CHEMISTRY

BOOKS - OMEGA PUBLICATION

THE D- AND F-BLOCK ELEMENTS

Questions

1. What are transition elements ? Which of the d block elements are not regarded as transition elements and why ?

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2. Give the electronic configurations of copper and chromium.

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3. Write the electronic configuration of Cr^{2+} and find the number of unpaired electrons in it.

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4. Write down the electronic configuration of:

Cr^{3+}

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5. Write down the electronic configuration of

Cu^{+}

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6. Write down the electronic configuration of:

$Co^{2}+$

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7. Write down the electronic configuration of:

Mn^{2+}

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8. Write down the electronic configuration of

Pm^{3+}

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9. Write down the electronic configuration of:

Ce^{4+}

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10. Write down the electronic configuration of:

Lu^{2+}

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11. Write down the electronic configuration of:

Th^{4+}

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

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13. In what way is the electronic configuration of transition elements different from that of the non-transition elements ?

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14. Calculate the number of unpaired electrons in the following gaseous ions

$i) Mn^{3+} ii) Cr^{3+} iii) V^{3+} iv) Ti^{3+}$

Which one of these is the most stable in aqueous solution ?

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15. What are d-Block elements ? Write their general electronic configuration.

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16. Copper atom has comletely filled d-orbitals $\left(3d^{10}\right)$ in its ground state. How can uyou say that it is transition element ?

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17. Why Zn, Cd and Hg are not transition elements ?

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18. Scandium (z = 21) is a transition element but zinc (z = 30) is not. Explain.

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19. Why Zn, Cd, Hg are soft and have low m.pt.

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20. In 3d series name the element with highest m.p. ?

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21. How does atomic size of elements vary on moving from left to right in a period

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22. In the transition series starting from Lanthanum (atom no =57), the next element hafmnium (atom no =72) why so observe this jump in atomic number ?

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23. Explain why transition elements have high melting and boiling points ?

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24. The transition elements have high melting points.

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25. Why are I.E. of 5d - elements greater than 3d- elements ?

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26. Why enthalpy of atomisation of the transition elements are quite high ?

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27. Write the name of metal which shows only +3 oxidation state.

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28. Write the nameand atomic number of fourth element of the3d-series.

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29. Write the formula of ferrocyanide ion.

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30. Write the name and atomic number of the last element of 3d-series.

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31. Write the formula of dichromateion.

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32. Writethe nameand atomic number of ninth element of the3d-series.

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33. Why is the third ionization enthalpy of manganese (At. no.=25) unexpectedly high ?

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34. In 3d series name the element which can so an oxidation state of +1.

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35. Write the formula of a compound where the transition metal is in +7 oxidation state.

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36. Explain :Transition elements exhibit variable oxidation states.

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37. Which of the 3d-series of transition elements exhibits the largestn number of oxidation states and why ?

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38. What may be the stable oxidation state of the transition element with the following d-electron configuration in the group state of their atoms ? $3d^3, 3d^5, 3d^8, 3d^4$

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39. Name the oxometal anions of the first series of transition metals in which the metal exhibits the oxidation state equal to its group number.

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40. Explain why Cu(I) is diamagnetic while Cu(II) is paramagnetic in nature?

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41. Co(II) is stable in aqueous solution, but in presence of complexing reagent it is easily oxidised. Explain.

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42. The $E^{\circ}_{M^{2+}/M}$ for copper is positive (0.34 V). Copper is the only metal in the first series of transition elements showing this behaviour.

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43. Why does Mn(II) shows maximum paramagnetic character among the divalent ions of first transition series ?

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45. Why are Mn^{2+} compounds more stable than Fe^{2+} compounds towards oxidation to their +3 state ?

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46. Why are Mn^{2+} compounds more stable than Fe^{2+} compounds towards oxidation to their +3 state ?

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47. Explain, why transition metal ions usually show paramagnetic behaviour ?

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48. Which of the two is paramagnetic V(IV) or V(V)

and why ?

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49. Which one is more paramagnetic Fe^{2+} or $Fe^{3+}(Z=26)$?

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50. How many unpaired electrons are in Cr(III) ?

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51. Why do the transition metals componds are coloured ?

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52. Out of ions Co^{2+} ,Cr^(3+), (Sc^{3+} which will give coloured aqueous solution and what will be the magnetic behaviour of each ion ? (Atomic number of Co = 27, Sc = 21 and Cr = 24).

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53. Predict which of the following will be coloured in aqueous solution? Ti3+, V3+, Cu+,

Sc3+, Mn2+, Fe3+ and Co2+. Give reasons for each.

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54. Out of the ions Ag^{+}, Co^{2+} and Ti^{4+} which will give coloured aqueous solution and what will be the magnetic behaviour of each ion ? (Atomic number of Ag = 47, Co = 27 and Ti = 22).

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55. Why Cd^{2+} salts are white ? Cd=48

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56. Zn^{2+} salts are white while Cu^{2+} salts are blue, explain why ?

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57. Why Cu(I) is colourless and Cu(II) is blue in colour ?

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58. Which out of the following ions would form coloured complexes : Ni^{2+}, Cu^{+} ?

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59. Why do transition metals form complexes ?

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60. Transition elements and their compounds are found to be good catalysts. Give examples.

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61. Why are Ni^{2+} compounds thermodynamically more stable than Pt^{2+} compounds whereas Pt^{4+} compounds are relatively more stable than Ni^{4+} compounds ?

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62. Why does V_2O_5 act as catalyst ?

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63. Transition metals form number of interstitial compounds. Explain.

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64. What is Misch metal ?

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65. Why transition elements form a large number of alloys ?

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66. Write the composition and one use of bell metal.

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67. What arecoinage metals ?

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68. How do alloys differ from amalgams ?

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69. Define tempering of steel.

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70. Describe the preparation of potassium dichromate from iron chromite ore. What is the effect of increasing pH on a solution of potassium dichromate?

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71. What is the action of heat on $K_2Cr_2O_7$ and

$KMnO_4$?

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72. What is action of heat on $KMnO_4$?

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73. Explain the structure of $Cr_2O_7^{2-}$

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74. What happens when H_2O_2 reacts with acidified $FeSO_4$

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75. How acidified $K_2Cr_2O_7$ reacts with the following :

$FeSO_4$

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76. Describe the reaction of acidified $K_2Cr_2O_7$ with Na_2SO_3 solution.

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77. Describe the reaction of acidified $K_2Cr_2O_7$ with Na_2SO_3 solution.

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78. Write chemical reaction for preparation of K2Cr207 from chromite ore.

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79. Explain chromyl chloride test for chlorides.

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80. In Alkaline solution we have chromates and in acidic solution, dichromates ? Explain.

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81. How will you convert pyrolusite ore into potassium permanganate ? Give the chemical reactions only.

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82. Write the formula of manganate ion and draw the structure of permanganate ion.

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83. Complete the following chemical reaction equations .

$Cr_2O_7^{2-}(aq) + Fe^{2+}(aq) + H^+(aq) \rightarrow$

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84. Complete the following chemical reaction equations .

$Cr_2O_7^{2-}(aq) + Fe^{2+}(aq) + H^+(aq) \rightarrow$

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85. Write the chemical equation for the oxidation of $S_2O_3^{2-}$ by MnO_4^- in neuntral medium.

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86. Write the chemical equation for the oxidation of Sn^{+2} by $Cr_2O_7^{2-}$ in acidic medium.

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87. Why is silver bromide (AgBr) used in photography ?

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88. What is the basic difference between the electronic configurations of transition and inner transition elements ?

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89. What are f-block elements ? Write their general electronic configuration.

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90. What are inner transition elements ? How do they differ from transition elements ?

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91. Write the general electronic configuration of lanthanoids.

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92. Briefly explain, why are electronic configuration of lanthanides not known with certainty ?

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93. Chemistry of all lanthanoids is so identical. Explain.

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94. Why separation of lanthanoid elements is difficult ?

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95. Define Lanthanide Contraction.

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96. Give the cause of Lanthanide Contraction.

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97. Which ion has maximum size in Lanthanoid series ?

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98. Write consequences of Lanthanoid contraction. Why Zr and Hf exhibit siumilar properties ?

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99. What are different oxidation states exhibited by lanthanoids ?

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100. The +3 oxidation state of Lanthanium (Z=57). Gadolinium (Z=64) and Lutetium (Z=71) are especially stable, Why ?

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101. All the members of actinoid series have +3 O.S. Assign reason for this.

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102. How does lanthanoid contraction affect the physical and chemical properties of the elements of lanthanoid series ?

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103. Why the properties of the third transition series are very similar to the second transition series?

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104. Why is $La(OH)_3$ more basic than $Lu(OH)_3$?

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105. Among lanthanoids, Ln (III) compounds are predominant. However, occasionally in solutions on in solid compounds, + 2 and +4 ions are also obtained.

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106. What is the most common oxidation state in the Lanthanoids ?

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107. Name members of lanthanoid series which exhibit +4 O.S. Assign reason for this.

108. Name the members of lanthanoid series which exhibit +2 O.S. Assign reason for this.

109. One among the lanthanoids, Ce(III) (Z=58) can easily be oxidised to Ce (IV). Explain why?

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110. What is the general electronic configuration of actinoids?

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111. How would you account for the following: There is a greater range of oxidation states among the actinoids than among the lanthanoids.

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112. All the ..... are radioactive.

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113. What is Actinoid contraction ? Explain it.

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114. Give three differences between lanthanides and actinides.

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115. Give one use of lanthanoids and actinoids.

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116. Why is equropium (II) more stable than cerium (II) (Eu = 63, Ce =58) give one reason.

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117. Why Zr and Hf exhibit similar properties ?

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118. The chemistry of the actinoid elements is not so smooth as that of the lanthanoids. Justify this statement by giving some examples from the oxidation state of these elements.

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Multiple Choice Questions

1. Which element belongs to d-block elements ?

A. Na

B. Ca

C. Cu

D. Ar

Answer: C

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2. The transition elements have a general electronic configuration of

A. $ns^2np^6nd^{1-10}$

B. $(n-1)d^{1-10}ns^{0-2}np^{0-6}$

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

D. $nd^{1-10}ns^{1-2}$

Answer: C

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3. The correct ground state electronic configuration of chromium atom (Z=24) is

A. $[Ar]4d^5 4s^1$

B. $[Ar]3d^1 4s^2$

C. $[Ar]3d^6 4s^0$

D. $[Ar]3d^5 4s^1$

Answer: D

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4. Which of the following electronic configuration is that of a transition element ?

A. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6$

B. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$

C. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4s^2$

D. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

Answer: C

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5. Which of the following elements is alloyed with copper to form brass?

A. Lead

B. Bismuth

C. Zinc

D. Antimony

Answer: C

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6. Copper can be extracted from

A. kupfernickel

B. dolomite

C. malachite

D. galena

Answer: C

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7. Argentite is an ore of

A. Cu

B. Pt

C. Au

D. Ag

Answer: D

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8. The process used for the extraction of gold is

A. Mac Arthur Forest Cyanide process

B. Parke's process

C. Baeyer's process

D. Liquation process

Answer: A

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9. Important ore of zinc is

A. calamine

B. cryolite

C. gibsite

D. malachite

Answer: A

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10. The inner transition elements are the elements in which the added electrons goes to

A. (n-1) d-orbitals

B. (n-2) f-orbitals

C. (n-1) d-orbitals and (n-1) f-orbitals

D. (n–1) d-orbitals and ns orbitals

Answer: B

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11. Transition elements

A. exhibit inert pair effect

B. exhibit variable oxidation states

C. have low melting points

D. do not show catalytic activity.

Answer: B

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12. The tendency of the transition elements to form coloured compounds is attributed to

A. transition of electrons from one atom to the other

B. transition of electrons from s-orbitals of the outer shells to p-orbitals

C. d-d transition in last but one shell

D. none of the reason is correct.

Answer: C

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13. Which of the following is diamagnetic ?

A. Fe^{2+}

B. Cr^{2+}

C. Zn^{2+}

D. Cu^{2+}

Answer: C

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14. The common oxidation state of the elements of lanthanide series is

A. $+2$

B. $+3$

C. $+4$

D. $+1$

Answer: B

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15. Which of the following is a lanthanide ?

A. Ta

B. Rh

C. Th

D. Lu

Answer: D

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16. For the process $Cu(g) \rightarrow Cu^{+}(g) + e^{-}$, the electron is to be removed from

A. 3d subshell

B. 4s subshell

C. 3p subshell

D. any of the above

Answer: B

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17. Paramagnetism is a property of

A. completely filled electronic subshells

B. unpaired electrons

C. non transition elements

D. melting and boiling points of the elements.

Answer: B

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18. The first ionisation energy of silicon is lower than that of

A. increase as the atomic number increases

B. decrease as the atomic number increases

C. do not show any change as the addition of electron takes place in the inner (n-1)d-orbitals

D. None of the above.

Answer: A

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19. Which of the following electronic configurations will have the lowest magnetic moment?

A. d^2

B. d^5

C. d^8

D. d^7

Answer: A

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20. In general, the melting and boiling point of transition metals

A. increases gradually across the period from left to right

B. decreases gradually across the period from left to right

C. first increases till the middle of the period configuration of and then decreases towards the end

D. first decreases regularly till the middle of the period and then increases towards the end.

Answer: A

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21. Which of the following transition element exhibit the oxidation state of +8?

A. Cd

B. Ru

C. Au

D. Te

Answer: B

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22. Within each transition series, the oxidation states

A. decreases regularly in moving from left to right

B. first increases till the middle of period and then decreases

C. first decreases till the middle of period and then increases

D. None of the trend is correct.

Answer: B

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23. Which forms interstitial compounds ?

A. Fe

B. Co

C. Ni

D. All

Answer: D

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24. Which of the following compounds is not coloured?

A. $ZnCl_2$

B. $CrCl_2$

C. $CuSO_4$

D. $NiCl_4^{2-}$

Answer: A

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25. A transition element X-has a configuration $[Ar]3d^4$ in its +3 oxidation state. Its atomic number is

A. 25

B. 26

C. 22

D. 19

Answer: A

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

A. $TiCl_3$

B. $MnCl_2$

C. $FeSO_4$

D. $CuSO_4$

Answer: B

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27. The maximum magnetic moment is shown by the ion with electronic configuration of

A. $3d^8$

B. $3d^5$

C. $3d^7$

D. $3d^9$

Answer: B

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28. which metal is present in vitamin B_{12} or cyanocobalamin?

A. Fe

B. Co

C. Ni

D. Na

Answer: B

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29. Which of the two have almost similar size ?

A. $_{22}Ti$ and $_{40}Zr$

B. $_{41}Nb$ and $_{73}Ta$

C. ${}_{39}Y$ and ${}_{57}La$

D. ${}_{20}Ca$ and ${}_{31}Ir$

Answer: B

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30. Which of the following shows ferromagnetism?

A. TiO_2

B. CrO_2

C. MnO

D. Fe_3O_4

Answer: B

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31. Which of the following is not a d-block element?

A. Hg

B. Po

C. Ni

D. W

Answer: B

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Answer: C

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Answer: D

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34. Which of the following elements is alloyed with copper to form brass?

A. Lead

B. Bismuth

C. Zinc

D. Antimony

Answer: C

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35. Argentite is an ore of

A. Cu

B. Pt

C. Au

D. Ag.

Answer: D

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36. The inner transition elements are the elements in which the added electrons goes to

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D. (n-1) d-orbitals and ns orbitals.

Answer: B

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C. Ni

D. all the above

Answer: D

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41. which metal is present in vitamin B_{12} or cyanocobalamin?

A. Fe

B. Co

C. Ni

D. Na.

Answer: B

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