbCrO_4$

C. An alloy of lanthanoid metals

D. An alloy of copper

Answer: C



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10. More number of oxidation states are exhibited by the actinoids than by the lanthanoids. The main reason for this is

A. Greater metallic character of the lanthanoids than that of the corresponding actinoids

B. More active nature of the actinoids

C. More energy difference between 5f and 6d orbitals than between 4f and 5d orbital's

D. Lower energy difference between 5f and 6d orbitals than between 4f and 5d orbital's

Answer: D



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11. Which of the following are correct about actinoids ?

- A. They show large number of oxidation states
- B. They show actinoid contraction
- C. They form oxo-cations
- D. All of the are radioactive

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



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12. Which of the following characteristics of lanthanides is correct ?

- A. Reducing property of lanthanides decreases from La to Lu
- B. Complex forming ability of lanthanides increases from La to Lu
- C. Basic character of the oxides and hydroxides increases from La to Lu
- D. Lanthanides form stable compounds only in + 3 oxidation state

Answer: A::B::D



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13. Which of the following statements concerning transition elements is not true?

- A. Lanthanides are separated from one another by an exchange method

- B. Ionic radii of trivalent lanthanides steadily increases with increase in the atomic number
- C. All lanthanides are dense metals
- D. More characteristic oxidation state of lanthanide elements is + 3

Answer: A::C::D



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14. Identify the incorrect statement among the following ?

- A. Shielding power of 4f electrons is quite weak
- B. There is a decrease in the radii of the atoms or ions while proceeding from La to Lu
- C. Lanthanoid contraction is the accumulation of successive shrinkages

D. As a result of lanthanoid contraction, the properties of 4d series of the transition elements have no similarities with 5d series of elements

Answer: D



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15. The first ionization enthalpy of 5d series elements are highest as compared to 3d and 4d elements because

- A. Weak shielding of nucleus by 5f-electrons
- B. Weak shielding of nucleus by 4f-electrons
- C. Strong shielding of nucleus by 5d electrons
- D. Strong shielding of nucleus by 4d-electrons

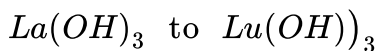
Answer: B



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16. Consider the following statements

(1) The basic strength of hydroxides of lanthanides decreases from



(2) The lanthanoid ion Lu^{3+} Yb^{2+} and Ce^{4+} are diamagnetic

(3) The correct order of ionic radii of



Which of the statements given above is / are correct ?

A. 1 only

B. 1,2 only

C. 1,2 and 3

D. None to these

Answer: B

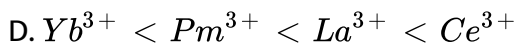
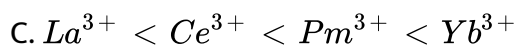
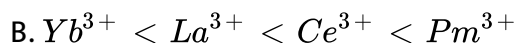
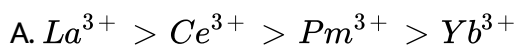


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1. f-block elements exhibit different oxidation state, colour, complex formation like properties. The size of lanthanides decreases due to poor screening effect of 4f electrons. It is called lanthanide contraction.

Lanthanide hydroxides are basic in nature

The colour of lanthanide ion is due to



Answer: A



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2. f-block elements exhibit different oxidation state, colour, complex formation like properties. The size of lanthanides decreases due to poor

screening effect of 4f electrons. It is called lanthanide contraction.

Lanthanide hydroxides are basic in nature

The colour of lanthanide ion is due to

- A. f-f transitions in partially filled f-orbitals
- B. f-f transitions in completely filled f-orbitals
- C. both
- D. None

Answer: A



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3. f-block elements exhibit different oxidation state, colour, complex formation like properties. The size of lanthanides decreases due to poor screening effect of 4f electrons. It is called lanthanide contraction.

Lanthanide hydroxides are basic in nature

The colour of lanthanide ion is due to

A. Ce

B. Lu

C. Gd

D. All are same

Answer: A



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4. The f-block consists of the two series lanthanoids and actinoids. Because Lanthanum closely resembles the Lanthanoids. The Lanthanoid resemble one another more closely than do the members of ordinary transition elements in any series. They have only one stable oxidation state. The chemistry of the actinoids is on the other hand, much more complicated. The complication arises partly owing to the occurrence of a wide range of oxidation states in these elements and partly because their radioactivity creates special problems in their study

Wrong statement of the following is

- A. Atomic radius of Lanthanoids decreases steadily from Ce to Lu
- B. The shielding of a 4f electron by another is less than one d-electron by another with increase in nuclear charge along the series
- C. Identical radii of Zr and Hf is a consequence of Lanthanoid contraction
- D. Ce^{+4} is a strong oxidising agent

Answer: A



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5. Which of the following is not a use of Lanthanoids

- A. Misch metal is an alloy of Lanthanoid metal used to produce bullets, shells
- B. Oxides of Lanthanoids can be used as catalysts in petroleum cracking

- C. Oxides of some Lanthanoids are used as phosphors in television screens
- D. All Lanthanoids are good oxidising agents in +3 state

Answer: D



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6. i) Common oxidation state of actinoids is + 3 (Except thorium)

ii) Maximum O.S of actinoids is +7

(iii) Actinoids evolve H_2 with alkalis

(iv) Configuration of thorium is $[Rn] 5f^0 6d^2 7s^2$

Correct statements are

A. i,iii

B. i,ii,iii

C. i,ii,iv

D. all are correct

Answer: C

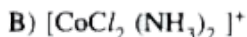


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Practice Sheet 5 Match The Following Questions

1. Match the following questions

COLUMN - I



COLUMN - II

p) 2

q) 3

r) 4

s) 0



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2. Match the following questions

COLUMN - I (Element)

A) Pr

B) Gd^{+2}

C) Eu

D) Tm^{+3}

COLUMN - II (Configuration)

p) $4f^{12}$

q) $4f^3 6s^2$

r) $4f^7 6s^2$

s) $4f^7 5d^1$



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Practice Sheet 5 Integer Answer Type Questions

1. How many incomplete orbitals are present in inner transition elements ?



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2. No. of 'f' electrons in ground state of Thorium



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3. Max no. of unpaired e^- in ground state of Gadolinium (Gd, $Z=64$)



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4. Highest oxidation state exhibited by actinoid is



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5. Rare earth metals belongs to the column of modern periodic table



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6. Number of electrons in outer most shell of Ce ($Z = 58$)



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