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ANSWER KEY

1. The magnetic moment of Fe^{2+} is 4.47 BM. The species is
(1) Cr^{2+} (2) Mn^{2+} (3) Fe^{3+} (4) Co^{2+}
Ans. (2)

2. Match the following

	List-I		List-II
(A)	Co^{2+}	(P)	$t_{2g}^6 e_g^1$
(B)	Ni^{2+}	(Q)	$t_{2g}^6 e_g^2$
(C)	Cu^{2+}	(R)	$t_{2g}^7 e_g^2$
(D)	Zn^{2+}	(S)	$t_{2g}^8 e_g^2$

Ans. (A) – (R), (B) – (Q), (C) – (P), (D) – (S)

	Complex	No. of unpaired electrons	Magnetic moment
Co^{2+}	$[Co(H_2O)_6]^{2+}$	3	$\sqrt{15}$ BM
Ni^{2+}	$[Ni(H_2O)_6]^{2+}$	2	$\sqrt{8}$ BM
Cu^{2+}	$[Cu(H_2O)_6]^{2+}$	1	$\sqrt{3}$ BM
Zn^{2+}	$[Zn(H_2O)_6]^{2+}$	0	0 BM

4. In the complex $[Co(NH_3)_5Cl]Cl_2$, The primary & secondary valency of central metal respectively are
(1) 2 and 5 (2) 3 and 5 (3) 3 and 6 (4) 2 and 6
Ans. (2)
Sol. Primary valency = Oxidation number of central metal.
Secondary valency = Number of ligands in complex.
$[Co(NH_3)_5Cl]Cl_2$ Primary valency = 3
Secondary valency = 5 + 1 = 6

5. Which of the following salts will give $NaNO_3$ on reacting with $AgNO_2$ in H_2O?
(1) $NaCl$ (2) KCl (3) $NaCN$ (4) $(NH^+)Cl$
Ans. (3)
Sol. An acidic which contain F^- or Cl^- ions give strong reducing properties. Thus, hypohalo/nitrous acid is a good reducing agent in comparison to F^- or Cl^- ions. Acid and nitrous, SO_2 formally, $AgNO_2$ is insoluble and $AgCl$, $AgBr$, AgI are insoluble in $AgNO_2$ solution.

6. $[CoCl_4]$ is a tetrahedral complex. The electronic configuration of central metal ion is, $t_{2g}^6 e_g^1$ that the value of Δ_0 is equal to unpaired electrons.
Ans. (2)
Sol. Co^{2+} : $3d^7$ ion
Accordingly Co^{2+} electronic configuration of $[Co^{2+}$ is $t_{2g}^6 e_g^1$
$\Delta_0 = P$; $\Delta_0 = 3$
Δ_0 = number of electrons = 3 + 2 = 5

7. Which of the following is/are true?
(1) $[Co(NH_3)_6]^{3+}$ is diamagnetic
(2) $[Co(NH_3)_6]^{3+}$ is paramagnetic
(3) $[Co(NH_3)_6]^{3+}$ is more stable than $[Co(H_2O)_6]^{3+}$
(4) $[Co(NH_3)_6]^{3+}$ is more stable than $[Co(H_2O)_6]^{3+}$
Ans. (1)
Sol. Co^{3+} : $3d^6$ ion
Accordingly Co^{3+} electronic configuration of $[Co^{3+}$ is $t_{2g}^6 e_g^0$
$\Delta_0 = P$; $\Delta_0 = 4$
Δ_0 = number of electrons = 3 + 3 = 6

8. A β -D- α -D-fructofuranose is obtained by treating 1 M CH_3OH and 0.5 M CH_3COOH, if the pH of CH_3COOH solution is 4.75. Then calculate pH of the solution.
(1) 5.75 (2) 3.75 (3) 2.75 (4) 3.75
Ans. (3)
Sol. For acetic buffer solution

$$pH = pKa + \log\frac{[salt]}{[acid]}$$

$$= 4.75 + \log\frac{0.5}{1}$$

$$= 4.75 + (-0.3)$$

$$= 3.75$$

	Liquid	Solid
(A)	S	(iii) Electrodic refining
(B)	P	(iv) Sublimation
(C)	Q	(i) Roasting & calcination
(D)	R	(ii) Blast furnace

Ans. (A) – (iii), (B) – (iv), (C) – (i), (D) – (ii)

9. The wavelength of the first of Paschen series is 720 nm. The wavelength of 2nd line of this series is
(1) 1080 nm (2) 1440 nm (3) 1920 nm (4) 960 nm
Ans. (1)
Sol. $\frac{1}{\lambda} = R\left(\frac{1}{3^2} - \frac{1}{4^2}\right)$
For the 2nd of Paschen series, $n_1 = 3$, $n_2 = 5$

$$\frac{1}{\lambda_2} = R\left(\frac{1}{3^2} - \frac{1}{5^2}\right) \quad \text{(1)}$$

$$\frac{1}{\lambda_1} = R\left(\frac{1}{3^2} - \frac{1}{4^2}\right) \quad \text{(2)}$$

$$\frac{\lambda_2}{\lambda_1} = \frac{9/16}{16/225} = \frac{225}{144}$$

For the 1st of Paschen series, $n_1 = 3$, $n_2 = 4$

$$\frac{\lambda_2}{720} = \frac{225}{144}$$

$$\lambda_2 = \frac{225 \times 720}{144} = 1080 \text{ nm}$$

10. Which of the following data are corresponding to ionic-water/aqueous reaction at 298K
(1) $\Delta H = -ve$; $\Delta S = -ve$
(2) $\Delta H = +ve$; $\Delta S = -ve$
(3) $\Delta H = -ve$; $\Delta S = +ve$
(4) $\Delta H = +ve$; $\Delta S = +ve$
Ans. (3)
Sol. For non-spontaneous reaction : $\Delta G > 0$
$\Delta G = \Delta H - T\Delta S$
$\Delta G = (-ve) - (298 \times +ve)$ or $\Delta G = (\Delta H + 298\Delta S)$
$\Delta H = -ve$; $\Delta S = +ve$
$\Delta G = -ve - (298 \times +ve) = -(ve) - -ve$
$\Delta G = -ve$ (spontaneous)
$\Delta G = +ve$ (spontaneous)
$\Delta G = -ve - (298 \times -ve) = -(ve) - -ve$
$\Delta G = -ve$ (spontaneous)
$\Delta G = +ve$ (spontaneous)
$\Delta G = -ve - (298 \times +ve) = -(ve) - -ve$
$\Delta G = -ve$ (spontaneous)
$\Delta G = +ve$ (spontaneous)

11. Statement-1 : The solubility of a solution decreases with decreases in amount non-volatile solute.
Statement-2 : Freezing point of the solution is less than that of the solvent.
(1) Both statement 1 and 2 are correct
(2) Statement 1 is incorrect but statement 2 is correct.
(3) Statement 1 is incorrect but statement 2 is correct
(4) Both statement 1 & 2 are incorrect
Ans. (4)

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Ans. $\frac{1}{2}[C_2O_4^{2-}] = [H_2O]$
Sol. $\Delta_r G^\circ = -RT \ln K$; Hard Freezing Point ?
$\Rightarrow$ Depression in Freezing Point occurs
12. 30g NaOH is dissolved in water to get 500 ml of solution. what concentration of the solution is required to get prepare 500 ml of 0.1 M NaOH solution ?
(1) 0.6 M
(2) 0.8 M
(3) 0.4 M
(4) 0.2 M
Ans. (3)
Sol. Given data
$M_1 = ?$
$V_1 = ?$
$M_2 = 0.1$
$V_2 = 500$ ml
$M_1V_1 = M_2V_2$
$M_1 \times 500 = 0.1 \times 500$
$M_1 = 0.1$
$\Rightarrow$ The NaOH $\Rightarrow$ $V = V_1 + V_2 = 500$
$M = 0.1$
$M_1 = 0.4$
13. Match Column-I with Column-II

	Column-I		Column-II
(A)	Borax acid	(P)	$Na_2B_4O_7$
(B)	Chlorophyll	(Q)	$Mg(NO_3)_2$
(C)	Magnesium nitrate	(R)	Mg^{2+}
(D)	Epsom salt	(S)	$MgSO_4$

(1) A – Q ; B – R ; C – P ; D – S
(2) A – P ; B – R ; C – Q ; D – S
(3) A – P ; B – R ; C – Q ; D – S
(4) A – P ; B – R ; C – P ; D – S
Ans. (3)
Sol. Theory Based

14. Cmpd. of X-ray frequency (ν) vs atomic number (Z) is linear. Find the value of ν.
(1) 10 (2) 11 (3) 12 (4) 1
Ans. (1)
Sol. $\nu = a(Z - b)$

$$\frac{\nu_1}{\nu_2} = \frac{Z_1 - b}{Z_2 - b}$$

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15. Which of the following statements are correct regarding Schlenck equation, $2X \rightleftharpoons MX_2 + MX_3$
(A) Slope of graph between 1/X vs $\frac{1}{\sqrt{[MX_2]}}$ is $\frac{1}{\sqrt{K}}$
(B) On increasing K_{sp} rate increases
(C) On increasing temperature, temperature coefficient decreases.
(D) Temperature coefficient is ratio of rate constant at two consecutive energy barrier increases.
(1) (A), (B), (C) (2) (A), (C), (D)
(3) (A), (B), (D) (4) (A), (B), (C) & (D)
Ans. (1)
16. First-order order of oxidant character
(A) H^+ (1)
(B) CrO_4^{2-} (1)
(C) Cl^- (0)
(1) A, B and C (2) A & C only (3) A, B & C (4) B & C only
Ans. (3)
17. Fluorine gas
(1) Great warming factor
(2) Fertilizer without producing metal-fluoro carbon.
(3) Weak pollutant
(4) Non-toxicant / potable antifreezer factor
Ans. (2)
Sol. Fluorine gas fertilizer without producing chloro-fluoro carbon.
18.

Ans. (2)(B-isomer)
Sol.

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19.

Ans. (3)
Sol.

20. Correct correlation order of decreasing structure is

(1) A > B > C (2) B > A > C (3) C > A > B (4) B > C > A
Ans. (3)
Sol. (C) is most stable as it has –ve charge on oxygen, (A) is less stable than (C) but more stable than (B) because the –ve charge in (A) is being delocalized on oxygen atom through resonance.

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21.

Ans. (2)
Sol.

22. The unsaturated ester of Wittig is a cyclic alkene of
(1) $C_6H_8O_2$ (2) $C_7H_8O_2$ (3) $C_8H_8O_2$ (4) C_8H_8O
Ans. (2)
Sol. The wittig acids medium or ion strong alkaline medium chemoselective bond hydrolysis that's why the Phd phosphoketone bond is not cleavage of the $C_6H_8O_2$.
23.

Ans. (3)
Sol.

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24. Statement-1 : Nonadsorbate is one of the reactants/products in heterogeneous catalysis.
Statement-2 : Nonadsorbate is one that the alpha-anomeric alpha monomer ions and the pelvic suffers from depression.
(1) Both Statement-1 and Statement-2 are correct.
(2) Statement-1 is correct but Statement-2 is incorrect.
(3) Statement-1 is incorrect but Statement-2 is correct.
(4) Both Statement-1 and Statement-2 are incorrect.
Ans. Fact from NCERT, solved 2 stages, not 4(2)
25. α -A is approximately
Ans. (3)
Sol.

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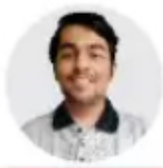

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