CHEMISTRY

BOOKS - TARGET CHEMISTRY (HINGLISH)

D AND F-BLOCK ELEMENT

Classical Thinking

1. In transition elements, the differentiating electron enters into _____ subshell.

A. ns

B. np

C. (n-1)d

D. (n-2)f

Answer: C

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2. The transition elements are so named because

A. they have partly filled d-orbitals

B. their properties are similar to other elements

C. their properties are different from other elements

D. the properties of transition metals are in between the properties of s and p block elements

Answer: D

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3. Which set of transition series of the d-block is CORRECT?

A. 3d, 4d, 5d, 6d

B. 2d, 3d, 4d, 5d

C. 3d, 5d, 6d, 7d

D. 4d, 5d, 6d, 7d

Answer: A

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4. The first transition element is_____.

A. chromium

B. Scandium

C. Nickel

D. Copper

Answer: B

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5. Ground state electronic configuration of Cr atom is

:

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

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

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

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

Answer: A

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6. Electronic configuration of manganese (Z = 25) is_____.

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

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

C. [Ar] $3d^5 4s^2$

D. [Ar] $3d^6 4s^1$

Answer: C

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7. Crocoite is_____.

A. Cr_2O_3

B. $FeCr_2O_4$

C. $PbCrO_4$

D. MnO_2

Answer: C

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8. Which of the following is not true for transition metals

A. They are malleable and ductile.

B. They have high boiling and melting points.

C. They have low density.

D. They form organometallic compounds.

Answer: C

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9. The d-block elements include_____.

A. Metals & NON-metals

B. only non-metals

C. only metals

D. metals,non-metals and metalloids

Answer: C

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10. Which is NOT a hard metal?

A. Cr

B. Cd

C. Mo

D. W

Answer: B

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11. The lightest transition element is

A. Hg

B. Sc

C. Fe

D. Ti

Answer: B

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12. The ionization enthalpies of transition metals is_____ s-block elements and _____ p-block elements.

A. higher than, lower than

B. lower than, higher than

C. equal to, lower than

D. higher than, equal to

Answer: A

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13. The first ionisation energies of the elements of the first transition series $(Ti \to Cu)$

A. increases as the atomic number increases

B. decreases as the atomic number increases

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

D. increases from Ti to Mn and then decreases from Mn to Cu

Answer: A

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14. Which of the following transition metal shows the highest oxidation state:

A. Mn

B. Ni

C. Fe

D. Cr

Answer: A

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15. Which of the following does NOT show different oxidation states?

A. Iron

B. Copper

C. Zinc

D. Manganese

Answer: C

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16. Zinc does not exhibit variable valency due to

A. complete 'd' subshell

B. inert pair effect

C. $4s^2$subshell

D. half filled d-subshell

Answer: A

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

A. $+5$

B. $+6$

C. $+7$

D. $+8$

Answer: D

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18. Oxidation number of osmium (Os) in OsO_4 is

A. $+4$

B. $+6$

C. $+7$

D. $+8$

Answer: D

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19. The atomic radii of transition elements in a row are_____.

A. smaller than those of s-block as well as p-block elements

B. greater than those of s-block as well as p-block elements

C. smaller than those of s-block but greater than those of p-block elements

D. greater than those of s-block but smaller than those of p-block elements

Answer: C

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20. Which ion has the highest ionic radii?

A. Sc^{3+}

B. Mn^{3+}

C. Ti^{3+}

D. Co^{3+}

Answer: A

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21. The colour of transition metal ions is due to

A. s-s

B. d-d

C. p-p

D. f-f

Answer: B

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22. In which of the following pairs are both the ions coloured in aqueous solution-

A. Sc^{3+}, Co^{2+}

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

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

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

Answer: C

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23. Of the ions Zn^2, Ni^{2+} and Cr^{3+} [atomic number of $Zn = 30, Ni = 28, Cr = 24$]

A. Zn^{2+} is colourless and Ni^{2+} and Cr^{3+} are coloured

B. all three are coloured

C. all three are colourless

D. Ni^{2+} is coloured and $Zn^{2+}\,\text{and}\,Cr^{3+}$ are colourless

Answer: A

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24. Magnetic moment is expressed in _____.

A. Faraday

B. Calorie

C. Bohr Magneton

D. Debye

Answer: C

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25. If n is the number of unpaired electrons, the magnetic moment (in BM) of transition metal/ion is

given by

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

B. $\sqrt{2n(n+1)}$

C. $\sqrt{n(n-2)}$

D. $\sqrt{2n(n-1)}$

Answer: A

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

A. 2.9 B.M.

B. 3.9 B.M.

C. 4.9 B.M.

D. 5.9 B.M.

Answer: D

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27. Which of the following is NOT a property of transition elements?

A. Formation of coloured complexes

B. Paramagnetism

C. Fixed valency

D. Catalytic activity

Answer: C

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28. Interstitial compounds are formed due to _____.

A. mettalic bonding

B. hydrogen bonding

C. covalent bonding

D. defect in the crystal lattice of transition metals

Answer: D

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29. _____ is an interstitial compound.

A. NaCl

B. $TiH_{1.73}$

C. $K_2Cr_2O_7$

D. $KMnO_4$

Answer: B

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30. The chemical properties of interstitial compounds are similar to those of _____.

A. parent transition metals

B. alkali metals

C. alkaline earth metals

D. inner transition elements

Answer: A

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31. Which of the following elements is alloyed with copper to form bronze?

A. Lead

B. Tin

C. Zinc

D. Antimony

Answer: B

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32. Stainless steel is an alloy of

A. Cr

B. Ni

C. C

D. N

Answer: A

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33. The colour of $K_2Cr_2O_7$ changes from red-orange to lemon-yellow on treatment with $KOH_{(aq.)}$,

because of:

A. reduction of Cr(VI) to Cr(III)

B. formation of chromium hydroxide

C. conversion of dichromate to chromate

D. oxidation of potassium hydroxide to potassium peroxide.

Answer: C

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34. Chromate ion has _____ structure.

A. square planar

B. tetrahedral

C. trigonal

D. pyramidal

Answer: B

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35. $K_2Cr_2O_7$ is NOT used in _____.

A. dyeing

B. estimation of ferrous ions

C. detection of chloride ion

D. estimation of ferric ions

Answer: D

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

A. K_2MnO_4, green

B. $KMnO_4$, purple

C. Mn_2O_3, brown

D. Mn_3O_4, black

Answer: A

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37. Lanthanides and actinides belong to _____ block of the periodic table.

A. s-block elements

B. p-block elements

C. d-block elements

D. f-block elements

Answer: D

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38. What is the total number of inner transition elements in the periodic table?

A. 10

B. 14

C. 28

D. 30

Answer: C

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39. Two series of inner transition elements are _____.

A. 3d and 4d

B. 4f and 5f

C. 5f and 6f

D. Alkali and alkaline earth

Answer: B

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40. The lanthanides and actinides are collectively known as_____.

A. representative elements

B. transition elements

C. inner transition elements

D. inert elements

Answer: C

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41. The series of the elements, starting from cerium and ending with lutetium, is called_____series.

A. actinoid

B. radioactive

C. lanthanoid

D. electromotive

Answer: C

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42. Lanthanoid series contains_____elements.

A. 6

B. 8

C. 10

D. 14

Answer: D

43. Lanthanoid elements range from atomic number_____.

A. 56 to 69

B. 57 to 70

C. 57 to 71

D. 59 to 72

Answer: C

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44. Lanthanoids are placed in _____.

A. 3^{rd} group and 7^{th} period

B. 3^{rd} group and 6^{th} period

C. 4^{th} group and 7^{th} period

D. 3^{rd} group and 8^{th} period

Answer: B

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45. The observed electronic configuration of samarium (atomic number 62) is_____.

A. [Xe] $4f^8 5d^1 6s^2$

B. [Xe] $4f^7 5d^1 6s^2$

C. [Xe] $4f^3 5d^5 6s^2$

D. [Xe] $4f^6 5d^0 6s^2$

Answer: D

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46. Tb (Z = 65) loses electrons from _____ orbitals to form Tb^{3+} ion.

A. 6s and 4f

B. 6s, 5d and 4f

C. only 4f

D. 5d and 4f

Answer: A

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47. Oxidation states shown by Eu are_____.

A. $+2,\ +3$

B. $+2,\ +3,\ +4$

C. $+2,\ +4$

D. $+3,\ +4$

Answer: A

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48. When lanthanoids (Ln) are heated with sulphur, they form corresponding _____.

A. sulphites

B. sulphates

C. thiosulphates

D. sulphides

Answer: D

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49. Which element among the lanthanoids has the smallest atomic radius ?

A. Cerium

B. Lutetium

C. Europium

D. Gadolinium

Answer: B

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50. Arrange Ce^{3+}, La^{3+}, Pm^{3} and Yb^{3+} in increasing order of their size -

A. $Yb^{+3} < Pm^{+3} < Ce^{+3} < La^{+3}$

B. $Ce^{+3} < Yb^{+3} < Pm^{+3} < La^{+3}$

C. $Yb^{+3} < Pm^{+3} < La^{+3} < Ce^{+3}$

D. $Pm^{+3} < La^{+3} < Ce^{+3} < Yb^{+3}$

Answer: A

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51. Chemical twins are present in which transition series?

A. 2^{nd} and $n3^{rd}$

B. 3^{rd} and 4^{th}

C. 1^{st} and 2^{nd}

D. 1^{st} and 3^{rd}

Answer: A

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52. Nb and Ta have almost same atomic size due to _____.

A. diagnol relationship

B. their presence in the same group

C. lanthanide contraction

D. same chemical properties

Answer: C

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53. The first member of actinoid series is_____.

A. actinium

B. cerium

C. thorium

D. uranium

Answer: C

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54. Actinoid series starts from atomic number_____.

A. 88 to 101

B. 89 to 102

C. 90 to 103

D. 91 to 104

Answer: C

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55. Which of the following belong to the actinide series?

A. U

B. Y

C. Lu

D. Ta

Answer: A

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56. Transuranic element is _____.

A. uranium

B. protactinium

C. thorium

D. plutonium

Answer: D

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57. The general electronic configuration [Rn] $5f^{1-14}6d^{0-1}7s^2$ is of the _____.

A. lanthanoids

B. actinoids

C. s-block elements

D. d-block elements

Answer: B

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58. Write the electronic configuration of the element with atomic number 102.

A. $5f^{14}6d^{0}7s^{2}$

B. $5f^{13}6d^{1}7s^{2}$

C. $5f^{14}6d^{1}7s^{1}$

D. $5f^{14}6d^{0}7s^{1}$

Answer: A

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59. Actinoids _____.

A. are all synthetic elements

B. include element with atomic no. 104

C. constitutes the first inner transition series

D. have variable valency

Answer: D

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60. Zeff| Shielding effect and Atomic radii

A. lanthanides is same as that of actinides

B. actinides is poor

C. lanthanide is less than that of actinides

D. f-orbital is greater than d-orbital

Answer: B

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61. Which of the following is NOT CORRECT for both lanthanoids and actinoids?

A. They involve the filling of f-orbitals.

B. They show $+3$oxidation state.

C. Hydroxides are basic in nature.

D. All elements are radioactive.

Answer: D

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62. Which one of the following is a transition element?

A. Pr

B. As

C. Mo

D. Rb

Answer: C

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63. Which one of the following statement is FALSE?

A. Lead is a non-transition element

B. Chromium is a transition element

C. Sodium is a non-transition element

D. Zinc is an inner-transition element

Answer: D

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64. Identify the FALSE statement.

A. Actinides have oxidation states of $+2$ and $+3$.

B. Zr and Hf occur in nature together since their ionic radii are almost same.

C. The seperation of lanthanides is difficult since the ionic radii of the lanthanides are very close to each other.

D. The transition elements exhibit colour as they absorb energy for d-p transition.

Answer: D

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65. Which of the following statements is TRUE?

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

B. Zr^{4+} and Hf^{4+} possess almost the same ionic radii.

C. The oxide $\ln_2 O_3$ reacts with water to form soluble hydroxides.

D. Lanthanoids are naturally available.

Answer: B

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66. Actinoids and lanthanoids are placed respectively in _____ of the periodic table.

A. group 3 and 6^{th} and 7^{th} period

B. group 4 and 7^{th} and 6^{th} period

C. group 3 and 7^{th} and 6^{th} period

D. group 3 and 6^{th} and 5^{th} period

Answer: C

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Critical Thinking

1. What are the characteristics of th transition elements and why are they called transition elements? Which of the d-block elements may not be regarded as the transition elements?

A. Cu, Ag, Au

B. Zn, Cd, Hg

C. Fe, Co, Ni

D. Ru, Rh, Pd

Answer: B

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2. d-block elements belong to _____periods of the periodic table.

A. $3-6$

B. $3-7$

C. $4-7$

D. $2 - 6$

Answer: C

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3. The electronic configuration of four elements are given below. Which element does not belong to the same family as others ?

A. [Xe] $4f^{14}5d^{10}6s^2$

B. [Kr] $4d^{10}5s^2$

C. [Ne] $3s^23p^5$

D. [Ar]$3d^{10}4s^2$

Answer: C

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4. Atomic number of the element having ns^1 configuration and belonging to 3d transition series would be_____.

A. only 24

B. only 25

C. only 29

D. 24 and 29

Answer: D

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5. The number of unpaired electrons in the ground state of chromium atoms is.....

A. 5

B. 6

C. 1

D. 4

Answer: B

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

A. Fe

B. Zn

C. Au

D. Hg

Answer: A

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7. The transition elements exhibit variable oxidation states because_____.

A. they form large number of complexes

B. (n - 1)d and ns electrons are of nearly same energy level

C. they have high density

D. they have high melting and boiling point

Answer: B

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8. In 3d series, the first ionization energy is maximum in case of_____.

A. Zn

B. Sc

C. Ni

D. V

Answer: A

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9. Which of the following exhibits variable oxidation states?

A. F

B. Na

C. Mg

D. Mn

Answer: D

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10. Chromous and chromium salts have Cr in the oxidation state of _____ and _____respectively.

A. $+3,\ +2$

B. $+2,\ +3$

C. $-2,\ +3$

D. $+2,\ -3$

Answer: B

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11. Which of the following ions has d^5 electronic configureation ?

A. Cr^{2+}

B. Co^{3+}

C. Mn^{3+}

D. Fe^{3+}

Answer: D

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12. Mn ion has 2 in _____ and 5 electrons in _____ orbitals respectively.

A. 3d, 4s

B. 4s, 3d

C. 4f, 3d

D. 3d, 4f

Answer: B

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13. 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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14. Which of the following exhibits maximum oxidation state of vanadium?

A. $VOCl_3$

B. VCl_4

C. VCl_3

D. VCl_2

Answer: A

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15. Among the following outermost configurations of transitionn metals, which shows the highest oxidation state

A. $3d^3 4s^2$

B. $3d^5 4s^1$

C. $3d^5 4s^2$

D. $3d^6 4s^2$

Answer: C

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16. In how many of the following , the oxidation state of transition metal is $+6$?

Potassium ferrate, Manganese dioxide, Chromyl chloride, Sodium chromate, Potassium permanganate, Cupric chloride

A. 2

B. 3

C. 4

D. 5

Answer: B

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17. The atomic radii of transition elements from Cr to Cu are almost equal because

A. increasing nuclear charge from Cr toCu

B. repulsion among increased electrons

C. increased screening effect to nullify increased neclear charge

D. all of these

Answer: C

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18. In which of the following compounds the radius of chromium ion is smallest?

A. K_2CrO_4

B. CrO_2

C. CrF_3

D. $CrCl_3$

Answer: A

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19. The colour of transition metal ion is attributed to:

A. small sized metal ions

B. complete ns subshell

C. incomplete (n - 1)d subshell

D. absorption of light in the UV region

Answer: C

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20. If a compound absorbs orange colour from the white light, then the observed colour of the compound is_____.

A. yellow

B. orange

C. blue

D. violet

Answer: C

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

A. both have half filled p and d-orbitals.

B. cuprous ion has incomplete d-orbital and cupric ion has completed d-orbitals.

C. both have unpaired electrons in (n - 1)d-orbitals.

D. cuprous ion has a completed d-orbital and cupric ion has an incomplete (n - 1)d-orbital.

Answer: D

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22. The catalytic activity of the transition metals and their compound is described to:

A. their chemical reactivity

B. their unfilled d-orbitals

C. their ability to adopt multiple oxidation states and their complexing ability

D. less metallic character

Answer: C

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23. Which of the following would be diamagnetic?

A. Cu^{2+}

B. Ni^{2+}

C. Ti^{4+}

D. Mn^{2+}

Answer: C

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24. Which of the following has highest paramagnetic character

A. Mn (II)

B. Fe(II)

C. CO(II)

D. Ni(II)

Answer: A

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25. Which one of the following sets correctly represents the increase in the paramagnetic property of ions

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

B. $Cu^{2+} < Cr^{2+} < V^{2+} < Mn^{2+}$

C. $Cu^{2+} < V^{2+} < Cr^{2+} < Mn^{2+}$

D. $V^{2+} < Cu^{2+} < Cr^{2+} < Mn^{2+}$

Answer: C

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26. Which one of the following pair will have equal magnetic moment value?

A. Cr^{+3} and Mn^{+2}

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

C. V^{+2} and Sc^{+3}

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

Answer: B

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27. For a transition metal ion having seven electrons in its d-subshell, the magnetic moment will be_____.

A. 7.98 B.M.

B. 4.90 B.M.

C. 3.87 B.M.

D. 2.83 B.M.

Answer: C

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28. The yellow colour of chromates changes to orange on acidification due to the formation of

A. Cr^{+3}

B. Cr_2O_3

C. $Cr_2O_7^{2-}$

D. CrO_4^{2-}

Answer: C

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29. Acidified potassium dichromate is treated with hydrogen sulphide. In the reactiion, the oxidation number of chromium

A. increases from $+3 \text{to} +6$

B. decreases from $+6 \text{to} +3$

C. remanins unchanged

D. decreases from $+6 \text{to} +2$

Answer: B

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

A. six equivalent Cr-o bonds and one O-O bond

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

C. eight equivalent Cr-O bonds

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

Answer: D

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31. The equivalent mass of $KMnO_4$ in the following reaction is _____.

(M = Molecular mass)

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

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

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

C. $\frac{M}{4}$

D. $\frac{M}{5}$

Answer: D

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

A. 1

B. 3

C. 5

D. 6

Answer: C

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33. Which orbital is progressively filled in lanthanides?

A. 4f

B. 5f

C. 3d

D. 4d

Answer: A

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34. In which of the lanthanide elements, 5d electrons does NOT shift to 4f orbitals?

A. Ce, Eu and Yb

B. La, Gd and Lu

C. Ce, Nd and Dy

D. Sm, Ho and Er

Answer: B

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35. Configuration of La^{+3} will be same as _____.

A. Ce^{+2}

B. Ce^{+3}

C. Ce^{+4}

D. Lu^{+3}

Answer: C

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36. Which of the following has the same observed and expected electronic configuration?

A. Ce

B. Pr

C. Ho

D. Gd

Answer: D

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37. The most stable state of Ce (Z = 58) is

A. $+4$

B. $+2$

C. $+1$

D. $+5$

Answer: A

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38. Among the following lanthanoid ions, the paramagnetic ion is

A. Ce^{4+}

B. Yb^{2+}

C. Lu^{3+}

D. Eu^{2+}

Answer: D

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39. La^{+3} and Lu^{+3} have their ionic radii 'a' and 'b' respectively, then lanthanide contraction will be equal to

A. x-y

B. y-x

C. x+y

D. none of these

Answer: A

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40. Across the lanthanide series, the basicity of the lanthanoid hydroxides:

A. increases

B. decreases

C. first increases and then decreases

D. first decreases and then increases

Answer: B

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41. The pair , that referred as 'chemical twins' is

A. Tc and Re

B. Zr and Ta

C. Mo and Hf

D. Ta and W

Answer: A

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42. In the periodic table actinons belong to

A. 4^{th} group and 6^{th} period

B. 4^{th} group and 4^{th} period

C. 3^{rd} group and 5^{th} period

D. 3^{rd} group and 7^{th} period

Answer: D

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43. Identify the INCORRECT statement.

A. Actinium (Z = 89) has no electron in 5f-orbital.

B. Neptunium (Z = 93) is a transuranic element.

C. Thorium (Z = 90) has one electron in 5f-orbital.

D. Americium (Z = 95) and curium (Z = 96) have half-filled 5f-orbital.

Answer: C

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44. Most common oxidation state of actinoids is .....

.

A. $+2$

B. $+3$

C. $+4$

D. $+5$

Answer: B

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45. Which of the following is FALSE regarding actinoids?

A. Actinoids show variable oxidation states due to the availability of 5f, 6d and 7s-orbitals.

B. Np and Pu exhibit $+7$ oxidation state.

C. Nobelium is very stable in $+2$ oxidation state due to f^7 configuration.

D. When the oxidation number increases to $+6$, the actinoid ions form oxygenated ions.

Answer: C

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46. The element has configuration of [Kr]$4d^7 5s^2$. The number of electrons present in its tripositive ion would be_____.

A. 45

B. 42

C. 43

D. 48

Answer: B

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47. Which of the following statement is INCORRECT?

A. The colour of Ni-DMG complex is due to d-d transition of electrons.

B. Aqueous manganate solution on electrolysis liberates hydrogen gas at cathode.

C. Fe^{2+} salts decolourize acidified $KMnO_4$ solution.

D. Fe^{2+} salts turn the colour of acidified $K_2Cr_2O_7$ solution to green.

Answer: A

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48. Which of the following statements is INCORRECT?

A. $La(OH)_3$ is less basic than $Lu(OH)_3$.

B. In lanthanoid series, ionic radius of $\ln^{3+}$ ions decreases as atomic number increases.

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

D. Atomic radii of Zr and Hf are same because of lanthanoid contraction.

Answer: A

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Competitive Thinking

1. General electronic configuration of transition metals is

A. $(n-1)d^{1-5}$

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

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

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

Answer: C

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2. Identify the transition element

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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3. Which of the following general configuration of outermost shell represents chromium [Cr's atomic number = 24]?

A. $d^5 s^1$

B. $d^6 s^0$

C. $d^4 s^2$

D. $d^3 s^2$

Answer: A

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4. The valence shell electronic configuration of Cr^{2+} ion is

A. $4s^0 3d^4$

B. $4s^2 3d^2$

C. $4s^2 3d^0$

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

Answer: A

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5. Electronic configurations of $Cu(Z = 29)$ is

A. [Ar] $3d^9 4s^2$

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

C. [Ar] $3d^5 4s^2$

D. [Ar] $3d^6 4s^2$

Answer: B

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6. Which of the following has completely filled d-orbital?

A. Sc

B. Mn

C. Zn

D. Cr

Answer: C

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7. The correct of decreasing second ionisation enthalpy of $Ti(22), V(23), Cr(24)$ and $Mn(25)$ is

A. $Mn > Cr > Ti > V$

B. $Ti > V > Cr > Mn$

C. $Cr > Mn > V > Ti$

D. $V > Mn > Cr > Ti$

Answer: C

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

A. 0

B. $+1$

C. $+2$

D. $+3$

Answer: C

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10. In acidic medium, H_2O_2 changes $Cr_2O_7^{-2}$ to CrO_5 which has two $(-O-O)$ bonds. Oxidation state of Cr in CrO_5 is

A. $+5$

B. $+3$

C. $+6$

D. -10

Answer: C

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11. Identify the oxidation states of titinium (Z=22) and copper (Z=29) in their colourless compounds.

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

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

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

D. Ti^{4+}, Cu^{2+}

Answer: C

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12. The aqueous solution containing which one of the following ions will be colourless

(Atomic number $Sc = 21, Fe = 26, Ri = 22, Mn = 25$)

A. Sc^{3+}

B. Fe^{2+}

C. Ti^{3+}

D. Mn^{2+}

Answer: A

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

A. orange-red

B. blue-green

C. yellow

D. violet

Answer: A

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

A. $TiCl_4$

B. $CrCl_3$

C. $ZnCl_2$

D. $CuCl$

Answer: B

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16. Which metal is used as a part of catalyst in Fischer-Tropschin method?

A. Mn

B. Co

C. V

D. Pt

Answer: B

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17. Which of the following ion is diamagnetic?

A. Sc^{3+}

B. V^{3+}

C. Ni^{2+}

D. Fe^{2+}

Answer: A

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18. Magnetic moments $2.84B.$ M is given by :

(At. nos. ni = 28, Ti = 22, Cr = 24, Co = 27).

A. Ni^{2+}

B. Ti^{3+}

C. Cr^{2+}

D. Co^{2+}

Answer: A

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19. Which of the following ion has the maximum theoretical magnetic moment?

A. Fe^{3+}

B. Cr^{3+}

C. Ti^{3+}

D. Co^{3+}

Answer: A

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

A. Interstitial compounds are much harder than the pure metal.

B. Transition metallic carbides are chemically reactive.

C. Transition metal hydrides are powerful reducing agents.

D. Interstitial compounds have higher melting points than the pure metal.

Answer: B

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21. The ore chromite is_____.

A. $FeCr_2O_4$

B. $CoCr_2O_3$

C. $CrFe_2O_4$

D. $FeCr_2O_3$

Answer: A

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22. 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 hydroxide

D. By the action of limestone

Answer: A

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23. Potassium dichromate is a good oxidising agent in acidic medium the oxidation state of chromium changes by

A. 2

B. 3

C. 4

D. 5

Answer: B

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24. Which one of the following statement is correct when SO_2 is passed through acidified $K_2Cr_2O_7$ solution?

A. $So_2$is reduced.

B. Green $Cr_2(SO_4)_3$ is formed.

C. The solution turns blue.

D. The solution is decolourized.

Answer: B

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25. The reaction of $K_2Cr_2O_7$ with NaCl and conc. H_2SO_4 gives_____.

A. $CrCl_3$

B. $CrOCl_2$

C. CrO_2Cl_2

D. Cr_2O_3

Answer: C

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26. $KMnO_4$ can be prepared from K_2MnO_4 as per the reaction

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

The reaction can go to completion by removing OH^- ions by adding.

A. HCl

B. KOH

C. CO_2

D. SO_2

Answer: C

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27. Upon heating poatssium permanganate, which of the following compounds is not obtained?

A. $\grave{O}_2$

B. MnO

C. MnO_2

D. Mn^{2+}

Answer: B

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28. $KMnO_4$ in basic medium is reduced to

A. K_2MnO_4

B. MnO_2

C. $Mn(OH)_2$

D. Mn^{2+}

Answer: B

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29. The number of moles of $KMnO_4$ reduced by $1\text{mol of}KI$ in alkaline medium is

A. one fifth

B. five

C. one

D. two

Answer: D

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30. When $KMnO_4$ is reduced with oxalic acid in acidic solution, the oxidation number of Mn changes from

A. 7 to 4

B. 6 to 4

C. 7 to 2

D. 4 to 2

Answer: C

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31. The reaction of aqueous $KMnO_4$ with H_2O_2 in acidic conditions gives_____.

A. Mn^{4+} andO_2

B. Mn^{2+} andO_2

C. Mn^{2+} andO_3

D. Mn^{4+} andMnO_2

Answer: B

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32. Name the gas that can readily decolourise acidified $KMnO_4$ solution:

A. SO_2

B. NO_2

C. P_2O_5

D. CO_2

Answer: A

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33. The colour and magnetic nature of mangante ion $\left(MnO_4^{2-}\right)$ is

A. green, paramagnetic

B. purple, diamagnetic

C. green, diamagnetic

D. purple, paramagnetic

Answer: A

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34. Solution of MnO_4^- is purple-coloured due to :

A. 3d-3d transition of electrons

B. 4f-4f transition of electrons

C. transfer of nagative charge

D. 5f-5f transition of electrons

Answer: C

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35. Potassium permanganate is used_____.

A. as Baeyer's reagent

B. in reduction

C. in the tanning of leather

D. in the manufacture of pigment

Answer: A

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36. Which of the following is Baeyer's reagent ?

A. alkaline $KMnO_4$

B. acidic $K_2Cr_2O_7$

C. alkaline $Na_2Cr_2O_7$

D. MnO_2

Answer: A

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37. Lanthanoids are

A. 14 elements in the sixth period (atomic no. = 58 to71) that are filling 4f sublevel

B. 14 elements in the seventh period (atomic no. = 58 to 71) that are filling 4f sublevel

C. 14 elements in the sixth period (atomic no. = 90 to 103) that are filling 4f sublevel

D. 14 elements in the seventh period (atomic no. = 90 to 103) that are filling 4f sublevel

Answer: A

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38. The atomic number of Gadolinium (Gd) is 64. The CORRECT electronic configuration of Gd^{3+} ion is_____.

A. [Xe] $4f^7$

B. [Kr] $4f^7$

C. [Xe] $4f^{13}$

D. [Kr]$4f^{1}$

Answer: A

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39. Gadolinium belongsd to 4f series. It's atomic number is 64. which of the following is the correct electronic configuration of gadolinium ?

A. [Xe] $4f^{7}5d^{1}6s^{2}$

B. [Xe] $4f^{6}5d^{2}6s^{2}$

C. [Xe] $4f^8 6d^2$

D. [Xe] $4f^9 5s^1$

Answer: A

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40. Which of the following oxidation states is the most common among the lanthanoids ?

A. 4

B. 2

C. 5

D. 3

Answer: D

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41. Which is the oxidation state generally found in lanthanides?

A. 4

B. 2

C. 5

D. 3

Answer: D

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42. Which one of the following lanthanide ions does NOT exhibit paramagnetism?

A. Lu^{3+}

B. Ce^{3+}

C. Eu^{3+}

D. Yb^{3+}

Answer: A

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43. Which of the following lanthanoids ions is diamagnetic?

A. Ce^{2+}

B. Sm^{2+}

C. Eu^{2+}

D. Yb^{2+}

Answer: D

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

A. $\ln S$

B. $\ln S_3$

C. $\ln_3 S_2$

D. $\ln_2 S_3$

Answer: D

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45. Reason of lanthanoid contraction is

A. negligible screening effect of 'f' orbitals

B. increasing nuclear charge

C. decreasing nuclear charge

D. decreasing screening effect

Answer: A

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46. In lanthanoids , atomic radius decreases as atomic no. increases because of_____.

A. f-f transition

B. lanthanide contraction

C. unpaired electrons in f orbital

D. unpaired electrons in s orbital

Answer: B

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47. The most basic hydroxide from the following is

A. $Pr(OH)_3$ (Z=59)

B. $Sm(OH)_3$ (Z=62)

C. $Ho(OH)_3$ (Z=67)

D. $La(OH)_3$ (Z=57)

Answer: D

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48. 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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49. 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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50. 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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51. Which of the following statement(s) is/are incorrect for pair of element Zr-Hf ?

A. Both possess same number of valence electrons.

B. Both have identical atomic sizes.

C. Both have almost identical ionic radii.

D. Both of these belong to same period of periodic table.

Answer: D

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52. Which of the following is NOT an actinide?

A. Curium

B. Plutonium

C. Uranium

D. Terbium

Answer: D

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53. The actinoids exhibit more number of oxidation states in general than the lanthanoids. This is because

A. the 5f orbitals are more buried than the 4f orbitals

B. there is similarity between 4f and 5f orbitals in their angular part of the wave function

C. the actinoids are more reactive than the lanthanoids

D. the 5f orbitals extend further from the nucleus than the 4f orbitals

Answer: D

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54. The reason for greater range of oxidation state in actinoids is attributed to:

A. actinoid contraction

B. 5f, 6d and 7s levels having comparable energies

C. 4f and 5d levels being close in energies

D. the radioactive nature of actinoids

Answer: B

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55. The only radioactive element among the lanthanoids is

A. gadolinium

B. holmium

C. promethium

D. neodymium

Answer: C

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56. 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 orbitals.

C. The chemistry of various lanthanoids is very similar.

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

Answer: D

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57. Which is not the correct statement about the chemistry of 3d and 4f series elements

A. 3d elements show more oxidation states than 4f series elements.

B. The energy difference between 3d and 4s orbitals is very little.

C. Europium (II) is more stable than Ce(II).

D. The paramagnetic character in 3d series elements increases from scandium to copper.

Answer: D

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58. An element in $+2$ oxidation state has the electronic configuration [Ar] $3d^5$. Its atomic number is_____.

A. 24

B. 23

C. 22

D. 25

Answer: D

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59. In context with the transition element, which of the following statement is incorrect?

A. In addition to the normal oxidation states, the zero oxidation state is also shown by these elements in complexes.

B. In the highest oxidation states, the transition metal show basic character and form cationic complexes.

C. In the highest oxidation states of the first five transition elements (Sc to Mn), all the 4s and

3d electrons are used for bonding.

D. Once the d^5 configuration is exceeded, the tendency to involve all the 3d electrons in bonding decreases.

Answer: B

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60. Iron exhibits $+2$ and $+3$ oxidation states. Which of the following statements about iron is incorrect?

A. Ferrous oxide is more basic in nature than the ferric oxide.

B. Ferrous compounds are relatively more ionic than the corresponding ferric compounds.

C. Ferrous compounds are less volatile than the corresponding ferric compounds.

D. Ferrous compounds are more easily hydrolysed than the corresponding ferric compounds.

Answer: D

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61. The basic character of the transition metal monoxide follows the order

A. $TiO > VO > CrO > FeO$

B. $VO > CrO > TiO > FeO$

C. $CrO > VO > FeO > TiO$

D. $TiO > FeO > VO > CrO$

Answer: A

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62. All the following statements about the transitional elements are true except that

A. all of the transitional elements are predominantly metallic

B. in aqueous solution many of their simple ions are coloured

C. most of the transitional elements show pronounced catalytic activity

D. most of the transitional elements show only one valence state

Answer: D

63. Which statement is NOT correct?

A. Potassium permanganate is a powerful oxidising substance.

B. Potassium permanganate is a weaker oxidising substance than potassium dichromate.

C. Potassium permanganate is a stronger oxidising substance than potassium

dichromate.

D. Potassium dichromate oxidises a secondary alcohol into a ketone.

Answer: B

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64. 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 Ln (III) decrease in general with increasing atomic number.

C. Ln (III) compounds are generally colourless.

D. Ln (III) hydroxides are mainly basic in character.

Answer: C

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65. 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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66. Which of the following is a transition element as per the ground state electronic configuration?

A. Os

B. Cd

C. Zn

D. Hg

Answer: A

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67. Which of the following oxide has the maximum basicity?

A. La_2O_3

B. Pr_2O_3

C. Sm_2O_3

D. Gd_2O_3

Answer: A

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68. Which one of the following statements related to lanthanons is incorrect ?

A. Ce $(+4)$ solutions are widely used as oxidizing agent in volumetric analysis.

B. Europium shows $+2$ oxidation state.

C. The basicity decreases as the ionic radius decreases from Pr to Lu.

D. All the lanthanoids are much more reactive than aluminium.

Answer: D

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69. Sodium salt of an organic acid 'X' produces effervescence with conc. H_2SO_4. 'X' reacts with the acidified aqueous $CaCl_2$ solution to give a white precipitate which decolourises acidic solution of $KMnO_4$ ' X ' is

A. C_6H_5COONa

B. $HCOONa$

C. CH_3COONa

D. $Na_2C_2O_4$

Answer: D

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Evaluation Test

1. In the transition element the incoming electron occupies $[n-1]$ d sublevel in preference to

A. np

B. ns

C. (n-1)p

D. (n-1)s

Answer: A

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2. If M is the molecular weight of $KMnO_4$, its equivalent weight will be when it is converted into K_2MnO_4

A. M

B. M/3

C. M/5

D. M/7

Answer: A

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3. Which one of the following d-block elements has half-filled penultimate d-subshell as well as half-filled valence s-subshell

A. Cr

B. Mn

C. Sc

D. Cu

Answer: A

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4. The titanium (atomic number 22) compound that does not exist is

A. TiO

B. TiO_2

C. K_2TiF_6

D. K_2TiO_4

Answer: D

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5. Potassium permanganate works as oxidising agent both in acidic and basic medium. In bot state product obtained by $KMnO_4$ is respectively

A. MnO_2^{-} and Mn^{3+}

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

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

D. Mn^{2+} and MnO_2

Answer: D

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6. Which of the following weighs less when weighed in magnetic field?

A. VCl_3

B. $ScCl_3$

C. $TiCl_3$

D. $FeCl_3$

Answer: B

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7. $KMnO_4$ reacts with ferrous ammonium sulphate according to the equation $MnO_4^- + 5Fe^{2+} + 8H^+ \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$, here $10ml$ of $0.1MKMnO_4$ is equivalent to

A. 20 mL of 0.1M $FeSO_4$

B. 30 mL of 0.1M $FeSO_4$

C. 40 mL of 0.1M $FeSO_4$

D. 50 mL of 0.1M $FeSO_4$

Answer: D

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8. Among the following, densest transition metal is_____.

A. Au

B. Ag

C. Os

D. Sc

Answer: C

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9. Which of the following is NOT oxidized by O_3?

A. KI

B. $FeSO_4$

C. $KMnO_4$

D. K_2MnO_4

Answer: C

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10. Which of the following ions has the least magnetic moment?

A. Cu^{+2}

B. Ni^{+2}

C. Co^{+2}

D. Fe^{+2}

Answer: A

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11. The maximum oxidation state exhibited by actinide ions is

A. $+3$

B. $+4$

C. $+5$

D. $+7$

Answer: D

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12. Which of the following is NOT inner transition element?

A. [Xe] $4f^3 5d^0 6s^2$

B. [Rn] $5f^4 6d^1 7s^2$

C. [Xe] $4f^7 5d^1 6s^2$

D. [Xe] $4f^0 5d^1 6s^2$

Answer: D

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13. Which of the following statement is TRUE?

A. Actinoids form oxocations while lanthanoids cannot form oxocations.

B. Hydroxides of actinoids are less basic than hydroxides of lanthanoides.

C. The extent of actinoid contraction is relatively less as compared to lanthanoid contraction.

D. Actinoids show less tendency to form complexes as compared to lanthanoids.

Answer: A

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14. Statement I: Nickel(II) compounds are thermodynamically less stable than platinum (II) compounds.

Statement II: Nickel(IV) compounds are

thermodynamically more stable than platinum(IV) compounds.

A. Statement I and II are correct.

B. Statement I and II are incorrect.

C. Statement I is correct but statement II is incorrect.

D. Statement I is incorrect but statement II is correct.

Answer: B

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15. Which of the following transition metal ion catalyses the reaction between iodide and persulphate ions?

A. Mn(IV)

B. Co(III)

C. Fe(III)

D. V(V)

Answer: C

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