CHEMISTRY

FOR IIT JEE ASPIRANTS OF CLASS 12 FOR CHEMISTRY

D BLOCK & TRANSITION ELEMENTS

Examples

1. Why is the E^{Θ} value for the Mn^{3+}/Mn^{2+} couple much postive than for Cr^{3+}/Cr^{2+} or Fe^{3+}/Fe^{2+}? Example

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2. Among $TiF_6^{2-}, CoF_6^{3-}, Cu_2C1_2$ and $NiC1_4^{2-}$ (At. No. $Ti=22, Co=27, Cu=29, Ni=28$), the colourless species are -

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3. On the basis of trends in the properties of the $3d$-series elements , suggested possible M^{2+} aqua ions for use as reducing agents , and write a balanced chemical equation for the reaction of one of those ions with O_2 in acidic solution.

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4. Which of the following is true for the species having $3d^4$ configuration?

(A) Cr^{2+} is reducing in nature.

(B) Mn^{3+} is oxidising in nature.

(C) Both (A) and (B)

(D) None of these

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5. Which of the following increasing order of oxidising power is correct for the following species?

$VO_2^+, MnO_4^-, Cr_2O_7^{2-}$

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

(A) Transition metals and many of their compounds show paramagnetic behaviour.

(B) The enthapies of atomisation of the transition metals are high

(B) The transition metals generally form coloured compounds

(D) Transition metals and their many compounds act as good catalyst.

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7. Statement-1 : The number of paired electrons in the following gaseouos ions Mn^{3+}, Cr^{3+}, V^{3+} and Ti^{3+} are $4, 3, 2$ and 1 respectively.

Statement-2 : Cr^{3+} is most stable in aqueous solution among these ions.

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

(B) Statement-1 is True, Statement-2 is True: Statement-2 is NOT a correct

explanation for Statement-1.

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

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8. S_1 interstitial compound have high melting points, higher than those of pure metals.

S_2 Permanganate titration in presence of hydrochloric acid are unsatisfactory

S_3: $KmnO_4$ does not act as an oxidising agent in strong alkaline medium.

S_4 : $KMnO_4$ On heating in a current of H_2 gives MnO

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9. What is the composition of mischmetal alloy and what are it's uses?

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Level I

1. Element with atomic number 111 might, belong to the following group

A. Chromium

B. Scandium

C. Copper

D. Titanium

Answer: C

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2. The following belongs to d-block but it sis not a transition element

A. Mn

B. Fe

C. Zn

D. Cr

Answer: C

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3. Which set of element is transitional in character

i) Fe, Co, Ni , ii) Ru, Rh, Pd , iii) Os, Ir, Pt

The correct statement is/are :

A. i,ii

B. iii,i

C. iii,ii

D. i,ii,iii

Answer: D

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4. Which of the following set of element not belongs to transitional elements?

A. Fe, Co , Ni

B. Cu, Ag, Au

C. Ti, Zr, Hf

D. Ga, In, Tl

Answer: D

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

A. np

B. ns

C. $[n-1]d$

D. $[n+1]d$

Answer: A

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6. Catalytic activity of transition elements and their compounds is due to their

A. Small size

B. Vacant d-orbitals

C. Higher densities

D. Colour

Answer: B

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7. Transition metals are good electrical conductors because

A. They are metals

B. They are solids

C. They have free electrons in outer energy levels

D. They are hard.

Answer: C

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8. Which of the following is a transition element

A. Al

B. As

C. Ni

D. Pb

Answer: C

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9. The ground state electronic configuration of chromium is against

A. Hund's rule

B. Pauli's principle

C. Auf-bau principle

D. Boyle principle

Answer: C

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10. The following has pseudo-inert gas configuration in the $(n-1)$ shell.

A. Typical transition elements

B. Zinc group elements

C. Both

D. Neither

Answer: C

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

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

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

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

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

Answer: B

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12. Which one of the following ions has same numbr of unpaired electrons as those present in V^{+3} ions?

A. Fe^{+3}

B. Ni^{+2}

C. Mn^{+2}

D. Cr^{+3}

Answer: B

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13. The electron which take part in order to exhibit variable oxidation states by transition metals are

A. ns only

B. $(n-1)d$ only

C. ns and $(n-1)d$ but not np

D. $(n-1)d$ and np only but not ns

Answer: C

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

A. Zn

B. Fe

C. Hg

D. Au

Answer: B

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15. In the following pair of d-block elements, the first number is a liquid at room temperature and the second member is mostly available in the earth's crust. The pair is

A. Hg, Fe

B. Hg, Tc

C. Hg, Zn

D. Hg, Au

Answer: A

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16. Cementite is:

A. Interstitial compound of iron and carbon

B. An alloy of Fe and Cr

C. A compound resembling cement

D. An ore of ion

Answer: A

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17.

$(\text{List -I, List-II}), ((\text{A}) \text{ Rutile}, (i) ZnCO_3), (\text{B}) \text{ Chromite}, (\text{ii}) \text{ MnO\_(2)}), ((\text{(}$

A. A-iv, B-iii, C-ii, D-i

B. A-I, B-ii, C-iii, D-iv

C. A-I, B-iii, C-iv, D-i

D. A-iv, B-I, C-ii, D-ii

Answer: A

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18. Which element exhibits highest density in 3d series

A. Sc

B. Cr

C. Zn

D. Cu

Answer: D

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19. The maximum and minimum melting points of first and second transition series respectively are observed with

A. Cr and Zn

B. Cr and Hg

C. V and Cd

D. Cr and Cd

Answer: D

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

A. Cu

B. Mn

C. Zn

D. W

Answer: D

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21. The property, which is not charactestics of transition metals

A. varible oxidation states

B. tendency to form complexes

C. formation of coloured compounds

D. They are usually diamagnetic

Answer: D

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22. The pair that has the greatest malleability and ductility property is

A. Na, K

B. Pb, Sn

C. Zn, Mn

D. Cu, Au

Answer: D

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23. The metal that has the lowest boiling point among the following is

A. Ti

B. Zn

C. Cu

D. Fe

Answer: B

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24. Oxide of metal cation which is not amphoteric ?

A. Al^{3+}

B. Cr^{3+}

C. Fe^{3+}

D. Zn^{2+}

Answer: C

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25. The wrong statement regarding transition metals among the following is:

A. 4s electron penetrates towards the nucleus more than 3d electron

B. Atomic radii of transitions metals increase in atomic number because of poor shielding of nuclear attraction by $(n-1)d$ electrons

C. second and third transition series elements have nearly the same size

D. their densities are higher and densities of the 5d series elementrs are higher than those of 4d series elements

Answer: B

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26. Which of the following statement is incorrect?

A. Mercurous ions exist as Hg^+

B. Mercurous ion is diamagnetic and exist as dimer Hg_2^{2+}

C. Mercurous ion is colourless

D. There is a covalent bond between two Hg^+ ions

Answer: A

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27. The IP of Zr is $674kJ/\text{mole}$. The IP of Hf is

A. $656kJ$

B. $760kJ$

C. $616kJ$

D. $631kJ$

Answer: C

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28. The following does not show variable valency

A. Mn

B. Fe

C. Zn

D. Cr

Answer: B

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29. Element which can show $+2,\ +3,\ +4,\ +6$ and $+7$ oxidation states is

A. Cr

B. Mn

C. Co

D. V

Answer: C

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30. Maximum oxdiation state exhibited by Osmium is

A. $+8$

B. $+7$

C. $+6$

D. $+5$

Answer: B

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31. Zn and Cd metals do not show varible valency because:

A. They have only two electrons in the outermost subshells

B. their d-subshells are completely filled

C. their d-subshells are partially filled

D. they are relative soft metals

Answer: B

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32. Each of the following ion contains vanadium the +5 oxidation state except

A. VO_2^+

B. $CV(OH)_4^+$

C. VO^{2+}

D. $[VO_3OH]^{2-}$

Answer: C

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33. Which of the following pair of elements have same radii?

A. Zr,Hf

B. Sc,Y

C. La,Ac

D. Zn,Cd

Answer: A

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34. The radii (metallic) of Fe, CO and Ni are nearly same.

This is due to:

A. lanthanide contraction

B. decrease in radii due to increase in effective nuclear charge is compensated by incease in radii due to increase in screening effect

C. decrease in radii due to increasing screeing effect is compensated by increase in size due to increasing effective nuclear charge

D. atomic radii do not remain constant but decrease in a normal gradation

Answer: B

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35. Which of the following ion is coloured in its aqueous solution?

A. Cd^{+2}

B. Zn^{+2}

C. Sc^{+3}

D. Ti^{+3}

Answer: D

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36. Transition metals are coloured due to the following electronic transition

A. d-s

B. d-d

C. s-p

D. f-s

Answer: B

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37. In which pair, both ions are coloured in aqueous medium

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

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

C. Ti^{+3}, Co^{+3}

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

Answer: C

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38. MnO_4^- is intense pint colour, though Mn is $(+7)$ oxidation state, It is due to

A. oxygen gives colour to it

B. charge transfer when Mn gives its electron to oxygen

C. Charge transfer when oxygen gives its electrons

D. None of these

Answer: C

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

A. charge transfer

B. d-d transition

C. half-filled d-sub-shells

D. increasing number of unpaired electrons

Answer: A

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40. Which is not true statement?

A. Ions of d-block element are coloured due to d-d transition.

B. Ions of f-block element are coloured due to f-f transition.

C. $\left[Sc(H_2O_6)_6\right]^{3+}$ and $\left[Ti(H_2O)_6\right]^{4+}$ are coloured complexes

D. Cu^+ is colourless ion.

Answer: C

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41. The catalyst used in the oxidation of 1° alcohol to aldehydes

A. $FeSO_4 + H_2O_2$

B. $Fe + Mo$

C. $Pt + Ir$

D. Raney Ni

Answer: A

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42. Name the catalyst and promoter in the Haber's process for the manufacture of ammonia.

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43. In a transition series, as the atomic number increases, paramagnetism

A. increases gradually

B. decreases gradually

C. first increases to a maximum and then decreases

D. first decreases to a minimum and then increases

Answer: C

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44. Paramagnetism is not exhibited by

A. $CuSO_4.5H_2O$

B. $CuCl_2.5H_2O$

C. CuI

D. $NiSO_4.6H_2O$

Answer: C

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45. The magnetic moment of the complex $\left[Ti(H_2O)_6\right]^{3+}$ is

A. $3.87BM$

B. $1.73BM$

C. $2.84BM$

D. $5.87BM$

Answer: B

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46. The ratio of magnetic moment of Fe(III) and Co(II) is :

A. $\sqrt{5}:\sqrt{7}$

B. $\sqrt{35}:\sqrt{15}$

C. $7:3$

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

Answer: B

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47. The ion having maximum magnetic moment is

A. Co^{+3}

B. Cr^{+3}

C. Ni^{+2}

D. Cu^{+1}

Answer: A

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48. The following metal shows ferromagnetic nature

A. Co

B. Cr

C. Cu

D. Mn

Answer: A

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49. For a paramagnetic substance, the field strength of substance (B) and applied field strength (H) are related as

A. $B = H$

B. $B < H$

C. $B > H$

D. $B > > H$

Answer: C

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50. Which of the following element form interstitial compounds?

A. Alkali metals

B. Transition metals

C. Halogens

D. Noble gases

Answer: B

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51. Metal (s) which does/do not form amalgam is/are :

A. Fe

B. Zn

C. Ni

D. Au

Answer: A

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52. One of the constituents of an amalgam is

A. Fe

B. Hg

C. Au

D. Os

Answer: B

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53. The alloy used in the reduction of nitrites to ammonia is

A. Gun metal

B. Devarda's alloy

C. Solder metal

D. Bronze

Answer: B

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54. Which of the following is not an amphoteric oxide?

A. HgO

B. PbO_2

C. ZnO

D. SnO_2

Answer: A

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55. Which oxide of Mn is acidic in nature?

A. MnO

B. Mn_2O_7

C. Mn_2O_3

D. MnO_2

Answer: B

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56. Which species is not available in Fenton's reagent?

A. Fe^{+2}

B. HO

C. HO^{-}

D. HO^{+}

Answer: D

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

A. NO_3^- ions is reduced in preference to hydronium ion

B. Conc. HNO_3 is a weaker acid than conc. H_2SO_4 and conc HCl

C. Conc. HNO_3 acts as a reducing agent

D. Zinc is more reactive than hydrogen

Answer: A

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Level Ii

1. Maximum IP value in 3d series is

A. Zn

B. Cr

C. Cu

D. V

Answer: A

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2. The second IP of Cu is very high due to the configuration of Cu^+ is

A. $3d^5$

B. $3d^0$

C. $3d^{10}$

D. $3d^9$

Answer: C

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3. Variable valency of transition element is on account of

A. incomplete p-orbitals

B. incomplete d-orbitals

C. completely filled d-orbitals

D. completely filled d-orbitals

Answer: B

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4. Transitions elements show generally positive oxidation state due to

A. Large atomic size

B. low ionization energy

C. low electronegativity

D. high electronegativity

Answer: B

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5. Which one of the transition metal ions have no unpaired electron

A. Ti^{+4}

B. V^{+4}

C. V^{+3}

D. Cr^{+3}

Answer: A

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6. The maximum oxidation state of ruthernium is

A. $+6$

B. $+7$

C. $+8$

D. $+5$

Answer: C

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7. Which of the following is a correct statement

A. Aqueous solutions of Cu^{+} and Zn^{+2} are colourless

B. Aqueous solutions of Cu^{+2} and Zn^{+2} are colourless

C. Aqueous solutions of Fe^{+2} is given in colour

D. Aqueous solutions of MnO_4^- is colourlesss

Answer: A

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8. The metal ion which does not form coloured compound is

A. Chromium

B. Iron

C. Zinc

D. Manganese

Answer: C

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9. Mn^{2+}, Mn^{+3}, Mn^{+6} have the colours

A. pink, blue and green

B. green, blue and yellow

C. blue, yellow and gree

D. yellow, blue and green

Answer: A

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

The number of unpaired electrons present in the ions is

A. 1

B. 4

C. 3

D. 5

Answer: C

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11. Transition metals are often paramagnetic due to

A. high melting point and boiling point

B. the presence of vacant orbitals

C. the presence of unpaired electrons

D. mallebility and ductility

Answer: C

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12. Match the following.

Set -I	Set -II
A) Ferromagnetism	1) $9.273 \times 10^{-24} J.Tesla^{-1}$
B) Paramagnetism	2) Fe, Co, Ni
C) Diamagnetism	3) $Cr^{2+}, Fe^{3+}, Mn^{2+}$
D) Bohr Magneton	4) Zn^{+2}, Cu^{+}, Sc^{+3}

A.

A	B	C	D
4	2	3	1

B.

A	B	C	D
2	3	4	1

C.

A	B	C	D
1	2	3	4

D.

A	B	C	D
3	1	2	4

Answer: B

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13. Match the following.

Set -I	Set -II
A) Sc^{3+}	1) 5.92 B.M
B) V^{2+}	2) 1.73 B.M.
C) Fe^{3+}	3) Zero.
D) Cu^{2+}	4) 3.87 B.M

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

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

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

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

Answer: A

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Level Iii

1. The atomic numbe of the element having magnetic numbe equal to $1.7BM$ in its $+2$ oxidation state is

A. 29

B. 25

C. 24

D. 30

Answer: A

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2. Atomic number of a transition metal is 25 then its magnetic moment in its +3 oxidation state is

A. $1.73BM$

B. $2.84BM$

C. $4.9BM$

D. $5.9BM$

Answer: C

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3. Find the correct statement

(i) Magnetic moment Mn^{2+} ions is $\sqrt{35}$

(ii) 1 Bohr Magneton $= 9.273 \times 10^{-24} J.\ \text{Tesla}^{-1}$

A. Only i is correct

B. Only ii is correct

C. Only i & iii are correct

D. All are correct

Answer: C

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4. In the presence of strong electrical field, the following set of orbitals are not degenerate

A. $3d_{xy}$ and $3d_{z^2}$

B. $3d_{xy}$ and $3d_{yz}$

C. $3d_{xy}$, $3d_{yz}$ and $3d_{zx}$

D. $3d_{x^2-y^2}$ and $3d_{z^2}$

Answer: A

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5. Which transition metal is known as stratagic or Wonder metal?

A. Tungsten

B. Platinum

C. Iron

D. Titanium

Answer: D

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6. 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. Vandium $(Z = 23)$

B. Chromium $(Z = 24)$

C. Manganese $(Z = 25)$

D. Iron $(Z = 26)$

Answer: C

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7. Many transition metals from intersitial compounds. The characeristics of these intersitial compounds are

I) They have low melting points

II) They are very hard

III) They retain metallic conductivity

IV) They are chemically more reactive than the pure metals.

A. II, III only correct

B. I, III only correct

C. II, IV only correct

D. IV only correct

Answer: A

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8. Which of the following oxides compound Mn shows maximum radius?

A. V_2O_5

B. MnO

C. Cr_2O_3

D. MnO_2

Answer: A

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9. In which of the following compound Mn shows maximum radius?

A. MnO_2

B. $KMnO_4$

C. MnO

D. $K_2\left[Mn(CN)_6\right]$

Answer: C

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10. In Nessler's reagent, the active ion is

A. Hg^{+}

B. Hg^{2+}

C. Hg_2^{2-}

D. HgI_4^{2-}

Answer: D

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11. Sodium chromate on treatment with lead acetate gives a precipitate. This precipitate is dried and the solid is used as a pigment for road sign and markings. The solid is known as

A. White lead

B. Chrome green

C. Chrome yellow

D. Red lead

Answer: C

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12. Gold dissolves in aqua regia forming

A. Auric chloride

B. Aurous chloride

C. Chloroauric acid

D. Aurous nitrate

Answer: C

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13. Which of the following sulphides is yellow in colour?

A. ZnS

B. NiS

C. CdS

D. MgS

Answer: C

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14. Which of the following are correct about Zn,Cd,Hg

I) They exhibit enthalpy of atomisation as the d-subshell is full

II) Zn,Cd do not show variable oxidation states, Hg can show +1,+2 states

III) Compounds of Zn, Cd, Hg are paramagnetic

IV) They are soft metals

A. I, II, III

B. I, III

C. II. IV

D. IV only

Answer: C

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15. The oxoanion which contains all equivalent M-O bond is

$I) CrO_4^{2-} \quad II) MnO_4^{2-} \quad III) Cr_2O_7^{2-}$

A. III only

B. I, II, III only

C. I, II only

D. I only

Answer: C

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16. 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 element 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 element (Sc to Mn), all the $4s$ and $3d$ electrons are used for bonding

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

Answer: B

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

A. Ferrous compounds are relatively more ionic than the corresponding Ferric compounds

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

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

D. Ferrous oxide is more basci in nature than the ferric oxide.

Answer: C

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18. The non transition metal present in German silver is

A. Cu

B. Zn

C. Ni

D. Pb

Answer: B

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19. Transition metal present in the alloy Gun metal is

A. Ni

B. Zn

C. Sn

D. Cu

Answer: D

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20. Which one of the following does not contain zinc?

A. Brass

B. German Silver

C. Bronze

D. Bell metal

Answer: D

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21. Which of the following s a consitutent of lithopone

A. $ZnSO_4$

B. ZnS

C. $ZnCl_2$

D. ZnO

Answer: B

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22. Which of the following factors may be regarded as the main cause of lanthanide contraction?

A. poor shielding of one of 4f electrons by another in the subsshell

B. effective shielding of one of 4f electron by another in the subshell

C. poor shielding of 5d electron by 4f electrons

D. poor shielding of 4f electron by 5d electron

Answer: A

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23. The correct order of $E^{\circ}_{M^{2+}/M}$ Values with negative sign for the four successive elements Cr, Mn, Fe and Co is:

A. $Cr > Mn > Fe > Co$

B. $Mn > Cr > Fe > Co$

C. $Cr > Fe > Mn > Co$

D. $Fe > Mn > Cr > Co$

Answer: A

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

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

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

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

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

Answer: A

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25. Percentage of Cu is minimum in

A. Brass

B. Bronze

C. Duralumin

D. Gun mental

Answer: B

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26. Four successive members of first row transition element are listed belw. Which one of them is expected to have highest $E_{\frac{M^{3+}}{(M^{2+})^{\ominus}}}$ value?

A. $Cr(Z=24)$

B. $Mn(Z=25)$

C. $Fe(Z = 26)$

D. $Co(Z = 27)$

Answer: D

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27. Chemically philosopher of wool is

A. ZnO

B. BaO

C. $HgCl_2$

D. $HgCl_2$

Answer: C

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28. Mercury is transported in metal containers made of

A. Ag

B. Pb, Sn

C. Al

D. Fe

Answer: C

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29. Which of the following is arranged in order of incresing melting point ?

A. $Zn < Cu < Ni < Fe$

B. $Fe < Ni < Cu < Zn$

C. $Ni < Fe < Zn < Cu$

D. $Cu < Zn < Fe < Ni$

Answer: D

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30. $CuSO_4$ solution + lime is called:

A. Luca's reagent

B. Bafored's reagent

C. Fehling solution

D. Bordeauxn mixture

Answer: D

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31. Metal used for making joints in jewellery is

A. Zn

B. Cu

C. Ag

D. Cd

Answer: D

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32. Which two sets of reactants best represent the amphoteric character of $Zn(OH)_2$?

Set 1: $Zn(OH)_2 \& OH^-(aq)$

Set 2: $Zn(OH)_2(s) \& H_2O(l)$

Set 3: $Zn(OH)_2(s) \& H^+(aq)$

Set 4: $Zn(OH)_2(s) \& NH_3(aq)$

A. 1 and 2

B. 1 and 3

C. 2 and 4

D. 3 and 4

Answer: B

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33. The compound in which nickel has the lower oxidation states is :

A. $Ni(CO)_4$

B. $(CH_2COO)_2Ni$

C. NiO

D. $\left[NiCl_2(PPh_3)_2\right]$

Answer: A

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34. Which of the following electronic configruation would be associated with the highest magnetic moment

A. $[Ar]3d^8$

B. $[Ar]3d^3$

C. $[Ar]3d^6$

D. $[Ar]3d^7$

Answer: C

Watch Video Solution

35. The correct statement about iron includes

(I) the oxidation state of iorn is $+6$ in K_2FeO_4

(II) that the iron shows $+2$ oxidation state with 6 electron in the 3d orbitals

(III) the common oxidation state of iron is $+3$ with five unpaired electron in the 3d orbital

A. I,II,III

B. I, II only

C. II,III only

D. I only

Answer: A

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36. Interstitial compounds are formed when small atoms are trapped inside the crystal lattice of metals. Which of the following are the characteristic properties of interstitial compounds?

I. They have high melting points in comparison to pure metals.

II. They are very hard.

III. They retain metallic conductivity.

IV. They are chemically very reactive.

A. I, II and III only

B. I and III only

C. II and IV only

D. IV only

Answer: A

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37. Tc the element below Mn in the periodic table, would be expected to have high values for its :

(I) boiling point , (II) melting point

(III) density

A. I, II and III

B. I and II only

C. II and III only

D. I only

Answer: A

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38. The transition metals exhibit higher enthalphies of atomisation due to :

A. their ability of show variable oxidation states

B. the presence of incompletely filled d- subshell

C. their ability to exist in the solid state with unpaired electron

D. strong interatomic interactions aries because of having large number of unpaired electrons in their atoms.

Answer: D

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39. Spiegeleisen is an alloy of

A. $Cu + Zn + Ni$

B. $Ni + Cr$

C. $Mn + Fe + C$

D. $Fe + Cr + Ni$

Answer: C

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40. FeI_3 does not exist because:

A. of large size of Fe

B. Fe^{3+} oxidises I^- to I_2

C. of low lattice energy

D. iodine is not highly electronegative enough to oxidise Fe to Fe^{3+}

Answer: B

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41. Which metal has the lowest melting point?

A. W

B. Cu

C. Au

D. Ag

Answer: D

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42. The atomic numbers of Ti, B, Cr and Mn are respectively 22, 23, 24 and 25. Which one of these may be expected to have the highest second ionisation enthalpy?

A. Ti

B. Cr

C. V

D. Mn

Answer: B

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43. False statement about the trent in oxidation states of transition element is :

A. There exists a general trend of lesser number of oxidation states at each end of the series and higher number in the middle

B. There is reduced tendency of higher oxidation states towards the end of the series

C. The stability of the higher oxidation states decreases going down the group

D. the highest oxidation stetes are oftern stabilized in the oxides and fluoride compounds.

Answer: C

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Level Iv

1. Electronic confriguration of a transition element X in +3 oxidation states is $[Ar]3d^5$.

What is its atomic number?

A. 25

B. 26

C. 27

D. 24

Answer: B

Watch Video Solution

2. The electronic configurationo of Cu(II) is $3d^9$ whereas that of Cu(I) is $3d^{10}$. Which of the following is correct ?

A. Cu(II) is more stable

B. Cu(II) is less stable

C. $Cu(I)$ and $Cu(II)$ are equally stable

D. Cu(I) and Cu(II) are equally stable

Answer: A

Watch Video Solution

3. Which of the following reactions are disproportionation reactions?

$(A) \quad Cu^+ \rightarrow Cu^{2+} + Cu$

$(B) \quad 3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

$(C) \quad 2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$

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

A. a,b

B. a,b,c

C. b,c,d

D. a,d

Answer: A

Watch Video Solution

4. Which of the following statements is not correct?

A. Copper liberates hydrogen from acids

B. In its higher oxidation stats, Mn forms stable compounds with oxygen anf fluorine

C. Mn^{3+} and Co^{3+} are reducing agents in aqueous solution

D. Ti^{2+} and Cr^{2+} are reducing agents in aqueous solution

Answer: A

Watch Video Solution

5. The highest Manganese fluoride is

A. MnF_4

B. MnF_7

C. MnF_3

D. MnF_2

Answer: A

Watch Video Solution

6. Which one of the following is lest stable?

A. VF_2

B. VCl_2

C. VBr_2

D. Vi_2

Answer: A

Watch Video Solution

7. Ferrates $[FeO_4]^{2-}$ are formed in alkaline media but they readily decomposes to

A. Fe_2O_3 and O_2

B. FeO and Fe_2O_3

C. Fe_2O_3 and Fe_3O_4

D. FeO and O_2

Answer: A

Watch Video Solution

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

A. much larger third ionisation energy of Mn

B. Much smaller third ionisation energy of Mn

C. Mn^{3+} is most stable

D. very low enthalpy of atomisation value of Mn among the $3d$ series elements

Answer: A

Watch Video Solution

9. Which one of the following catalyses the reaction between iodide and persulphate ions $\left(2I^- + S_2O_8^{2-} \rightarrow I_2 + 2SO_4^{2-}\right)$

A. Fe(III)

B. Fe(II)

C. Fe(0)

D. Cr(III)

Answer: A

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10. Which one of the following does not exist?

A. ScO

B. CrO

C. MnO

D. NiO

Answer: A

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11. For Mn^{3+}/Mn^{2+} system, the E^0 values for some metals are as follows:

$Cr^{3+}/Cr^{2+}(-0.4V)$, $Mn^{3+}/Mn^{2+}(+1.5V)$,

$Fe^{3+}/Fe^{2+}(+0.8V)$. Then the relative stabilities of Fe^{3+}, Cr^{3+} and Mn^{3+} is :

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

B. $Fe^{3+} < Mn^{3+} < Cr^{3+}$

C. $Cr^{3+} < Fe^{3+} < Mn^{3+}$

D. $Fe^{3+} < Cr^{3+} < Mn^{3+}$

Answer: A

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12. which metal in the first series of transition metals exhibits +1 oxidation state most frequently and why?

A. Cr

B. Cu

C. Co

D. Ni

Answer: B

Watch Video Solution

13. Match the catalysts given in column I with the processesn given in column II

Column I

(i) Ni in the presence of hydrogen

(ii) Cu_2Cl_2

(iii) V_2O_5

(iv) Finely divided iron

(v) $TiCl_4 + Al(CH_3)_3$

Column II

(a) Zieglar Natta catalyst

(b) Contact process

(c) Vegetable oil to ghee

(d) Sandmeyer reaction

(e) Haber's process

(f) Decomposition of $KClO_3$

A. $i - c, ii - d, iii - b, iv - de, v - ab$

B. $i - c, ii - d, iii - b, iv - e, v - a$

C. $i - c, ii - dc, iii - b, iv - de, v - ab$

D. $i - d, ii - c, iii - b, iv - de, v - ab$

Answer: B

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14. Match the properties given in Column I with the metals given in Column II

	Column I (Property)		Column II (Metal)
A.	An element which can show +8 oxidation state	1.	Mn
B.	3*d* block element that can show upto +7 oxidation state	2.	Cr
C.	3*d* block element with highest melting point	3.	Os
		4.	Fe

A. $i-a, ii-b, iii-d$

B. $i-c, ii-a, iii-d$

C. $i-c, ii-a, iii-b$

D. $i-a, ii-b, iii-c$

Answer: C

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15. Match the statements given in Column I with the oxidation states given in Column II.

	Column I		Column II
A.	Oxidation state of Mn in MnO_2 is	1.	+2
B.	Most stable oxidation state of Mn is	2.	+3
C.	Most stable oxidation state of Mn in oxides is	3.	+4
D.	Characteristic oxidation state of lanthanoids is	4.	+5
		5.	+7

A. $i-c, ii-a, iii-e, iv-b$

B. $i-c, ii-a, iii-b, iv-e$

C. $i-a, ii-c, iii-b, iv-e$

D. $i-e, ii-c, iii-b, iv-a$

Answer: A

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16. Match the solutions given in Column I and the colours given in Column II.

	Column I (Aqueous solution of salt)		Column II (Colour)
A.	$FeSO_4 \cdot 7H_2O$	1.	Green
B.	$NiCl_2 \cdot 4H_2O$	2.	Light pink
C.	$MnCl_2 \cdot 4H_2O$	3.	Blue
D.	$CoCl_2 \cdot 6H_2O$	4.	Pale green
E.	Cu_2Cl_2	5.	Pink
		6.	Colourless

A. $i-d, ii-a, iii-b, iv-e, v-a$

B. $i-d, ii-a, iii-b, iv-a, v-e$

C. $i-b, ii-a, iii-d, iv-a, v-e$

D. $i-e, ii-a, iii-d, iv-a, v-e$

Answer: A

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17. Metch the properties given in column I with the metals given in column II

Column I(Property)

(i) Element with highest second ionisation enthalpy

(ii) Element with highest third ionisation enthalpy

(iii) M in $M(CO)_6$

(iv) Element with highest heat of atomisation

Column II(Metal)

(a) Co (b) Cr

(c) Cu (d) Zn

(e) Ni

A. $i-c, ii-d, iii-e, iv-a$

B. $i-c, ii-d, iii-b, iv-a$

C. $i-c, ii-d, iii-a, iv-e$

D. $i-d, ii-c, iii-a, iv-e$

Answer: B

View Text Solution

18. Transition element which exhibits typical metal (complex) structure

A. Mn

B. Co

C. Ni

D. Cu

Answer: A

View Text Solution

19. Ferrotes are formed in alkaline medium but they readily decopose to Fe_2O_3 and O_2. Then oxidation state of iron in ferrates is

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

B. $+\frac{3}{8}$

C. $+6$

D. $+2$

Answer: C

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20. Which of the following ions show higher spin only magnetic moment value?

A. Ti^{3+}

B. Co^{3+}

C. Mn^{2+}

D. Fe^{2+}

Answer: C::D

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21. Which of the following will not act as oxidising agents?

A. CrO_3

B. MoO_3

C. WO_3

D. CrO_4^{2-}

Answer: B::C

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

A. Copper can displace hydrogen from dilute acids

B. First ionisation enthalpy of Cr is lower than that of Zn

C. The second and third rows of transition elements resembles each other much more than they resembles the first row.

D. In the series Sc to Zn, the enthalpy of atomisation of Zn is the lowest.

Answer: B::C::D

View Text Solution

23. Which one of the following does not exhibit variable oxidation states?

A. Sc

B. Cu

C. Co

D. Zn

Answer: A::D

Watch Video Solution

24. Which one of the following does not exist?

A. FeI_3

B. $FeCl_3$

C. CoF_2

D. $NiCl_3$

Answer: A::D

Watch Video Solution

25. For which one of the following, observed magnetic moment is more than calculated magnetic moment (The experimental data are mainly for hydrated ions in solution)?

A. Cu^{2+}

B. Ti^{2+}

C. V^{2+}

D. Cr^{2+}

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

View Text Solution

26. For which one of the following, observed magnetic moment is less than calculated magnetic moment(The experimental data are mainly for hydrated ions in solution)?

A. Cu^{2+}

B. Ti^{2+}

C. V^{2+}

D. Cr^{2+}

Answer: B::C::D

View Text Solution

27. Which one of the following is correct?

A. Of the d^4 species, Cr^{2+} is strogly reducing while Mn^{3+} is strongly oxidising

B. Co^{2+} is stable in aqueous solution but in the presence of complexing reagents it is easily oxidised

C. The d^1 configuration is very unstable in ions

D. Sc readily form stable oxide of the type MO

Answer: A::B::C

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28. $MnO_4^{2-} + H^+ \rightarrow X + Y + Z$ (unbalanced), then identify X, Y and Z?

A. $X = MnO_4^-$

B. $Y = MnO_2$

C. $Z = O_2$

D. $Z = H_2O$

Answer: A::B::D

Watch Video Solution

29. Which one of the following is correct?

A. MnO_2O_7 is a covalent green oil

B. $V_2O_3 > V_2O_4 > V_2O_5$: basic nature

C. V_2O_4 dissolved in acids to give VO^{2+} salts.

D. V_2O_5 reacts alkalies as well as acids to give VO_4^{3-} and VO_2^+ respectively.

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

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Level Iv Multiple Answer

1. Transition elements show magnetic moment due to spin and orbital motion of electrons which of the following metallic ions have almost same spin only magnetic moment?

A. Co^{2+}

B. Cr^{3+}

C. Mn^{2+}

D. Cr^{2+}

Answer: A::B

Watch Video Solution

Level I H W

1. The following is not typical transition element

A. Cu

B. Ag

C. Au

D. Hg

Answer: D

Watch Video Solution

2. Which of the following statement regarding transition elements is false

A. Their atoms contain partically filled $'d'$ orbitals

B. They are capable of showing variable valencies

C. All of their ions are colourless

D. They form complexes readily

Answer: C

Watch Video Solution

3. Which of following is a true transition element

A. Zinc

B. Cadmium

C. Aluminium

D. Iron

Answer: D

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4. The group numbers of transition elements

A. 1 to 10

B. 1 to 9

C. 3 to 11

D. 3 to 12

Answer: C

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5. Best conductor of electricity is

A. Cu

B. Al

C. Au

D. Ag

Answer: D

Watch Video Solution

6. Which of the following set of element are transitions elements?

A. Po, At, Rn

B. Ga, In, Tl

C. Cs, Ba, La

D. Ac, Ku, Ha

Answer: D

Watch Video Solution

7. Give general electronic configuration of d-block elements.

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

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

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

D. $nd^{1-9}ns^{0-2}$

Answer: C

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8. ns^1 electron configuration is not present in

A. Ag

B. Mn

C. Cr

D. Cu

Answer: B

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9. Which of the following is the stable electron configuration of Fe^{+3} ion

A. $3d^6 4s^0$

B. $3d^5 4s^0$

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

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

Answer: B

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10. The general configuration $(n-1)d^3ns^2$ indicates that particular element belongs to the following group

A. II B

B. I B

C. V B

D. III B

Answer: C

Watch Video Solution

11. Which of the following ions has same number of unpaired electrons as that of V^{3+} ion

A. Cr^{+3}

B. Mn^{+2}

C. Ni^{+2}

D. Fe^{+3}

Answer: C

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12. Platinum, palladium, iridium, etc., are called noble metals because

A. Alfred Nobel discovered them

B. They are inert towards many common reagents

C. They are shining lustrous pleasing to look at

D. They are found in active state7

Answer: B

Watch Video Solution

13. In which of the following elements, the configuration is against Aufbau rule?

A. Ni, Pd, Pt

B. Sc, Ti, Zr

C. Pd, Pt, Cu

D. Fe, Cr, Mn

Answer: C

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14. The configuration of chromium atom in ground state is

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

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

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

D. $[Ar]3d^7 4s^2$

Answer: B

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15. The chemical formula of siderite

A. Fe_2O_3

B. Fe_3O_4

C. $FeCO_3$

D. MnO_2

Answer: C

Watch Video Solution

16. The mineral of silver is

A. Argentite

B. Horn silver

C. Sylvine

D. Both 1 and 2

Answer: D

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17. Which of the following group elements exhibits high melting and boiling points

A. IVB

B. VB

C. VIB

D. IIB

Answer: C

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18. Which group elements exhibits highest densities

A. IIIB

B. IVB

C. VIB

D. VIIIB

Answer: D

Watch Video Solution

19. Which of the following transition metals has the highest melting point?

A. Cr

B. Mo

C. W

D. Hg

Answer: C

Watch Video Solution

20. Transition element which is volatile

A. Zn

B. Cd

C. Hg

D. All

Answer: A

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21. The metal that has the least melting point among the following is

A. Mn

B. Fe

C. Cr

D. W

Answer: B

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22. The melting points and the boiling points of the transitions elements are higher than the corresponding s-block elements. This is because

A. Transition metals have smaller size

B. Of the presence of one or more unpaired electrons contribution to higher inter atomic forces on account of covalent bond

C. of strong metalic bond due to small size and higher ionization energy

D. of the presence of vacant d-orbitals

Answer: D

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23. The second IP of Cr is high due to

A. $3d^5$

B. $3d^0$

C. $3d^{10}$

D. $3d^4$

Answer: A

Watch Video Solution

24. Transition metals are less reactive because of their

A. High ionization potential and low melting point

B. High ionization potential and high melting point

C. Low ionization potential and low melting point

D. Low ionization potential and high melting point

Answer: B

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25. An element M has the electron configuration $[Ar]3d^5 4s^2$. Which one of its oxide is unlikely to exist

A. MO_2

B. M_2O_3

C. MO_4

D. M_2O_7

Answer: C

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26. Which of the following element exhibits maximum oxidation state

A. Mn

B. Co

C. Fe

D. Zn

Answer: A

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27. In which of the following compounds iron has lowest oxidation state?

A. $Fe(CO)_5$

B. Fe_2O

C. $K_4[Fe(CN)_6]$

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

Answer: A

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28. The pair that can exhibit more stable $+4$ oxidation state is

A. Fe, Ni

B. Ag, Au

C. Pt, Pd

D. Cd, Hg

Answer: C

Watch Video Solution

29. Which of the following electronic configuration is associted with the highest stable oxidation state

A. $[Ar]3d^14s^2$

B. $[Ar]3d^54s^1$

C. $[Ar]3d^54s^2$

D. $[Ar]3d^64s^2$

Answer: C

Watch Video Solution

30. The correct statement about iron includes

I) Fe_3O_4 is a mixed oxide of iron

II) that the iron show +2 oxidation state with six electrons in the unfilled 3d orbitals

(III) The common oxidation state iron is $+3$ with five unpaired electrons in the 3d orbitals

A. I,II,III

B. I,II

C. II,III

D. I only

Answer: A

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31. The correct order of atomic sizes is

A. $Sc < Y < La$

B. $Ti < Zr < Hf$

C. $Sc > Y > La$

D. $Sc > Y < La$

Answer: A

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32. Which of the following cation is colourless in its aqueous solution

A. Cu^{+2}

B. Sc^{+3}

C. Fe^{+3}

D. Co^{+3}

Answer: B

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

A. Cuprous ion has completed d-orbitals while Cupric ion has incomplete d-orbitals

B. Curpose ion has exactly half-filled $'d'$ orbitals

C. Cupric ion has completely filled $'d'$ orbitals, while Curpose ion has incompletely filled $'d'$ orbitals

D. Cupric ions has half-filled d-orbitals

Answer: A

Watch Video Solution

34. Which of the folllowing pairs of ions are coloureless

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

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

C. Sc^{+3}, Zn^{+2}

D. Ni^{+2}, V^{+3}

Answer: C

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35. Colour of ferrous ion is

A. Red

B. Blue

C. Pale green

D. Pale yellow

Answer: C

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

A. small size metal ions

B. absorption of light in UV region

C. complete (ns) subshell

D. incomplete $(n-1)d$ subshell

Answer: D

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37. Which one of the following pairs is coloured

A. $TiCl_3, VCl_2$

B. $TiCl_4, Cu_2Cl_2$

C. Hg_2Cl_2,anhydrous $CuSO_4$

D. $AgNO_3, Cd(NO_3)_2$

Answer: A

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38. Which is highly coloured due to inter valence electron transfer transitions?

A. FeO

B. Cr_2O_3

C. Fe_3O_4

D. CuO

Answer: C

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39. 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. TiF_6^{2-} and Cu_2Cl_2

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

Answer: C

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40. Which of the following compounds ar coloured substances?

$I - Ag_2CO_3 II - Ag_3PO_4 III - AgI IV - Ag_2S$

A. Only III

B. only III and IV

C. only I,III and IV

D. all the four

Answer: D

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41. the catalyst used in the hydrogenation of oils is :

A. V_2O_5

B. Pd

C. Fe

D. Ni

Answer: D

Watch Video Solution

42. The catalyst used in the polymerisation of ethylene is

A. $R_3Al + TiCl_4$

B. $SnCl_4$

C. Ni

D. Pt

Answer: A

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43. Which of the following is not responsible for the catalytical activity of transition metals and their compounds?

A. Transition metals have large surface area

B. Transition metals show varible oxidation states

C. Transition metals form intermediate complexes

D. Transition metals are coloured

Answer: D

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44. 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: B

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45. The following species is repelled by a magnetic field

A. Hg^{+2}

B. Fe^{+2}

C. Co^{+3}

D. Ni^{+2}

Answer: A

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46. The following is not a ferromagnetic

A. Fe

B. Co

C. Y

D. Ni

Answer: C

Watch Video Solution

47. In the calcultion of magnetic moment. The orbital magnetic moment contribution is negligible for the following ion

A. Pt^{+2}

B. Mo^{+2}

C. Pd^{+2}

D. Ti^{+3}

Answer: D

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48. A compound of metal ion $M^{x+}(z = 25)$ has spin only magnetic moment of $\sqrt{15}B.M.$ The positive O.S. of the metal is

A. 2

B. 3

C. 4

D. 5

Answer: C

Watch Video Solution

49. The magnetic moment of two ions M^{x+} and M^{y+} of the element $M(Z=26)$ is found to be $5.916B.M.$ If $x>y$, then which of the following statement is correct?

A. M^{y+} is more stable than M^{x+}

B. M^{y+} is less stable than M^{x+}

C. Both are equally stable

D. Can not be perdicated

Answer: B

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50. The magnetic moment of ion is close to $36\times10^{-24}\text{joule}/\text{Tesla}$. The number of unpaired electrons of the ions are

A. 4

B. 2

C. 1

D. 3

Answer: D

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51. Which is not an interstitial compound?

A. TiH

B. Fe_2O_3

C. Mn_2C_3

D. W_2C

Answer: B

Watch Video Solution

52. The metal that forms interstitial nitride is

A. Mg

B. Ca

C. Cr

D. Li

Answer: C

Watch Video Solution

53. The common metal present in german silver, bell metal and brass is

A. Fe

B. Cu

C. Zn

D. Sn

Answer: B

Watch Video Solution

54. Which of the following is an alloy of a metal and a non-metal

A. bronze

B. electron

C. nichrome

D. steel

Answer: D

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55. The alloy that is used for making permanent

A. Al,Ni,Co

B. Pb,Sn,Bi

C. Fe,Mn,Cu

D. Cu,Au,Hg

Answer: A

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56. The susbtance that sublimes on heting is

A. $MgCl_2$

B. $AgCl$

C. $HgCl_2$

D. NaCl

Answer: C

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57. The least stable oxide at room temperature is

A. CuO

B. Ag_2O

C. ZnO

D. Hg_2O

Answer: B

Watch Video Solution

58. Which of the following metal oxides is white in colour but becomes yellow on heating

A. Ag_2O

B. ZnO

C. FeO

D. MgO

Answer: B

Watch Video Solution

59. Oxide of metal cation which is not amphoteric ?

A. Al^{+3}

B. Cr^{+3}

C. Fe^{+3}

D. Zn^{+2}

Answer: C

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60. Which of the following oxides of chromium is amphoteric in nature?

A. CrO

B. Cr_2O_3

C. CrO_3

D. CrO_5

Answer: B

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Level Ii H W

1. Which of the following is ionic in nature?

A. CuF_2

B. $CuCl_2$

C. $CuBr_2$

D. CuI_2

Answer: A

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2. Metal-Metal bonding is more frequent in 4d or 5d series than in 3d series due to

A. Their greater enthalpy of atomisation

B. Large size of orbitals which participate in bonding

C. their ability to involve both ns and (n-1)d orbitals in bond formation

D. The comparable size of 4d and 5d series elements

Answer: A

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3. Zinc does not show variable valency Because of:

A. They are soft

B. Their d subshells are complete

C. They have only 2-electrons in outermost subshells

D. Their d subshells are incomplete

Answer: B

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4. Oxidation number of chromium in potassium dichromate is

A. $+4$

B. $+5$

C. $+6$

D. $+3$

Answer: C

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5. Manganese achieves its maximum oxidation state in its compound :

A. K_2MnO_4

B. $KMnO_4$

C. MnO_2

D. Mn_3O_4

Answer: B

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6. The number of unpaired electrons in ferrous ion is

A. 2

B. 3

C. 4

D. 5

Answer: C

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7. Which of the following ion is coloured?

A. Zn^{+2}

B. Ca^{+2}

C. Cu^{+2}

D. Sc^{+3}

Answer: C

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8. Which of the following metal ion is colour less in water

A. V^{+2}

B. Cr^{+3}

C. Fe^{+2}

D. Sc^{3+}

Answer: D

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9. Which of the following are not coloured ?

A. $CuSO_4.5H_2O$

B. $FeSO_4.7H_2O$

C. $NiSO_4.7H_2O$

D. $ZnSO_4.7H_2O$

Answer: D

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10. Identify the order in which the spin only magnetic moment (in BM) increases for the following four ions

I) Fe^{+2} , II) Ti^{+2} , III) Cu^{+2} , IV) V^{+2}

A. I,II,IV,III

B. IV,I,II,III

C. III,IV,I,II

D. III,II,IV,I

Answer: D

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11. 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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Level V H W

1. There are 3 unpaired electrons in $\left[Co(H_2O)_6\right]^{2+}$ and calculated value of magnetic moment on the basis of $\sqrt{n(n+2)}$ is $3.87BM$, which is much lower than the experimental value of $4.4BM$. The reason for this difference is due to :

A. Increase in the number of unpaired electrons during determination

B. Some contribution of orbital angular momentum of electron towards the magnetic moment

C. $d - d^{\cdot}$ transition

D. Experimental error

Answer: B

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2. Metallic radii of some transitions element are given below. Which of these elements will have highest density ?

Element	Fe	Co	Ni	Cu
Metallic radii/pm	126	125	125	128

A. Fe

B. Ni

C. Co

D. Cu

Answer: D

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3. Which of the following is amphoteric oxide?

$Mn_2O_7, CrO_3, Cr_2O_3, CrO, V_2O_5, V_2O_4$

A. V_2O_5, Cr_2O_3

B. Mn_2O_7, CrO_3

C. CrO, V_2O_5

D. V_2O_5, V_2O_4

Answer: A

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4. The magnetic moment is associated with its spin angular momentum and orbital angular momentum. Spin only magnetic moment value of Cr^{3+} ion is

A. $2.87BM$

B. $3.87BM$

C. $3.47BM$

D. $3.57BM$

Answer: B

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5. Ionisation energies of Ni and Pt in $KJmol^{-1}$ are given below

	$\underbrace{(IE)_1 + (IE)_2}$	$\underbrace{(IE)_3 + (IE)_4}$
Ni	2.49	8.80
Pt	2.60	6.70

So, (select the correct statement)

A. nickel (II) compounds tend to be termodynamically more stable than platinum (II)

B. platinum (IV) compoundds tend to be more stable than nickel (IV)

C. (A) & (B)

D. none is correct

Answer: C

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6. Atoms of the transition element are smaller than those of the s-block elements, because :

A. there is increase in the nuclear charge along the period.

B. orbital electrons are added to the penultimate d-subshell rather than to the outer shell of the atom.

C. the sheilding effect of d-electrons is small.

D. All of these

Answer: D

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7. Standard reduction electrode potential of Zn^{2+}/Zn is -0.76V`. This means:

A. ZnO can't be reduced to Zn by H_2 under standard conditions.

B. Zn can't liberates H_2 with concentrated acids

C. Zn is generally the anode in an electrochemical cell

D. Zn is generally the cathode in an electrochemical cell

Answer: A

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8. E^{Θ} value for the couple Cr^{3+}/Cr^{2+} and Mn^{3+}/Mn^{2+} are -0.41 and $+1.51$ volts respectively. Considering these value select the correct option from the following statements.

A. Cr^{2+} acts as reducing agent abd Mn^{3+} acts as an oxidising agent in their aqueous solutions.

B. Cr^{2+} (aq.) is more stable than Cr^{3+} (aq)..

C. Mn^{3+} (aq.) is more stable than Mn^{2+} (aq).

D. None of these.

Answer: A

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9. Of the ions Zn^{2+}, Ni^{2+} and Cr^{3+} (atomic number Zn=30,Ni=28,Cr=24):

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

B. all three are colourless.

C. all three are coloured.

D. only Ni^{2+} is coloured and Zn^{2+} and Cr^{3+} are colouless.

Answer: A

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10. Iron is rendered passive by treatment with concentrated

A. HCl

B. H_2SO_4

C. HNO_3

D. both (B) & (C)

Answer: C

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11. Which of the following dissolves in hot concentrated NaOH solution?

A. Fe

B. Zn

C. Cu

D. Ag

Answer: B

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

A. MnO_4^-

B. $Cr(CN)_6^{3-}$

C. NiF_6^{2-}

D. CrO_2Cl_2

Answer: D

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

A. $MnO_2, FeCl_3$

B. $[MnO_4]^-, CrO_2Cl_2$

C. $[Fe(CN)_6]^{2-}, [Co(CN)_6]^{3-}$

D. $[NiCl_4]^{2-}, [Ni(CO)_4].$

Answer: B

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14. Which of the following pair of compounds is expected to exhibit same colour in aqueous solution?

A. $FeCl_3, CuCl_2$

B. $VOCl_2, CuCl_2$

C. $VOCl_2, FeCl_2, FeCl_2$

D. $FeCl_2, MnCl_2$

Answer: B

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15. Among the following the coloured compound is .

A. $CuCl$

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

C. CuF_2

D. $\left[Cu(CH_3CN)_4\right]BF_4$

Answer: C

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16. The colour of $KMnO_4$ is due to

A. $M \rightarrow L$ charge transfer transition

B. $d - d$ transition

C. $L \rightarrow M$ charge transfer transition

D. $s - s^{\cdot}$ transition

Answer: C

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17. Which of the following statement are correct about Cr^{2+} (Z = 24) and Mn^{3+} (Z = 25) ?

(i) Cr^{2+} is a reducing agent

(ii) Mn^{3+} is an oxidizing agent

(iii) Both Cr^{2+} and Mn^{3+} exhibit d^4 configuration

(iv) When Cr^{2+} is used as a reducing agent, the chromium ion attains d^5 electronic configuration

A. Cr^{2+} is a reducing agent

B. Mn^{3+} is an oxidizing agent

C. Both Cr^{2+} and Mn^{3+} exhibit d^4electronic configuration

D. When Cr^{2+} is used as a reduding agent, the chormium ion attains d^5electronic configuration

Answer: D

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18. Aqurated copper (I) catin undergoes disproportionation as $2Cu^+(aq) \rightarrow Cu^{2+}(aq) + Cu$, because

A. Cu^+ has d^{10} configuration

B. Cu^{2+} has d^{10} configuration

C. hydration energy of Cu^{2+} is higher than that of Cu^+ which compensates second ionisation energy of Cu.

D. size of $Cu^+ < Cu^{2+}$

Answer: C

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19. In solution, the stability of the d-block compounds depends upon electrode potential. The electrode potential depends upon which of the following parameters.

(i) Entlhalpy of sublimation

(ii) Ionisation enthalpy

(iii) Hydration enthalpy

A. i,ii only

B. i, ii only iii

C. i, iii only

D. ii,iii only

Answer: B

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20. Which of the following is the best oxidant?

A. Cr^{3+} (aq)

B. Fe^{3+} (aq)

C. Co^{3+} (aq)

D. Sc^{3+} (aq)

Answer: C

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21. Which of the following is the best reductant?

A. Co^{2+} (aq)

B. Fe^{2+} (aq)

C. Cr^{2+} (aq)

D. Cu^{2+} (aq)

Answer: C

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22. Mn shows its highest oxidation state in its

A. fluoride

B. chloride

C. oxide

D. carbide

Answer: C

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23. Transition elements form binary compounds with halogens. Which of the following elements will form MF_3 type compounds?

A. Cr

B. Co

C. Cu

D. Ni

Answer: A::B

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24. Order of paramagnetic character among following element is/are"

A. $Mn > Fe > Cr$

B. $Fe > Zn > Cr$

C. $Cr > Fe > Zn$

D. $Cr > Mn > Fe$

Answer: C::D

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

A. Transition element exhibit higher enthalpies of atomization as they have stronger interatomic interaction

B. IE_2 of $._{23} V < ._{24} Cr >_{25} Mn$ & $._{28} Ni <_{29} Cu >_{30} Zn$

C. Ni(III) compounds are more stable than $Pt(IV)$

D. The elements which give the greatest number of oxidation states do not occur in or near the middle of the series.

Answer: A::B::C

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26. Correct statements among the following is/are:

A. V_2O_5, Cr_2O_3 are amphoteric oxides

B. Interstitial compounds are very hard

C. In its higher oxidation states, manganese forms stable fluoride.

D. Amiong CuF_2, $CuCl_2$ and $CuBr_2$, CuF_2 is ionic.

Answer: A::B::D

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27. The correct statement among the following is:

A. The colour of the transition metal compounds having incompletely filled d- orbitals in the metal ions is due to $d - d$ transition

B. Intense colours occur due to charge transfer i.e, transfer of electrons from the ligand to the metal

C. The colours of $AgBr$, Ag_2CO_3, Ag_3PO_4, Ag_2O, Cu_2O etc is due to polarizing power of transition metal ion and polarisability of anion

D. The colour of a particular transition metal ion is independent on the nature of ligand

Answer: A::B::C

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28. Which of the following statement is/are correct?

A. For a transition metal that can exhibit variable oxidation states, higher oxidation states are more stable in basic medium

B. In a transition group stablity higher oxidation state is diminshed towards the end of each series

C. All $Cu(II)$ halides are known except the iodide.

D.

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

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

A. MoO_3 and WO_3 are not stronger oxidising agents where as $Cr_2O_7^{2-}$ is strong oxidising agent is $Au > Cu > Ag$

B. The ionisation enthalpy order of Cu, Ag and Au is $Au > Cu > Ag$

C. The high melting points of transition metals are attributed to the involvement of greater number of electrons from $(n-1)d$ in addition to the ns electrons

D. Second and third row transition elements have greater enthalpy of atomization than the corresponding elements of first transition series.

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

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30. Identify the correct statement(s)?

A. $Co > Mn > Fe > Cr$: decreasing M^{3+}/M^{2+} value

B. Cr^{2+} is oxidising and Mn^{3+} is reducing even though both have d^4 configuration

C. $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$: oxidizing property

D. Cr_2O_3, V_2O_5, Mn_2O_7 and ZnO are all amphotric oxides.

Answer: A::B::C

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31. Which are the true statements regarding ionization energy of d-series elements?

A. Ionization enrgy of Mn is greater than Cr

B. Ionization energy of $Pd > Rh$ and $Pd > Ag$

C. Ionization energy decreases from $3d$ to 4d transition series but it increases from $4d$ to $5d$ series

D. Ionization energy of Mo is greater than W

Answer: A::B::C

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32. Transition metals usually from coloured complexes and d-d transitions $\left(t_{2g} \Leftrightarrow e_g\right)$ are responsible for colour as the energy difference between t_{2g} and e_g lies in visible region. But all the coloured ions are not dut to d-d transition but charge transfer bands also play important roles. Charge transfer bands may be of two types.

(i) ligand to metal (CTLM) (ii) metal to ligand (CTML).

Charge transfer transition always produces intense colour as compared to d-d transition.

Select the incorrect statement :

A. d-block metal ions are usually coloured.

B. Colour of the most of d-block metal ions is generally due to d-d transition

C. All the complexes of Cu^+ are colourless on account of diamagnetic nature i.e., d^{10} configuration.

D. CrO_3 is bright orange due to $CTLM$.

Answer: C

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33. Transition metals usually from coloured complexes and d-d transitions $\left(t_{2g} \Leftrightarrow e_g\right)$ are responsible for colour as the energy difference between t_{2g} and e_g lies in visible region. But all the coloured ions are not dut to d-d transition but charge transfer bands also play important roles. Charge transfer bands may be of two types.

(i) ligand to metal (CTLM) (ii) metal to ligand (CTML).

Charge transfer transition always produces intense colour as compared to d-d transition.

MnO_4^- is dark purple coloured though Mn is in $(+VII)$ oxidation state with $3d^\circ$ configuration

A. due to d-d transition

B. due to CTML spectra.

C. due to CTLM spectra

D. None of these.

Answer: C

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34. Transition metal and their compounds are used as catalyst in industry and in biological system. For example, in the Contact Process, vanadium compounds in the +5 state $\left(V_2O_5 \text{ or } VO_3^-\right)$ are used to oxidise SO_2 to SO_3:

$$SO_2 + \frac{1}{2}O_2 \xrightarrow{V_2O_5} SO_3$$

It is thought theta the actual oxidation process takes place in two stages. In the first step, V^{5+} in the presence of oxide ions converts SO_2 to SO_3. At the same time, V^{5+} is reduced to V^{4+}.

$$2V^{5+} + O^{2-} + SO_2 \rightarrow 2V^{4+} + SO_3$$

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

$$2V^{4+} + \frac{1}{2}O_2 \rightarrow 2V^{5+} + O^{2-}$$

The overall process is, of curse, the sum of these two steps:

$$SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$$

Q. Transition metals and their compounds catalyse reactions because:

A. They have completely filled s-subshell

B. They have a comparable size due to poor shielding of d-subshell

C. They introduce an entirely new reaction mechanism with lower activation energy

D. They have variable oxidation sates differ during the course of reaction.

Answer: C

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35. Transition metal and their compounds are used as catalyst in industry and in biological system. For example, in the Contact Process, vanadium compounds in the +5 state $\left(V_2O_5 \text{ or } VO_3^-\right)$ are used to oxidise SO_2 to SO_3:

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The overall process is, of curse, the sum of these two steps:

$$SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$$

Q. Catalytic activity in transition metals depends on:

A. Their ability of exist in different oxidation stales.

B. The size of metal atoms

C. The number of empty atomic orbitals available

D. None of these.

Answer: A

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36. Transition metal and their compounds are used as catalyst in industry and in biological system. For example, in the Contact Process, vanadium compounds in the +5 state $\left(V_2O_5 \text{ or } VO_3^-\right)$ are used to oxidise SO_2 to SO_3:

$$SO_2 + \frac{1}{2}O_2 \xrightarrow{V_2O_5} SO_3$$

It is thought thta the actual oxidation process takes place in two stages. In the first step, V^{5+} in the presence of oxide ions converts SO_2 to SO_3. At the same time, V^{5+} is reduced to V^{4+}.

$$2V^{5+} + O^{2-} + SO_2 \rightarrow 2V^{4+} + SO_3$$

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

$$2V^{4+} + \frac{1}{2}O_2 \rightarrow 2V^{5+} + O^{2-}$$

The overall process is, of curse, the sum of these two steps:

$$SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$$

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

A. V^{+5}

B. V^{+4}

C. O^{-2}

D. VO_3^-

Answer: B

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37. The oxide formed in the maximum oxidation state is ZrO_x. x is

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38. How many of the following reactions cannot occur?

$(1) Fe + 2HCl \rightarrow FeCl_2 + H_2 \uparrow$

$(2) Cu + 2HCl \rightarrow CuCl_2 + H_2 \uparrow$

$(3) Cu + ZnSO_4 \rightarrow CuSO_4 \rightarrow CuSO_4 + Zn \downarrow$

$(4) Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag \downarrow$

$(5) Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag \downarrow$

$(6) Fe + CuSO_4 \rightarrow FeSO_4 + Cu \downarrow$

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

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40. What is the composition of the alloy Alnico?

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41. A compound of vanadium has a magnetic moment (μ) of $1.73BM$. If the vanadium ion in the compound is present as V^{x+}, then, the value of

x is ?

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42. Number of outer most $'d'$ electrons in Rhodium are

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

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44. How many 3d series elements (Sc to Zn) have positive standard potential for M^{2+}/M?

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45. Match the pair of substance having similar properties

Column – I

a) $NiSO_4$ and VO^+ b) $TiCl_4$ and $ZnSO_4$

c) $MnCl_{3(aq)}$ and $CoCl_{3(aq)}$ d) $FeCl_3$ and $MnSO_4$

Column – II

p) Same magnetic moment

q) Nearly similar colour

r) Same oxidation state

s) Same outer electronic configuration

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46. Match the following

List-I Metals	List-II Characteristic
(A) Cd	(p) d-block metal
(B) Rh	(q) Transition metal
(C) Fm	(r) Inner transition metal
(D) Gd	(s) Lanthanide
	(t) Actinide

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47. Match the following

List-I (Property)	List-II (Transition elements)
(A) Highest oxidation state	p) Cr
(B) Highest density	q) Os
(C) Elements with maximum unpaired electrons	r) Tc
(D) Radioactive transition element	s) Ru

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Level Vi H W

1. Generally transition elements from coloured salts due to the presence of unpaired electrons. Which of the following compounds will be coloured in solid state?

A. Ag_2SO_4

B. CuF_2

C. ZnF_2

D. Cu_2Cl_2

Answer: D

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2. Which of the following is amphoteric oxide?

$Mn_2O_7, CrO_3, Cr_2O_3, CrO, V_2O_5, V_2O_4$

A. V_2O_5, Cr_2O_3

B. Mn_2O_7, CrO_3

C. CrO, V_2O_5

D. V_2O_5, V_2O_4

Answer: A

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3. Interstitial compounds are formed when small atoms are trapped inside the crystal lattice of metals. Which of the following are the characteristic properties of interstitial compounds?

I. They have high melting points in comparison to pure metals.

II. They are very hard.

III. They retain metallic conductivity.

IV. They are chemically very reactive.

A. The have high melting points in comparison to pure metals.

B. They are very hard.

C. They retain metallic conductivity.

D. They are chemically very reactive.

Answer: D

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4. Higher oxidation state of manganese in fluoride is $+4(MnF_4)$ but highest oxidation state in oxides is $+7(Mn_2O_7)$ because

A. fluorine is more electronegative than oxygen.

B. fluorine does not posses d-orbitals.

C. fluorine stabilises lower oxidation state.

D. in covalent compounds fluorine can form single bond only while oxygen forms double bond.

Answer: D

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5. Although zirconium belongs to 4d transition series and hafnium to 5d transition series even then they show similar physical and chemical properties because ..... .

A. both belong to d-block

B. both have same number of electrons.

C. both have similar ionic radii.

D. both belong to the same group of the periodic table.

Answer: C

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6. Although Cr^{3+} and Co^{2+} ions have same number of unpaired electrons but the magnetic moment of Cr^{3+} is $3.87B.M.$ and that of Co^{2+} 4.87 B.M. because....

A. They have different no. of d electrons

B. They have same electronic but different orbital contribution

C. They have different electronic but same orbital contriguration

D. they are typical elements.

Answer: B

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7. The aqueous solution of transition metal salt changes colour from pink to blue, when concentrated hydrochloric acid is added to it. The changes in colour is due to:

A. evolution of hydrogen that changes the oxidation state of the metal ion

B. change in the coordination number of the metal ion from 6 to 4 formation of new species in solution.

C. inability of formation of a coordination complex of the metal ion with HCl acid

D. protonation of the metal ion

Answer: B

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8. While Fe^{3+} is stable Mn^{3+} is not stable in acitic solution because

A. O_2 oxidises Mn^{2+} to Mn^{3+}

B. O_2 oxidises both Mn^{2+} to Mn^{3+} and Fe^{2+} to Fe^{3+}

C. Fe^{3+} oxidises H_2O to O_2

D. Mn^{3+} oxidise H_2O to O_2

Answer: B

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9. Which of the following transition metal oxides is(normally) neither acidic nor amphoteric?

A. CrO_3

B. V_2O_5

C. Mn_2O_2

D. CuO

Answer: D

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10. The thermally unstable compounds are

A. MnI_7

B. CrO_3

C. Mn_2O_7

D. CrI_6

Answer: A::D

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11. Which one of the following reactions cannot occur?

A. $Cu + ZnSO_4 \rightarrow CuSO_4 + Zn \downarrow$

B. $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag \downarrow$

C. $Cu + FeSO_4 \rightarrow CuSO_4 + Fe \downarrow$

D. $3Ag + AuCl_3 \rightarrow 3AgCl + Au \downarrow$

Answer: A::C

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12. Which of these are liquids at room temperature ?

A. $TiCl_4$

B. Zn

C. Hg

D. $CuCl_2$

Answer: A::C

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13. The typical acidic oxides are

A. MnO

B. Mn_2O_7

C. CrO

D. CrO_3

Answer: B::D

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14. The compounds that undergo hydrolysis readily is/are

A. $TiCl_4$

B. VCl_5

C. $FeCl_3$

D. $CaCl_2$

Answer: A::B::C

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15. Which are the best suitable as coinage metals?

A. Mg

B. Cu

C. Ag

D. Au

Answer: B::C::D

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16. Paramagnetism is exhibited by :

A. $CuSO_4.5H_2O$

B. $CuCl_2.5H_2O$

C. CuI

D. $NiSO_4.6H_2O$

Answer: A::B::D

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17. In the form of dichromate, Cr(VI) is a strong oxidising agent in acidic medium but Mo(VI) in $Mo0_3$ and W(VI) in $W0_3$ are not because

A. $Cr(VI)$ is more stable than $Mo(VI)$ and $W(VI)$

B. $MO(VI)$ and $W(VI)$ are more stable than $Cr(VI)$

C. Higher oxidation states of heavier members of group 6 of transition series are more stable

D. Lower oxidation states of hevier members of group 6 transition series are more stable

Answer: B::C

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18. The diamagnetic compounds is/are

A. $HgCl_2$

B. Hg_2Cl_2

C. Cu_2Cl_2

D. $K_2Cr_2O_7$

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

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19. The colour of the transition metal ions is due to

A. d-d transition of electrons in presence of ligands

B. charge transfer from ligands to metal ion

C. small atomic sizes

D. polarisation of anion by cation

Answer: A::B::D

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20. Select the correct statement(s) with respect to oxides and oxoanions of transition metals

A. Among oxides of chromium : CrO is basic Cr_2O_3 amphoteric and Cr_2O_3 is acidic

B. No higher oxides of iron above Fe_2O_3 are found

C. Ti, V, Cr and Mn from oxides of MO and their correct incrasing order of acidic character is $MnO < CrO < VO < TIO$

D. Vandium (V) oxide does not react with acids but reacts with alkalies only

Answer: A::B

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

A. $KMnO_4$

B. CrO_3

C. $CuCl_2$

D. Cu_2O

Answer: A::B::D

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22. Transition element act as good catalysts because

A. Presence of partically filled $'d'$ orbitals

B. Form Hydrogen bonding easily

C. Transition element show variable oxidation state

D. Easy interconvertibility of oxidation states due to low oxidation and reduction potential

Answer: A::C::D

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23. The true statement among the following are:

A. Cu^{2+} undergoes disproporationation in aq solutions

B. All $Cu(II)$ salts are known except the iodide

C. The only transition metal in 3d series with a positive $E^0\left(M^{+2}/M\right)$ value is copper

D. Copper has the higest second ionization enthalpy among all the 3d elements

Answer: B::C::D

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24. Which of the following oxides are amphoteric?

A. V^{5+}

B. Zn^{2+}

C. Fe^{2+}

D. Fe^{3+}

Answer: A::B

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25. Which of the following are nonferrous alloys?

A. Brass

B. Bronze

C. Chromium Steel

D. German Silver

Answer: A::B::D

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26. In the formation of intersitital compounds by transition metals, identify the correct statements

A. Melting points of interstial carbides are more than those of respective pure metals

B. Densities of interstial hydrides are less than those respective pure metals

C. Electrical conductivity is lost in the formation of interstial compound from a metal

D. Interstitial borides are very hard in nature and less reactive than the parent metals

Answer: A::B::D

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27. Which of the following is/are correct about Wilkinson's catalyst?

A. It is used ad homogeneous catalyst for selective hydrogenation of organic molecule at room temperature and pressure

B. It is tetrahedral complex

C. It does not have unpaired electrons

D. Its formula is $TiCl_4 + Al(C_2H_5)_3$

Answer: A::C

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28. Which of the following statement(s) is /are correct for the alloys, bronzene, brass , gun metal , and solder?

A. Brass contains Cu and Zn.

B. Gun metal contains Cu, and Sn.

C. Solder metal contains Sn and Pb.

D. Bronze contains Zn, Sn and Pb.

Answer: A::B::C

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29. The E^0 values are

$Zn^{2+}/Zn: -0.76V, Fe^{2+}/Fe: -0.44V,$

$Ni^{2+}/Ni: -0.25V$

$Cu^{2+}/Cu: +0.34V, Ag^{+}/Ag: +0.80V,$

$Mn^{2+}/Mn: -1.21V$

$Pt^{2+}/Pt: +1.20V$

A. Zn

B. Fe

C. Ni

D. Pt

Answer: D

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30. The E^0 values are

$Zn^{2+}/Zn: -0.76V, Fe^{2+}/Fe: -0.44V,$

$Ni^{2+}/Ni: -0.25V$

$Cu^{2+}/Cu: +0.34V, Ag^{+}/Ag: +0.80V,$

$Mn^{2+}/Mn: -1.21V$

$Pt^{2+}/Pt: +1.20V$

The element that does not displace hydrogen from dilute acids is

A. Zn

B. Mn

C. Cu

D. Fe

Answer: C

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31. The E^0 values are

$Zn^{2+}/Zn: -0.76V, Fe^{2+}/Fe: -0.44V,$

$Ni^{2+}/Ni: -0.25V$

$Cu^{2+}/Cu: +0.34V, Ag^{+}/Ag: +0.80V,$

$Mn^{2+}/Mn: -1.21V$

$Pt^{2+}/Pt: +1.20V$

The metal that does not displace Cu from the $CuSO_4$ solution is

A. Zn

B. Fe

C. Mg

D. Ag

Answer: B

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32. The transition metals and their compounds have paramagnetic properties. This is due to the reason that ions of transition metals have unpaired electrons in (n-1)d orbitals. As the number of unpaired Sc to Mn, the paramagnetic character increases accodingly. From Mn onwards, this character decreases as electrons get paired up. The paramagnetic behaviour is expressed in terms of magnetic moment which is because of the spin of unpaired electron (n). It is given as Magnetic moment $= \sqrt{n(n+2)}B.M$

Majority of transition metal compounds are coloured both in solid state as well as in aqueous solution. due to d-d transition in which unpaired

electrons from the lower energy d-orbitals are transferred to higher energy d-orbitals. The energy of this transition correspond to the radiation in visibe region. Thus, when white light falls on such a transition metal compound, some light energy corresponding to a particular colour is absorbed and one or more electrons are raised from lower energy set of orbitals to those of higher energy. With the absorption of radiations corresponding to specific colour from the white light, a colour known asd the complementary colour is observed or transmitted.

The compound which have the same magnetic moment like that of $FeCl_2$

A. $CrCl_3$

B. $MnCl_2$

C. $CoCl_3$

D. $NiCl_2$

Answer: C

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33. The transition metals and their compounds have paramagnetic properties. This is due to the reason that ions of transition metals have unpaired electrons in (n-1)d orbitals. As the number of unpaired Sc to Mn, the paramagnetic character increases accodingly. From Mn onwards, this character decreases as electrons get paired up. The paramagnetic behaviour is expressed in terms of magnetic moment which is because of the spin of unpaired electron (n). It is given as Magnetic moment $= \sqrt{n(n+2)}B.\,M$

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

A. 2

B. 3

C. 4

D. 5

Answer: B

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34. The transition metals and their compounds have paramagnetic properties. This is due to the reason that ions of transition metals have unpaired electrons in (n-1)d orbitals. As the number of unpaired Sc to Mn, the paramagnetic character increases accodingly. From Mn onwards, this character decreases as electrons get paired up. The paramagnetic behaviour is expressed in terms of magnetic moment which is because of

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For which one of the following ions, the colour is not due to a d-d transition:

A. CrO_4^{2-}

B. $Cu(NH_3)_4^{2+}$

C. $Ti(H_2O)_6^{3+}$

D. CoF_6^{3-}

Answer: A

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35. The (n-1)d shell of electron in d-block elements is expanding and, therefore they have many physical and chemical properties in common. They show variable oxidation state and all are metals. The transition element i.e., d-block element show an unparallel tendency to form coordination compound with thhose groups which are able to donate an electron pair (i.e. lewis base).

Which one is most acidic?

A. Cr_2O_3

B. V_2O_5

C. Mn_2O_7

D. Fe_2O_5

Answer: C

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36. The (n-1)d shell of electron in d-block elements is expanding and, therefore they have many physical and chemical properties in common. They show variable oxidation state and all are metals. The transition element i.e., d-block element show an unparallel tendency to form coordination compound with thhose groups which are able to donate an electron pair (i.e. lewis base).

Which of the following statement is incorrect?

A. Across a period from Sc to Cu the densities increase with increasing atomic number.

B. The melting point of transition elements rise to a maximum from Sc to Cr and then decreases from Fe to Zn.

C. Transition elements have high entahlpies of atomization and in 3d series regularly from Sc to Cu.

D. On going down a group from 3d to 6d series the stability of higher oxidation state increases with increasing atomic number.

Answer: C

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37. Paramagnetism is a property due to the presence of unpaired electrons. In case of transition metals, as they contain unpaired electrons in the (n-1)d orbitals, most of the transition metal ions and their compounds are paramagnetic. Paramagnetism increases with increases in number of unpaired electrons. Magnetic moment is calculated from 'Spin only formula' viz.

$\mu = \sqrt{n(n+2)}B.M.$ $n = no.$ of unpaired electrons

Similarly the colour of the compounds of transition metals may be attributed to the presence of incomplete (n-1)d subshell. When an electron from a lower energy of d-orbital is excited to a higher energy d-orbital, the energy of excitation corresponding to the frequency of light absorbed. This frequency generally lies in the visible region. The colour

observed correponds to complementary colour of the light absorbed. The frequency of the light absorbed is determined by the nature of the ligand.

Which of the following pair of compounds is expected to exhibit same colour in aqueous solution.

A. $FeCl_2, CuCl_2$

B. $VOCl_2, CuCl_2$

C. $VOCl_2, FeCl_2$

D. $FeCl_2, MnCl_2$

Answer: B

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38. Paramagnetism is a property due to the presence of unpaired electrons. In case of transition metals, as they contain unpaired electrons in the (n-1)d orbitals, most of the transition metal ions and their compounds are paramagnetic. Paramagnetism increases with increases in

number of unpaired electrons. Magnetic moment is calculated from 'Spin only formula' viz.

$\mu = \sqrt{n(n+2)}B.\ M.\ n = no.$ of unpaired electrons

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Titanium shows magnetic moment of $1.7BM$ in its compound. What is the oxidation state of titanium in the compound?

A. $+2$

B. $+1$

C. $+3$

D. $+4$

Answer: C

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39. Paramagnetism is a property due to the presence of unpaired electrons. In case of transition metals, as they contain unpaired contain unpaired electrons in the $(n-1)$ d orbitals , most of the transition metal ions and their compounds are paramagnetic . Paramagnetism increases with increases in number of unpaired electrons. Magnetic moment is calculated from 'spin only formula' Vz

$\mu = \sqrt{n(n+2)}B.\ Mn = \text{number of unpaired electrons}$

Similarly the colour of the compounds of transition metals may be attributed to the presence of incomplete $(n-1)$ d sub-shell. When an electron from a lower energy of d-orbitals is excited to a higher energy d-orbital, the energy of excitation corresponds to the frequency of light absorbed. This frequency generally lies in the visible region. The colour observed corresponds to complementry colour of the light obserbed. The frequency of the light absorbed is determined by the nature of the

ligand.

Identify the correct statement.

A. Mn^{2+} has the highest paramagnetism amongst the bivalent cations of the I^{st} transition series.

B. The coloured ions or compounds of transition elements are due to d-d transition only.

C. In $3d$ series the paramagnetic chaacter first increase to maximum & then starts decreasing.

D. Cr^{2+} is stroger reducing agent than Fe^{2+}

Answer: B

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40. Match the following

Column - I Metals	Column - II Properties
(A) $Hf > Zr$	(p) density
(B) $Au > Ag$	(q) IE
(C) $Fe > Mn$	(r) MP
(D) $Cu > K$	(s) Higher nuclear charge
	(t) More positive E^0_{SRP} value.

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41. Match the following

Column - I Compound	Column - II Characteristic
(A) $TiCl_4$	(p) Liquid at room temperature
(B) $CaCl_2$	(q) Has the highest MP among the compounds given
(C) $FeCl_3$	(r) Aqueous solution is acidic
(D) $ZnCl_2$	(s) Undergoes hydrolysis
	(t) Solid at room temperature

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42. $S_1 : Mn^{2+}$ compounds more stable than Fe^{2+} towards oxidation to their $+3$ state.

S_2 : Titanium and copper both in the first series of transition metals exhibits $+1$ oxidation state most frequently.

$S_3 : Cu^+$ ions is stable in aqueous solutions.

S_4 : The E^0 value for the Mn^{3+}/Mn^{2+} couple much more positive than that for Cr^{3+}/Cr^{2+} or Fe^{3+}/Fe^{2+},

A. $TTFT$

B. $TFFT$

C. $TFTT$

D. $FFTF$

Answer: B

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43. In how many of the following, the second element has a higher density than the first one?

(1) Ag, Au , (2) Hf, Zr , (3) Zn, Hg

(4) Na, Cu , (5) Ca, Co , (6) Ta, Nb

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44. The number of transition metals in bronze is x, in brass is y and inGerman silver is z. The $(x + y + z)$ is

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45. Total number of 3d-series transition elements contain either $3d^1$ or $4s^1$ orbital in their ground state electric configuration.

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46. How many of the following show variable oxidation states in their compounds ?

$Sc, Cr, Cu, Zn, Fe, Hg, La$

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47. Magnetic moment value for a d-block ion is 4.90 BM determine value of total spin for it (consider clock wise spin).

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48. How many of the following ions have spin mangnetic moment more than $4B.M.$

$Ti^{3+}, Cu^{+}, Ni^{2+}, Fe^{3+}, Mn^{2+}, Co^{2+}$

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49. How many of the following compounds are diamagnetic and coloured?

$K_2MnO_4, Cu_2Cl_2, Hg_2I_2, Ag_2S, HgI_2, K_2CrO_4, Cr_2O_3, AgCl, Ag_2O, Cu$

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