CHEMISTRY

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

D - AND F-BLOCK ELEMENTS

Example

1. The pair of compounds having metals in their highest oxidation state is

.

A. $MnO_2, FeCl_3$

B. $[NiCl_4]^{2-}, [CoCl_4]^-$

C. $[MnO_4]^-, CrO_2Cl_2$

D. $\left[Fe(CN)_6\right]^{3-}, \left[Co(CN)_3\right]$

Answer: C

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2. The transition metal ion that has 'spin -only ' magnetic moment value of 5.96 is

A. Fe^{2+}

B. Cu^{2+}

C. Mn^{2+}

D. V^{2+}

Answer: C

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Practice Exercise Exercise 1

1. For the four successive transition elements (Cr, Mn, Fe, and Co), the stability of $+2$ oxidation state will be there in which of the following order ?

$(At.\ Nos.\ Cr = 24, Mn = 25, Fe = 26, Co = 27)$

A. $Cr > Mn > Co > Fe >$

B. $Mn > Fe > Cr > Co$

C. $Fe > Mn > Co > Cr$

D. $Co > Mn > Fe > Cr$

Answer: B

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2. The colour of zinc sulphide is

A. White

B. black

C. brown

D. red

Answer: A

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3. Which of the following element does not belong to 4d series of transition elements?

A. Titanium

B. Zirconium

C. Molybdenum

D. Technetium

Answer: A

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4. Number of unpaired electrons in Mn^{3+} is

A. 2

B. 3

C. 4

D. 5

Answer: C

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5. Which of the following is red in colour?

A. Cu_2O

B. CuF

C. ZnF_2

D. $ZnCl_2$

Answer: A

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6. Copper exhibits only +2 oxidation state in its stable compounds. Why?

A. Coppper is a transition metal in +2 state

B. $+$ 2 state compounds of copper are formed by exothermic reactions

C. Electron i.e. configuration of copper in '+'2 state is $[Ar]3d^9 4s^0$

D. copper gives coloured compounds in '+' 2 state

Answer: B

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7. 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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8. Which of the following ions has a magnetic moment of 5.93 BM? (Atomic number of V=23, Cr=24, Mn=25,Fe=26)

A. Mn^{2+}

B. Fe^{2+}

C. Ce^{2+}

D. Cr^{3+}

Answer: A

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

A. Sc

B. Ti

C. Mn

D. Zn

Answer: C

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10. Consider the following statements about transition metals.

A. Only I

B. Only II

C. Both I and II

D. None of these

Answer: C

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11. Spin-only' formula to calculate magnetic moment is expressed as

A. $\mu = n(n+2)$

B. $\mu - \frac{\sqrt{n+2}}{n}$

C. $\mu = \sqrt{n(n+2)}$

D. $\mu = \frac{n+2}{\sqrt{n}}$

Answer: C

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12. Among the given optins the most dense element is

A. Cu

B. Hg

C. Cd

D. Fe

Answer: B

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13. Which of the following is colourless?

A. $\left[Zn(H_2O)_6\right]^{2+}$

B. $\left[V(H_2O)_6\right]^{2+}$

C. $\left[Mn(H_2O)_6\right]^{3+}$

D. $\left[Fe(H_2O)_6\right]^{2+}$

Answer: A

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14. Atomic number of an element is 26. the element shows

A. ferromagnetism

B. diamagnetism

C. paramagnetism

D. None of these

Answer: A

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15. Which of the following species is/are paramagnetic?

$Fe^{2+}, Zn^{0}, Hg^{2+}, Ti^{4+}$

A. Only Fe^{2+}

B. Zn^0 and Ti^{4+}

C. Fe^{2+} and Hg^{2+}

D. Zn^0 and Hg^{2+}

Answer: A

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16. What is the correct roder of spin only magnetic moment (in BM) of Mn^{2+}, Cr^{2+} and Ti^{2+}?

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

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

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

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

Answer: C

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17. The coordination number in a/an..... Complex may increase to 8.

A. cobalt

B. osmium

C. nickel

D. iron

Answer: B

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18. The spin only magnetic moment of Mn^{4+} ion is nearly

A. 3BM

B. 6BM

C. 4BM

D. 5BM

Answer: C

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19. Mercury is a liquid metal because

A. it has a completely filled s-orbital

B. it has a small atomic size

C. it has a completely filled d- orbital that prevents d-d overlapping of orbitals

D. it has a completely filled d-orbital that causes d-d overlapping

Answer: C

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20. The highest oxidation state exhibited by a transition metal is

A. $+7$

B. $+8$

C. $+6$

D. $+5$

Answer: B

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

A. 2

B. 3

C. 4

D. 5

Answer: B

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22. The one which has incompletely filled d-orbitals in its ground state or in any one of its oxidation state is known as

A. transition element

B. d-block elements

C. f-block element

D. None of these

Answer: A

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23. $(n-1)d^{10}ns^2$ is the electronic configuration of

A. Zn

B. Cd

C. Hg

D. All of these

Answer: A

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24. When an electron from a lower energy d-orbital is excited to a higher energy d-orbital

(i)The energy of excitation corresponds to the frequencey of light absorbed.

(ii) This frequency generally lines in the visible region.

(iii) The colour observed corresponds to the compementary colour of the light absorbed.

(iv) The frequencey of the light absorbed is determined by the nature of

the ligand.

Which one of the above mentioned statements are correct?

A. I,II and Iv

B. I,II and III

C. I,II,III,and Iv

D. II and iv

Answer: D

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25. Select the correct order of sizes for the following d-block elements.

A. $Zr = Hf, Nb = Ta, Fe \cong Co \cong Ni$

B. $Zr^{4+} < Zr, Nb^{3+} < Ta^{3+}, Fe^{3+} < Fe^{2+} < Fe$

C. $Zr^{4+} = Hf^{4+}, Nb^{3+} = Ta^{3+}, Fe < Co < Ni$

D. $Zr^{4+} < Hf^{4+}, Nb^{3+} = Ta^{3+}, Ni < Cu < Co$

Answer: C

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26. In an aqueous solution, $Cu(+1)$ salts are unstable because

A. $Cu(+1)$ has a $3d^{10}$configuration

B. they disproportionate easily to the Cu and $(+2)$ states

C. they disproprtionate easily to the $Cu(+2)$ and $Cu(+3)$states

D. the change in free energy of the overall is zero

Answer: B

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27. Which of the following pairs has the same size ?

A. Zn^{2+}, Hf^{4+}

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

C. Zr^{4+}, Ti^{4+}

D. Zr^{4+}, Hf^{4+}

Answer: D

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28. Which of the following statements concerning transition elements is false?

A. They are all metals

B. They easily form complex coordination compounds

C. they from compounds containing unapaired electrons and their ions are mostly coloured electrons and there are mostly coloured

D. They show multiple oxidation states always differing by units of two

Answer: D

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29. Which of the following is expected to be coloured?

A. CuCl

B. CuF_2

C. Ag_2SO_4

D. MgF_2

Answer: C

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30. Out of Cu^{2+}, Ni^{2+}, Co^{2+} and Mn^{2+} those dissolved in dil. HCL only one gives a precipitate when H_2S is passed. Identify the corresponding one.

A. Ni^{2+}

B. Cu^{2+}

C. Co^{2+}

D. Mn^{2+}

Answer: B

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31. The stability of ferric ion is due to

A. Half- filled f-orbitals

B. half-filled d-orbitals

C. completely filled f-orbitals

D. completely filled d-orbitals

Answer: B

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32. The spin only magnetic moment of Fe^{2+} ion (in BM) is approximately

A. 4

B. 7

C. 5

D. 6

Answer: C

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33. Which one of the following transition metal ions is diamagnetic?

A. Co^{2+}

B. Ni^{2+}

C. Cu^{2+}

D. Zn^{2+}

Answer: D

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34. Which of the following is not a characteristic of transition elements?

A. Variable oxidations state

B. Formation if coloured compounds

C. Formation of intersititial compounds

D. Natural radioactivity

Answer: D

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

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

B. Fe^{2} and Cu^{2+}

C. Cr^{2+} and Fe^{2+}

D. Co^{2+} and Ti^{2+}

Answer: C

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36. The metal which is considered as transition metal is

A. zinc

B. cadmium

C. mercury

D. scandium

Answer: D

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37. Consider the following statements is / are.

(i)Sc has a low value of $E^{\ominus}_{(M^{3+}/M^{2+})}$.

(ii) Zn has the highest value of $E^{\ominus}_{(M^{3+}/M^{2+})}$.

(iii) Mn and Fe have comparatively high and low values respectively.

The correct set of statements is/are (choose the appropriate option)

A. I and II

B. II and II

C. I and III

D. I,II and III

Answer: D

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38. The magnetic nature of elements depends on the presence of unpaired electrons. Identify the configuration of transition element,

which shows highest magnetic moment.

A. $3d^5$

B. $3d^2$

C. $3d^7$

D. $3d^8$

Answer: A

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39. Consider the following statements for transition elements.

(I) form sets of compounds which disply different oxidation states of the metal.

(II) from coloured ions in solution.

(III) burn vigorously in presence of oxygen.

(IV) replace H_2 from dilute acids.

A. I,II III are correct

B. II,III,Iv are correct

C. I,II are correct

D. All are correct

Answer: C

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40. Which of the following compounds is used as the starting material for the preparation of potassium dichromate?

A. $K_2SP_4.\ Cr_2(SO_4)_3.\ 24H_2O$

B. $PbCrO_4$

C. $FeCr_2O_7$

D. $PbCrO_4.\ PbO$

Answer: C

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41. Potassium dichromate is used

A. in electroplating

B. as a reducing agent

C. oxidise ferrouse ion into ferric ions in acidic media as

D. oxidise ferrous ions into ferric ions in acidic media as an oxidsing agent

Answer: C

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42. The bonds present in the structure of dichromate ion are

A. four equivalent Cr-O bonds

B. six equivalent Cr-Obonds and one Cr-O bond

C. six equivalent Cr-O and bonds and one Cr-Cr bond

D. eight equivalent Cr-O bonds

Answer: B

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43. $4K_2Cr_2O_7 \xrightarrow{heat} 4K_2CrO_4 + 3O_2 + X$. In the above reaction X is

A. CrO_3

B. Cr_2O_7

C. Cr_2O_3

D. CrO_5

Answer: C

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44. When MnO_2 fused with KOH, a coloured compound is formed . The product and its colour is:

A. Potassium permanganate

B. Potassium manganate

C. manganese hydroxide

D. Hn_3O_4

Answer: B

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45. Which of the oxide of manganese is amohoteric

A. MnO_2

B. Mn_2O_3

C. Mn_2O_7

D. MnO

Answer: A

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46. Concider the following statements,

(I) As the oxidation number of a metal increases, ionic character decreases.

A. I,II,III and IV

B. only II

C. II and III

D. II and IV

Answer: A

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47. A blue solution of copper sulphate becomes darker when treated with excess of ammonia. This is because

A. ammonia molecules replace water molecules in the solution

B. ammonia is stronger ligand than water

C. ammonia froms a stable comlex ion $\left[Cu(NH_3\_(4)\right]^{2+}$ with Cu^(2+)` ions

D. All of above

Answer: D

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48. $2mNo_4^{2-} + cl_2 \rightarrow Mn^{2+} + 5Fe^{3+}$

MnO_4^{2-} can be converted to MnO_4^-

A. by oxidation with Cl_2

B. by electrochemical oxidationat anode

C. Both (a) and (b)

D. None of the above

Answer: C

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49. One mole of FeC_2O_4 is oxidised by KMnO_(4) in acidic medium. Number of moles of KMnO_(4) used are

A. 0.6mol

B. 1.2mol

C. 0.4mol

D. 1mol

Answer: A

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50. Acidified potassium permanganate soultion is decoloursied by

A. bleaching powder

B. white vitriol

C. Mohr's salt

D. microcosmic salt

Answer: C

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51. $KMnO_4$ in basic medium is used as

A. strong oxidising agent

B. strong reducing agent

C. strong hydrogenating agent

D. poor reducing agent

Answer: A

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52. The atomic number of V, Cr, Mn and Fe are respectively $23, 24, 25$ and 26. Which one of these may be expected to have the highest second ionization enthalpy?

A. Variable oxidations state

B. Cr

C. Mn

D. Fe

Answer: B

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53. In the following figure the $Cr - O - Cr$ bond angle is of X^o. What is the exact value of X?

A. 126°

B. 136°

C. 116°

D. 106°

Answer: A

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54. Acidified $KMnO_4$ can be decolourised by:

A. H_2O_2 / H^+

B. SO_2 / H^+

C. $C_2O^2\_(4) / H^+$

D. All of these

Answer: B

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55. On heating $KMnO_4$, one among the following is not formed:

A. K_2MnO_4

B. Mn_2O

C. MnO_2

D. MnO

Answer: A

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56. $KMnO_4$ forms dark purple crystals, which are isostructural with those of ...A... . Here, A refers to

A. K_2SO_4

B. K_2MnO_4

C. $KClO_4$

D. None of these

Answer: C

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57. In alkaline H_2O_2, $Cr_2O_7^{2-}$ changes to tetraperoxo species... having oxidation number of Cr as ...

A. CrO_4^{2+}, 6

B. Cro_5, 6

C. CrO_8^{3-}, 5

D. CrO_8^{3-}, 11

Answer: C

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58. $K_2Cr_2O_7 / H^+$ changes to green by

A. Fe^{2+}

B. SO_2

C. Both (a) and (b)

D. None of these

Answer: C

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59. An explosion takes place when conc. H_2SO_4 is added to $KMnO_4$. Which of the following is formed?

A. Mn_2O_7

B. MnO_2

C. $MnSO_4$

D. Mn_2O_3

Answer: A

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60. The outer electronic configuration of Gd (At.No. 64) is

A. $4f^3 5d^5 6s^2$

B. $4f^8 5d^0 6s^2$

C. $4f^4 5d^4 6s^2$

D. $4f^7 5d^1 6s^2$

Answer: D

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61. Identify the incorrect statement among the following.

A. d-block elements show irregular and erratic chemical properties among themselves

B. La and Lu have partially filled d-orbitals and no other partially filled orbital

C. The chemistry of various lanthanoids is very similar

D. 4f and 5f-orbitals are equally shielded

Answer: D

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62. The atomic size of cerium and promethium is quite close, because

A. they are in same period in periodic table

B. their electronic configuration is same

C. f-electrons have poor shielding effect

D. nuclear charge is higer on certium than promethium

Answer: C

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63. The lanthanide contraction relates to

A. atomic radii

B. atomic as well as M^{3+} radii

C. valence electrons

D. oxidation states

Answer: B

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64. Because of lanthnoid contraction, which of the following pairs of elements have nearly same atomic radii ? (Number in the parenthesis are atomic numbers)

A. Ti(22) and Zr(40)

B. Zr (40) and Nb(41)

C. Zr (40) and Hf(72)

D. Zr(40) and Ta(73)

Answer: C

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65. $\ln^{3+}$ (trivalent lanthanides ions) have electronic configuration.

A. $[Xe]4f \text{to} [Xe]4f^{14}$

B. $[Xe]4d^{1}4f \text{to} [Xe]4d^{1}4f^{14}$

C. $[Xe]4d^2 4f^0 \text{to} [Xe]4d^1 4f^{14}$

D. $[Xe]4f^0 \text{to} [Xe]4f^{14}$

Answer: A

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66. The basicity of lanthanoid hydroxides, across the lanthanoid series

A. decreases

B. increases.

C. first decreases and then increases

D. first increases and then decreases

Answer: A

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67. There are 14 elements in actinoid series. Which of the following elements does not belong to this series?

A. U

B. Np

C. Tm

D. Fm

Answer: C

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68. lanthanoid contraction, the unique in the chemistry of lanthanoids, is basically

A. the overall increases in atomic and ionic radii from La to Lu

B. the overall decreases in atomic and ionic radii from La to Lu

C. the overall increases in atomic radii only from La to Lu

D. the overall decreases in ionic radii only from La to Lu

Answer: B

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69. Misch metal is

A. an alloy which consists of a lanthanoid metal $(\sim 95\,\%)$ and iron $(\sim 5\,\%)$ an traces of S,C,Ca and Al

B. used in Mg based alloy to produce bullets, shell and lighter flint

C. Both (a) and (b) are true

D. Both (a) and (b) are false

Answer: C

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70. Consider the following statements,

(I) $La(OH)_3$ is the least basic among hydroxides of lanthanides.

(II) Zr^{4+} and Hf^{4+} possess almost the same ionic radii

(III) Ce^{4+} can act as an oxidising agent.

Which of the above is/are true?

A. I and III

B. II and III

C. Only II

D. I and II

Answer: B

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71. Which one of the following exists in the oxidation state other than $+3$?

A. B

B. Al

C. Ce

D. Ga

Answer: C

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72. The radius of La^+ (at no 57) is 1.06Å. What may be the radius of Lu^{3+} (at no.71)?

A. 1.06Å.

B. 1.40Å

C. 1.06Å

D. 0.85Å

Answer: D

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73. Lanthanoid contraction is caused due to:

A. the appreciable shielding on outer electrons by 4f-electrons from the nuclear charge

B. the appreciable shielding on outer electrons by 5d-electrons from the nuclear charge

C. the same effective nuclear charge from Ce to Lu

D. the imperfect shielding on outer electrons by 4f-electrons from the nuclear charge

Answer: D

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74. Match the Column and choose the correct option from codes given below.

A.

A	B	C	D	E
1	2	3	4	5

B.

A	B	C	D	E
4	3	5	1	2

C.

A	B	C	D	E
3	2	1	5	4

D.

A	B	C	D	E
5	4	3	2	1

Answer: B

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75. Which of the following ion acts as an oxidising agent?

A. Eu^{2+}

B. Np^{4+}

C. Sm^{2+}

D. Yb^{2+}

Answer: B

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76. Which of the following has got incompletely filled f-subshell?

A. Gadolinium

B. Lutetium

C. Lawrecium

D. Tantalum

Answer: A

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77. The first ionsation enthalpies of the lanthanoids are around...A.....,the second about .....B..... Comparable with those of .....C.....Here, A,B and C refers to `

A. $A-600KJmol^{-1}, B-1200KJmol^{-1}C-\text{calcium}$

B. $A-1200KJmol^{-1}, B-600KJmol^{-1}C-\text{strontium}$

C. $A-1200KJmol^{-1}, B-600KJmol^{-1}C-\text{lanthanum}$

D. $A-600KJmol^{-1}, B-1200KJmol^{-1}C-\text{lutetium}$

Answer: A

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78. Knowing that the Chemistry of lanthanoids (Ln) is dominated by its+3 oxidation state, which of the following statement is incorrect?

A. Because of the large size of the Ln (III) ions the bonding in its compounds is predominantly ionic in character

B. The ionic sizes of Lu (III) decrease in general with increasing atomic number

C. Lu (III) compounds are generally colourless

D. Lu (III) hydroxide are mainly basic in character

Answer: C

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Exercise 2 Miscellaneous Problems

1. When I^{Θ} is oxidised by MnO_4^{Θ} in an alkaine medium, I^{Θ} converts into

A. lO_3^-

B. l_2

C. lO_4^-

D. lO^-

Answer: A

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2. When MnO_2 is fused with KOH, a coloured compound is formed. The product and its colour is

A. K_2MnO_4, purple colour

B. $KMnO_4$,purple

C. Mn_2O_3, brown

D. Mn_3O_4, black

Answer: A

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3. $MSO_4 \xrightarrow{NH_4OH} \underset{\text{White}}{X\downarrow} \xrightarrow[\text{Excess}]{NH_4OH} Y \xrightarrow{H_2S} Z\downarrow$

Here, M and Z are

A. Cu,ZnS

B. Zn,ZnS

C. Fe,FeS

D. Al, Al_2S_3

Answer: B

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

A. $V^{2+} < Cr^{2+} < Mn^{2+} < Fe^{3+}$ paramagnetic behaviour

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

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

D. $Sc < Ti < Cr < Mn$ number of oxidation states

Answer: A

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5. The spin only magnetic moment of Fe^{3+} ion (inBM) is approximately

A. 4

B. 7

C. 5

D. 6

Answer: D

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6. For which of the following pairs, magnetic moment is same ?

A. $MnCl_2, CuSo_4$

B. $CuCl_2, TiCl_3$

C. $TiO_2, CuSO(4)$

D. $TiCl_3NiCl_2$

Answer: B

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7. A comapound in which a metal ion $M^{x+}(Z = 25)$ has a spin only magnetic moment of $\sqrt{24}$BM The number of unpaired electrons in the compound and the oxidation state of the metal ion respectively are

A. 4 and 2

B. 5 and 3

C. 3and 2

D. 4 and 3

Answer: A

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8. Within each transition series, the oxidation states

A. decreases regularly in moving from left to right

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

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

D. None of above

Answer: B

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9. Which one of the following reactions will occure on heating $AgNO_3$ above its melting point?

A. $2AgNO_3 \rightarrow 2Ag + 2NO_2 + O_2$

B. $2AgNO_3 \rightarrow 2Ag + N_2 + 3O_2$

C. $2AgNO_3 \rightarrow 2AgNO_2 + O_2$

D. $2AgNO_3 \rightarrow 2Ag + 2NO + 2O_2$

Answer: C

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10. Among the following, the compound that is both paramagnetic and coloured is :-

A. $K_{20Cr_2O_7}$

B. $(NH_4)_2[TiCl_6]$

C. $VOSO_4$

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

Answer: C

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11. Number of electrons in 3d-orbital of V^{2+}, Cr^{2+}, Mn^{2+} and Fe^(2+) $are 3, 4, 5,$ and $6 respectively. Which of the following ions will have a vel gar \geq$

(mu)`?

A. V^2

B. Cr^{2+}

C. Mn^{2+}

D. Fe^{2+}

Answer: C

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12. A soild, A which has photographic effect reacts with the solution of a sodium salt B to give a pale yellow precipitate C. Sodium salt on heatinggives brown vapours. Identity A,B and C.

A. $AgNO_3, NaBr, AgBr$

B. $AgNo_3, NaCl, AgNO_3$

C. $AgNO_3, NaBr, AgCl_2$

D. $AgCl, NaBr, AgBr_2$

Answer: A

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13. Amongst $[TiE_6]^{2-}, [CoF_6]^{3-}, Cu_2Cl_2$ and $[NiCl_4]^{2-}$ [Atomic no. $Ti = 22, Co = 27, Cu = 29, Ni = 28$] the colourless species are :

(A) $[TiF_6]^{2-}$ and $[Cu_2Cl_2]$

(B) Cu_2Cl_2 and $[NiCl_4]^{2-}$

(C) $[TiF_6]^{2-}$ and $[CoF_6]^{3-}$

(D) $[CoF_6]^{3-}$ and $[NiCl_4]^{2-}$

A. COF_6^{3-} and $NiCl_4^{2-}$

B. TiF_6^{2-} and COF_6^{3-}

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

D. TiF_6^{2-} and $Cu_2Cl(2)$

Answer: D

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14. At $pH = 4$, CrO_4^{2-} exists as

A. CrO_4^{2-}

B. CrO_3

C. CrO_2^{2-}

D. $Cr_2O_7^{2-}$

Answer: D

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15. When Kl (excess) is added to

(I)$CuSO_4$,

(II) $HgCl_2$

(III)Pb(NO_(3)_(2))`

A. a white ppt. of cul in I, an orange ppt. of Hgl_2 in II and a yellow ppt. of Pbl_2in III

B. a white ppt. of $C\underline{\underline{\quad}}(2), Hgl_2$ and $ayellowppt.\ of$Pbl_(2)` in III

C. a white ppt. of $C\underline{\underline{\quad}}(2), Hgl_2$ and Pbl_2

D. None of the above

Answer: A

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16. In which of the following complexes the metal ion is in zero oxidation state?

A. $[Cu(NH_3\_(4)]Cl_2]$

B. $Zn_2[Fe(CN_6]$

C. $Mn_2(CO)_{10}$

D. $\left[Ag(NH_3)_2\right]Cl$

Answer: C

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17. Consider the followinh reaction of permaganate ions.

$10^- + 2MnO_4^- + 16H^+ \rightarrow 2Mn^{2+}8H_2O + 5l_2$

(II) $5Fe^{2+} + MnO_4^- + 8H^+ \rightarrow Mn^{2+} + 4H_2O + 5Fe^{3+}$

$5NO^{2+} + 2MnO_4^- + 6H^+ \rightarrow 2Mn^{2+} + 5NO_3^- + 3H_2O$

$2MnO_4^- + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H +$

$5NO^{2+} + 2MnO_4^- + 6H^+ \rightarrow 2Mn^{2+} + 5NO_3^- + 3H_2O$

$2MnO_4^- + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H +$

$5NO^{2+} + 2MnO_4^- + 6H^+ \rightarrow 2Mn^{2+} + 5NO_3^- + 3H_2O$

(III) $2MnO_4^- + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H +$

In the above reaction, Which reaction occur in acidic solution?

A. I and II

B. II and III

C. III,II and I

D. IV and II

Answer: C

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18. Which of the following statement (s) is/are correct when a mixture of NaCl and $K_2Cr_2O_7$ si gently warmed with conc. H_2SO_4?

(I) A deep red vapour is evoleved. ltbr4gt (II) The vapour when passes into NaOH solution gives a yellow solution of Na_2CrO_4.

(III) Chomyl chloride is formed.

Choose the coorect option.

A. I and II

B. I, II and III

C. I,II and IV

D. III and Iv

Answer: C

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

A. reaction is exothermic

B. Mn^{2+} acts as an autocatalyst

C. CO_2 is formed as the product

D. MnO_4^- catalyses the reaction

Answer: B

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20. What happen when a solution of potassium chromate is treated with an excess of dil. Nitic acid?

A. Cr^{3+} and $Cr_2O_7^-$ formed

B. $Cr_2O_7^-$ and H_2O are formed

C. $CerO_4^{2-}$ is reduced tp $+3$ state of Cr

D. None of the above

Answer: B

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21. When SO_2 is passed through an acidified $K_2Kr_2O_7$ solution, the oxidation state of sulphur changes from

A. $+4 \rightarrow 0$

B. $+4 \rightarrow +2$

C. $+4 \rightarrow +6$

D. $+6 \rightarrow +4$

Answer: C

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22. The catalytic of the transition metals and their compounds is described to

A. their chemical reactivity

B. their magnetic behaviour

C. their unfilled d-orbitals

D. their ability to adopt multiple oxidation state and their complexing ability

Answer: D

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

A. $Cr_2O_7^{2-} > MnO_4^- > VO_2^-$

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

C. $VO_2^+ > MnO_4^- > Cr_2O_7^{2-}$

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

Answer: B

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24. Magnetic moment of maganese in $(NH_4)_2MnBr_2$ is

A. 3.87BM

B. 5.91BM

C. 4.89BM

D. 2.82BM

Answer: B

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25. Pick out the correct statements from the following.

(I) Cobalt (III) is more stable in octahedral complexes.

(II) Zinc froms coloured ion or complexes.

(III) Most of the d-block elements and their compounds are ferromagnetic.

(IV) Osmium show (VIII) oxidation sate.

A. I and II

B. I and III

C. II and IV

D. I and IV

Answer: D

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26. Which pair of compounds is expected to show similar colour in aqueous medium?

A. $FeCl_3$ and $CuCl_2$

B. $VOCl_2$ and $CuCl_2$

C. $COCl_2$ and $FeCl_2$

D. $FeCl_2$ and $MnCl_2$

Answer: B

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27. Match the following columns.

A.
A	B	C	D	E
1	2	3	4	5

B.
A	B	C	D	E
5	4	3	2	1

C.
A	B	C	D	E
4	5	1	3	2

D.
A	B	C	D	E
2	1	4	5	3

Answer: D

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

x and y can be :

A. 4 and 5

B. 4 and 8

C. 8 and 4

D. 8 and 9

Answer: C

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29. Consider the following statements,

A. Colour of a transition metal complex is dependent on the nature of energy difference between two d-levels.

B. colour of the complex is dependent on the nature of the ligand and the

type of complex formed.

C. $ZnSO_4$ and TiO_2 white and in both d-dspectra are impossible.

Select the correct statements.

A. A,B and C

B. A and B

C. B and C

D. A and C

Answer: A

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30. When a magnetic field is applied to substances, mainly two type of magnetic behaviour are observed. These are

A. paramagnetism and ferromagnetism

B. ferromagnetism and ferromagnetism

C. ferrimagnetism and diamagnetism

D. paramagnetism and diamagnetism

Answer: D

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31. Match the properties given in Column I with the metals given in Column II and choose the correct option from the given below.

A. $\begin{matrix} A & B & C & D \\ 1 & 2 & 3 & 4 \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ 3 & 4 & 2 & 1 \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ 4 & 3 & 2 & 1 \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ 2 & 1 & 4 & 3 \end{matrix}$

Answer: B

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32. The ion Cr^{2+} is redusing agent while that of Mn^{3+} is an oxidising agent though both have $3d^4$ configuration.

This is because

A. Cr^{2+} configuration results from $d^3 \rightarrow d^4$ while that of Mn^{3+} result from highly stable d^5 configuration

B. Cr^{2+} Configuration results from $d^4 \rightarrow d^3$ while that of Mn^{3+} results from highly stable d^5 configuration.

C. Both the ions, Cr^{2+} and Mn^{3+} results from d^5 configuration.

D. Cr^{2+} configuration results from d^5 while that of Mn results from d^5

Answer: B

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

(I) CuS is white in colour.

(II) $KMnO_4$ exists as dark purple black prismatic crystals.

(III) Basic copper carbonate is $CuCO_3.Cu(OH)_2$.

(IV) On strong heating, potassium dicheomate decomposes with evolution of oxygen.

Choose the correct option.

A. I,II and III

B. II,III and IV

C. I,Iii,and IV

D. I,II,III and IV

Answer: B

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34. Cuprous ion is colourless, while cupric ion is colured because

A. both have unpaired electrons in the d-subshell

B. cuprous ion has a complete d-subshell and cupric ion has an incomplete d-subshell

C. both have half-filled p and d-subshell

D. cuprous ion has incomplete d-subshell and cupric ion has a complete d-subshell

Answer: B

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

A. 2

B. 3

C. 4

D. 6

Answer: D

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36. The 3d-metal ion are generally paramagnetic in nature because

A. they from coloured salts

B. they have one or more unpaired d-electrons

C. they have one or more paired electrons

D. they are reducing agents

Answer: B

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37. the caculated magnetic moment of a divalent ion of an atomic number 24 in aqueous solution is

A. 4.90BM

B. 5.92BM

C. 2.87BM

D. 1.73BM

Answer: A

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38. Four successive members of the first row transition elements are listed below with their atomic number. Which one of them is expected to have the highest third ionisation enthalpy ?

A. Vanadium (Z=23)

B. Chromium (Z=24)

C. Iron(Z=26)

D. Manganese (Z=25)

Answer: D

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39. Among the following series of transition metal ions, the one in which all metal ions have $3d^2, 3p^6$ electronic configuration is (Atomic no. of $Ti = 22, V = 23, Cr = 24, Mn = 25$)

A. $Ti^+, V^{2+}, Cr^{3+}, Mn^{4+}$

B. $Ti^+, V^{4+}, Cr^{6+}, Mn^{7+}$

C. $Ti^{4+}, V^{3+}, Cr^{2+}, Mn^{3+}$

D. $Ti^{2+}, V^{3+}, Cr^{4+}, Mn^{5+}$

Answer: D

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40. The colourless species is

A. VCl_3

B. $VOSO_4$

C. Na_3VO_4

D. $\left[V(H_2O)_6\right]SO_4.\ H_2O$

Answer: C

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41. Amongst the following, the lowest degree of paramgnetism per mole of the compound at $298K$ will be shown by

A. $MnSO_4.4H_2O$

B. $NiSO_4.6H_2O$

C. $FeSO_4.6H_2O$

D. $CuSO_4.5H_2O$

Answer: D

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42. Which do not decolourise $KMnO_4$ in aqueous solution?

A. $C_2O_4^{2-}$

B. HSO_3^-

C. CO_3^-

D. SO_3^-

Answer: C

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43. Potassium permaganate acts as oxidant in alkaline and acidic media. The final products formed from $KMnO_4$ in the two conditions are respectively

A. MnO^{2-} and Mn^{3+}

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

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

D. Mn^{2+}, MnO_2

Answer: D

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44. A certain metal will liberate hydrogen from dilute acids. It will react with to from hydrogen only when the metal is heated and water is in the from of steam . The metal is probably

A. iron

B. Potassium manganate

C. copper

D. mercury

Answer: A

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45. Cu^{2+} has a stronger polarising power than that of Ca^{2+} because

A. Ca^{2+} ion is saller than Ca^{2+} ion

B. Ca^{2+} ionhas inert gas configuration whereas Cu^{2+} ion does not

C. copper shows valency ,calcium does not

D. Cu^{2+} ion is smaller than Ca^{2+} ion and the d-electrons in Cu^{2+} ion shield the nucleus poorly

Answer: A

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46. On addition of $AgNO_3$ to four different test tubes containing different solution, one of them gave a white precipitate . It may be

A. $CHCl_3$

B. $CaCL_2$

C. KNO_3

D. CCl_4

Answer: B

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47. Which of the following compounds will show magnetic moment of 1.72 BM ?

A. $\left[Ni(CN)_4\right]^{2-}$

B. $[CoCl_6]^{4-}$

C. $\left[Cu(NH_3\_(4)\right]^{2+}$

D. $TiCl_4$

Answer: C

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

(I) In acidic solution dichromate ions are converted to chromate ions .

(II) An acidified solution of $K_2Cr_2O_7$ liberates iodine from iodides.

(III) Potassium dichromate is used as a titrant for Fe^{2+} ions.

(IV) Ammonium dichromate on heating undergo exothermic decomposition to give Cr_2O_3.

Choose the correct option .

A. I,II and III

B. II,III, and IV

C. I,II,III and IV

D. II and III

Answer: C

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49. Which of the following paires have same radii?

A. Am and Cm

B. U and Np

C. BK and Cf

D. Pu and Th

Answer: C

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50. Zn gives H_2 gas with H_2SO_4 and HCl but not with HNO_3 because

A. Zn acts as an oxidising agent when reacts with HNO_3

B. HNO_3 is weaker acid than H_2SO_4 and HCl

C. in electrochemical series, Zn is above hydrogen

D. NO_3^- ion is reduced in prefence to hydronium ions

Answer: D

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51. Which of the statements (s) is/are not true?

A. On passing H_2Sthrough acidifid $K_2Cr_2O_7$solution, a milky colour is obseved

B. $Na_2Cr_2O_7$ is preferred over $K_2Cr_2O_7$ in volumetric analysis

C. $K_2Cr_2O_7$ solution in acidic medium is orenge

D. $K_2Cr_2O_7$solution becomes yellow on increasing the pH beyond 7

Answer: B

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52. When H_2O_2 is shaken with an acidified solution of $K_2Cr_2O_7$ in the presence of ether , the ethereal layer turns blue due to the formation of

A. Cr_2O_3

B. CrO_4^-

C. $Cr_2(SO_3)_3$

D. CrO_5

Answer: D

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53. Which of the following lanthanoid ions is diamagnetic? (Atomic number of $Ce = 58, Sm = 62, Eu = 63, Yb = 70$]

A. Ce^{2+}

B. Sm^{2+}

C. Eu^{2+}

D. Yb^{2+}

Answer: D

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54. The trivalent ion having size in lanthanide series is

A. Ti

B. Zr

C. Hf

D. La

Answer: D

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55. The correct statement is

A. The earlier members of lanthanoid series resemble calcium in their chemical properties

B. The extent of actinoid contraction is almost the same as lanthanoid contraction

C. In general, lanthanoid and actinoids do not show variable oxidation states

D. Ce^{4+} in aqueous solution is not known

Answer: A

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56. A metal gets coated with a green basic carbonate when exposed to atmosphere. Metal is

A. copper

B. Zinc

C. Iron

D. silver

Answer: A

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57. The colour of light absorbed by an aqueous solution of $CuSO_4$ is

A. orange-red

B. blue-green

C. yellow

D. voilet

Answer: A

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58. Which one of the following does not correctly represent the correct order of the property indicated against it

A. $Ti < V < Cr < Mn$: increasing number of oxidation states

B. $Ti^{3+} < V^{3+} < Cr^{3+} < Mn^{3+}$: increasing magnetic moment

C. $Ti < V < Cr < Mn$: increasing melting poitns

D. $Ti < V < Mn < Cr$: increasing 2nd ionisation enthalpy

Answer: C

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59. Which one of the following has a magnetic moment of 1.75 BM?

A. V^{3+}

B. Cr^{3+}

C. Fe^{3+}

D. Ti^{3+}

Answer: D

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60. The oxidation state of chromium in the final product formed by the reaction between Kl and acidified potassium dichromate solution is :

A. $+3$

B. $+2$

C. $+6$

D. $+4$

Answer: A

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61. Which of the following compound is used in gas lighter?

A. Pyrophoric Misch metal

B. CeO_2

C. Nichrome

D. Nitinol

Answer: A

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62. The reaction of aqueus $KMnO_4$ with H_2O_2 in acidic conditions gives

A. Mn^{4+} and O_2

B. Mn^{2+} and O_2

C. Mn^{2+} and O_3

D. Mn^{4+} and MnO_2

Answer: B

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63. In which of the pairs of ions given, there is an ion that forms a co-ordination compound both aqueous sodium hydroxide and ammonia and another ion that forms a co-ordination compound only with aqueous sodium hydroxide ?

A. Pb^{2+}, Cu^{2+}

B. Zn^{2+}, Al^{3+}

C. Cu^{2+}, Zn^{2+}

D. Al^{3+}, Cu^{2+}

Answer: B

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64. Four successive members of the first series of transition metals are listed below. For which one of the of standard potential $\left(E^{\circ}_{M^{2+}/M}\right)$ value has a positive sign ?

A. Co(Z=27)

B. Ni(Z=28)

C. Cu(Z=29)

D. Fe(Z=26)

Answer: C

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65. Which of the following statements about the interstitial compounds is incorrect?

A. They are much harder than the pure metal

B. They have higher melting points than the pure metal

C. They are much hard than the pure metal

D. They moment 2.83 BM is given by which of the following ions?

Answer: B

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66. Magnetic moment 2.83 BM is given by which of the following ions?

At. nos. Ti=22, Cr=24, Mn=25,Ni=28

A. Ti^{3+}

B. Ni^{2+}

C. Cr^{2+}

D. Mn^{2+}

Answer: B

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67. The metal that cannot obtained by electrolysis of an aqueous solution of its salts is :

A. Ag

B. ca

C. Cu

D. Cr

Answer: B

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68. What is the general electronic configuration for second row transition series?

A. $[Ne]3d^{1-10}, 4s^2$

B. $[Ar]3d^{1-10}, 4s^{1-2}$

C. $[Kr]4d^{1-10}, 5s^{1-2}$

D. $[Xe]5d^{1-10}, 5s^{1-2}$

Answer: C

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69. The colour of Cu_2^{2+} containing salt is

A. white

B. blue

C. orange

D. yellow

Answer: A

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Mht Cet Corner

1. What is the general molecular formula of the products obtained on heating lanthanoid (Ln) with sulphur?

A. LnS

B. $\ln S_3$

C. $\ln_3 S_2$

D. $\ln_2 S_3$

Answer: D

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2. How is sodium chromate converted into sodium dichromate in the manufacture of potassium dichromate from chromite ore?

A. By the action of concentrated sulphuric acid

B. By roasting with soda ash

C. By the action of sodium hydroxid

D. By the action of limestone

Answer: A

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3. Identify the metal that froms colourless compounds.

A. Iron(Z=26)

B. Chromium (Z=24)

C. Vanadium (Z=23)

D. Scandium(Z=21)

Answer: D

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4. The only radioactive element among the lanthanoids is

A. gadolinium

B. holmium

C. promethium

D. neodynium

Answer: C

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5. Identify a 'Chemical twin' among the foolowings.

A. Zr-Ta

B. Nb-Tc

C. Hf-Re

D. Nb-Ta

Answer: D

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6. Select the coloured compound amongst the following (atomic no $Ti = 22, Cr = 24, Cu = 29, Zn = 30$)

A. $Ticl_4$

B. $CrCl_3$

C. $ZnCl_3$

D. $CuCl$

Answer: B

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7. Which of the following does not give oxygen on heating?

A. $KClO_3$

B. $Zn(ClO_3)_2$

C. $K_2Cr_2O_7$ solution in acidic medium is orenge

D. $(NH_4)_2Cr_2O_7$

Answer: D

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8. $KMnO_4$ can be prepared from K_2MnO_4 as per reaction

$3MnO_4^{2-} + 2H_2O \Leftrightarrow 2MnO_4^- + MnO_2 + 4OH^-$

A. HCl

B. KOH

C. CO_2 is formed as the product

D. sO_2

Answer: D

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9. Which of the following lanthanoid ions is diamagnetic? (Atomic number of $Ce = 58, Sm = 62, Eu = 63, Yb = 70$]

A. Cu^{2+}

B. Sm^{2+}

C. Eu^{2+}

D. Yb^{2+}

Answer: D

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10. The oxidation state of Cr in $K_2Cr_2O_7$ is:

A. $+4$

B. $+3$

C. $+6$

D. $+5$

Answer: C

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11. Which of the following species shows the maximum magnetic moment?

A. Mn^{6+}

B. Ni^{2+}

C. Fe^{3+}

D. Ag^{+}

Answer: C

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12. Fool's gold is

A. Cu_2S

B. FeS_2

C. Al_2O_5

D. $CuFeS_2$

Answer: B

View Text Solution

13. When Zn is treated with excess of NaOH, the product obtained is

A. $Zn(OH)_2$

B. ZnOH

C. Na_2ZnO_2

D. None of these

Answer: C

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14. The most common oxidation states of cerium are

A. $+2,\ +4$

B. $+3, \ +4$

C. $+3, \ +4$

D. $+3, \ +5$

Answer: B

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15. Til_4heating gives

A. $Til_2 + l_2$

B. $Ti + 2l_2$

C. $Til_3 + \frac{1}{2}l_2$

D. None of these

Answer: B

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16. Ce^{4+} is stable .This is because of

A. half-filled d-orbital

B. all paired electrons in d-orbital

C. empty orbital

D. fully filled d-orbital

Answer: C

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17. German silver does not contain

A. Sn

B. Cu

C. Zn

D. Ni

Answer: A

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18. Which gives +7 oxidation state ?

A. Mn(25)

B. Cr(24)

C. Cu(29)

D. Fe(26)

Answer: A

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19. The maximum number of unpaired electrons is present in

A. Fe

B. Cu

C. Co

D. Ni

Answer: A

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20. Most basic hydroxide among the following is

A. $Lu(OH)_3$

B. $Eu(OH)_3$

C. $Yb(OH)_3$

D. $Ce(OH)_3$

Answer: D

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21. The point of dissimilarity between lanthanides and actinic is

A. three outermost shells are partially filled

B. they show oxidation state of $+3$ (common)

C. they are called inner transition elements

D. they are radioactive

Answer: D

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

A. $(n-1)d^{10}, (n+1)s^2$

B. $(n-1)d^{1-10}, (n+1)s^{1-2}$

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

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

Answer: D

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23. Which of the following ions is colourless in solution?

A. V^{3+}

B. Cr^{3+}

C. Co^{2+}

D. Sc^{3+}

Answer: D

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24. What is the fuel of atomic pile?

A. Thorium

B. Sodium

C. Uranium

D. Petroleum

Answer: C

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25. Oxidation state of in Fe_3O_4 is

A. $\frac{8}{3}$

B. $\frac{3}{4}$

C. $\frac{3}{2}$

D. $\frac{1}{2}$

Answer: A

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26. The electronic configuration of the fourth transition element is

A. $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2$

B. $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^2, 4s^2$

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

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

Answer: B

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27. In solution of $AgNO_3$.If Cu is added, the solution becomes blue due to

A. oxidation of Ag

B. oxidation of Cu

C. reduction of Ag

D. reduction of Cu

Answer: B

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