

CHEMISTRY

SECTION – A

Multiple Choice Questions: This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Choose the correct answer :

1. Radius of 2nd orbit of Li²⁺ ion is x, radius of 3rd orbit of Be³⁺ will be

(1) $\frac{27x}{16}$ (2) $\frac{16x}{27}$

(3) $\frac{4}{3}x$ (4) $\frac{3}{4}x$

Answer (1)

Sol. $r_{Li^{2+}} = r_0 \times \frac{2^2}{3} = \frac{4r_0}{3} = x$

$\Rightarrow r_0 = \frac{3x}{4}$

$r_{Be^{3+}} = r_0 \times \frac{3^2}{4} = \frac{9r_0}{4} = \frac{9 \times 3 \times x}{4 \times 4}$

$r_{Be^{3+}} = \frac{27x}{16}$

2. If X-atoms are present at alternate corners and at body centre of a cube and Y-atoms are present at 1/3rd of face centres then what will be empirical formula?

- (1) X₂·5Y
- (2) X₅Y₂
- (3) X_{1.5}Y₂
- (4) X₃Y₂

Answer (4)

Sol. Number of X-atoms per unit cell = $1 + 4 \times \frac{1}{8}$
 $= \frac{3}{2}$

Number of Y-atoms per unit cell = $2 \times \frac{1}{2} = 1$

∴ Empirical formula of the solid is X₃Y₂.

3. Thionyl chloride on reaction with white phosphorous gives compound A. A on hydrolysis gives compound B which is dibasic. Identify A and B.

- (1) A– PCl₅, B–H₃PO₂ (2) A–P₄O₆, B–H₃PO₄
- (3) A–POCl₃, B–H₃PO₄ (4) A–PCl₃, B–H₃PO₃

Answer (4)



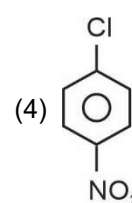
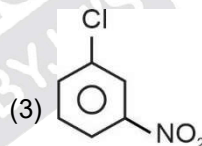
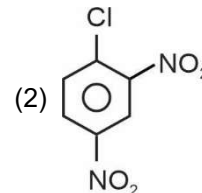
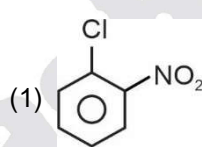
(A)



(B)

Correct answer is (4).

4. Which of the following shows least reactivity towards nucleophilic substitution reaction



Answer (3)

Sol. Aryl halides containing E.W.G at ortho or para position are more reactive than meta isomer towards nucleophilic substitution reaction.

5. The correct decreasing order of positive electron gain enthalpy for the following inert gases

He, Ne, Kr, Xe

- (1) He > Ne > Kr > Xe
- (2) He > Ne > Xe > Kr
- (3) He > Xe > Ne > Kr
- (4) Ne > Kr > Xe > He

Answer (4)

Sol. Correct order is Ne > Kr > Xe > He

6. Which of the following reaction is not involved in the extraction of copper metal?

- (1) $\text{CuFeS}_2 \xrightarrow{\text{partial roasting}} \text{Cu}_2\text{S} + \text{FeS} + \text{SO}_2 + \text{Cu}_2\text{O}$
- (2) $\text{Cu}_2\text{S} + 2\text{Cu}_2\text{O} \rightarrow 6\text{Cu} + \text{SO}_2$
- (3) $\text{FeO} + \text{SiO}_2 \rightarrow \text{FeSiO}_3$
- (4) $2\text{Fe}_2\text{O}_3 + 3\text{C} \rightarrow 2\text{Fe} + 3\text{CO}_2$

Answer (4)

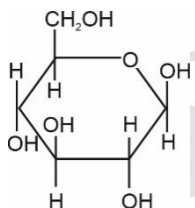
Sol. Option (4) contains the reaction involved in the reduction of hematite ore not in copper extraction.

7. Match the **List-I** and **List-II**.

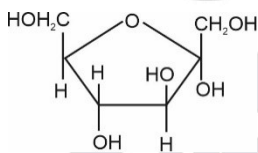
List-I

List-II

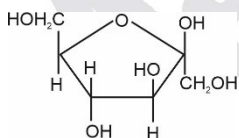
(A) α -D-Glucopyranose (1)



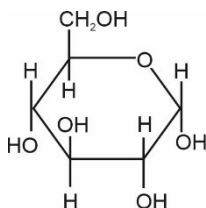
(B) β -D-Glucopyranose (2)



(C) α -D-Fructofuranose (3)



(D) β -D-Fructofuranose (4)

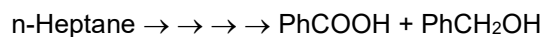


- (1) A \rightarrow 4; B \rightarrow 1; C \rightarrow 2; D \rightarrow 3
- (2) A \rightarrow 1; B \rightarrow 4; C \rightarrow 3; D \rightarrow 2
- (3) A \rightarrow 2; B \rightarrow 3; C \rightarrow 4; D \rightarrow 1
- (4) A \rightarrow 1; B \rightarrow 3; C \rightarrow 2; D \rightarrow 4

Answer (1)

Sol. The correct options is (1).

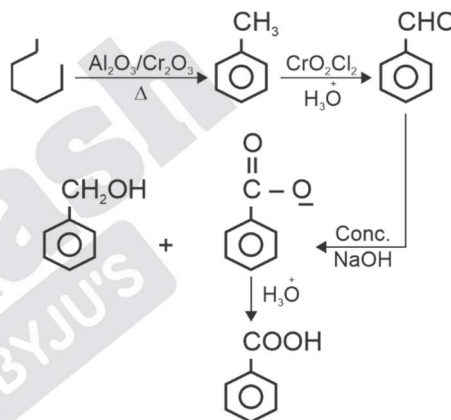
8. Identify the correct sequence of reagents for the following conversion.



- (1) $\text{Al}_2\text{O}_3/\text{Cr}_2\text{O}_3$, $\text{CrO}_2\text{Cl}_2 / \text{H}_3\text{O}^+$
Conc. NaOH, H_3O^+
- (2) $\text{Al}_2\text{O}_3/\text{Cr}_2\text{O}_3$, $\text{CrO}_2\text{Cl}_2 / \text{H}_3\text{O}^+$
 H_3O^+ , Conc. NaOH
- (3) CrO_2Cl_2 , Al_2O_3 ,
Conc. NaOH, H_3O^+
- (4) Sn/HCl, NaOH
Conc. CrO_2Cl_2 , HNO₃

Answer (1)

Sol.



9. Which of the following option contains the correct match?

Table-1 (Elements)

Table-2 (Flame colour)

- | | |
|--------|-----------------|
| (A) K | (P) Violet |
| (B) Ca | (Q) Brick red |
| (C) Sr | (R) Apple green |
| (D) Ba | (S) Crimson red |
- (1) (A) \rightarrow P, (B) \rightarrow Q, (C) \rightarrow S, (D) \rightarrow R
 - (2) (A) \rightarrow Q, (B) \rightarrow P, (C) \rightarrow S, (D) \rightarrow R
 - (3) (A) \rightarrow R, (B) \rightarrow S, (C) \rightarrow P, (D) \rightarrow Q
 - (4) (A) \rightarrow S, (B) \rightarrow R, (C) \rightarrow Q, (D) \rightarrow P

Answer (1)

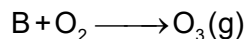
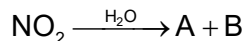
Sol. K \rightarrow Violet

Ca \rightarrow Brick red

Sr \rightarrow Crimson red

Ba \rightarrow Apple green

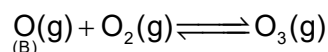
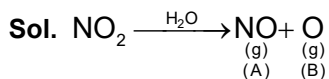
13. Consider the following sequence of reactions



A is?

- (1) N_2O (2) NO
 (3) N_2O_3 (4) N_2

Answer (2)

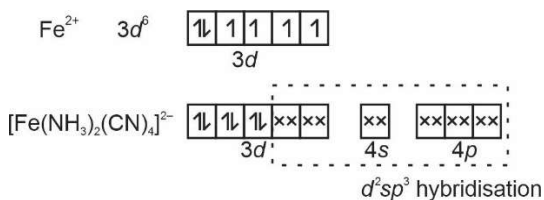
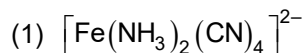


14. Which one of the following complexes is paramagnetic in nature?

- (1) $[\text{Fe}(\text{NH}_3)_2(\text{CN})_4]^{2-}$
 (2) $[\text{Ni}(\text{CN})_4]^{2-}$
 (3) $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$
 (4) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$

Answer (3)

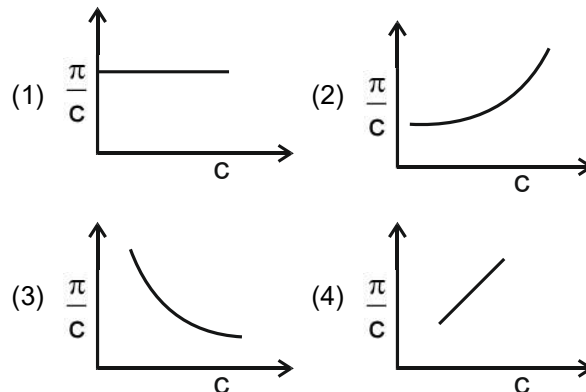
Sol.



Complex is diamagnetic

- (2) $[\text{Ni}(\text{CN})_4]^{2-}$ dsp^2 hybridisation, diamagnetic
 (3) $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ sp^3d^2 hybridisation, paramagnetic
 (4) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ d^2sp^3 hybridisations, diamagnetic

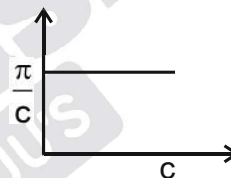
15. Which of the following options contains the correct graph between $\frac{\pi}{c}$ and c at constant temperature? [where π is osmotic pressure and c is concentration of solute]



Answer (1)

Sol. $\pi = cRT$

$$\therefore \frac{\pi}{c} = RT$$



\therefore The value of $\frac{\pi}{c}$ is constant at constant temperature.

16. Which of the following is correct about antibiotics.
- (1) Antibiotics are the substances that promote the growth of microorganism
 (2) Penicillin has bacteriostatic effect
 (3) Erythromycin has Bactericidal effect
 (4) These are synthesized artificially

Answer (4)

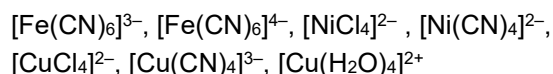
Sol. Antibiotics are synthesized artificially.

17.
 18.
 19.
 20.

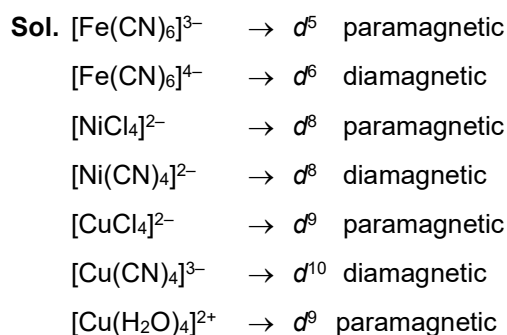
SECTION - B

Numerical Value Type Questions: This section contains 10 questions. In Section B, attempt any five questions out of 10. The answer to each question is a **NUMERICAL VALUE**. For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the second decimal place; e.g. 06.25, 07.00, -00.33, -00.30, 30.27, -27.30) using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.

21. How many of the following complex(es) is(are) paramagnetic:

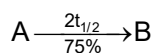
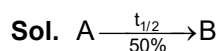


Answer (4)



22. For a first order reaction $A \rightarrow B$, $t_{1/2}$ is 30 min. Then find the time (in minutes) required for 75% completion of reaction

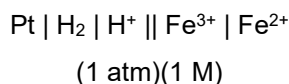
Answer (60.00)



\therefore In 75% completion, two $t_{1/2}$ will be required.

\therefore Time required will be 60 minutes.

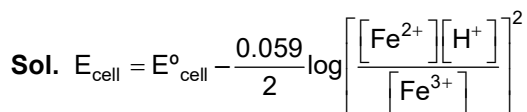
23. Consider the following cell representation:



Then find the ratio of concentration of Fe^{2+} to Fe^{3+}

[Given: $E_{\text{cell}} = 0.712$ and $E_{\text{Cell}}^{\circ} = 0.771$]

Answer (10.00)

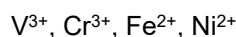


$$0.712 = 0.771 - \frac{0.059}{2} \times 2 \log \left[\frac{[\text{Fe}^{2+}]}{[\text{Fe}^{3+}]} \right]$$

$$-0.059 = -0.059 \log \left[\frac{[\text{Fe}^{2+}]}{[\text{Fe}^{3+}]} \right]$$

$$\therefore \left[\frac{[\text{Fe}^{2+}]}{[\text{Fe}^{3+}]} \right] = 10$$

24. How many of the following ions/elements has/have same value of spin magnetic moment?



Answer (2)

Sol. $\text{V}^{3+} = d^2 \rightarrow 2$ unpaired electrons

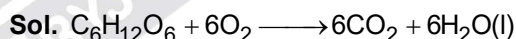
$\text{Cr}^{3+} = d^3 \rightarrow 3$ unpaired electrons

$\text{Fe}^{2+} = d^6 \rightarrow 4$ unpaired electrons

$\text{Ni}^{2+} = d^8 \rightarrow 2$ unpaired electrons

25. An athlete is given 100 g of glucose energy equivalent to 1560 kJ. He utilizes 50% of this gained energy in an event. Enthalpy of evaporation of H_2O is 44 kJ/mole. In order to avoid storage of energy in body, mass of water (in g) he would need to perspire is:

Answer (319)



$$h = \frac{100}{180}$$

$$\therefore \text{Energy needed to perspire water} = 1560 \times \frac{1}{2} = 780 \text{ kJ}$$

$$\therefore \text{Moles of water evaporated} = \frac{780}{44} \text{ mole}$$

$$\therefore \text{Weight of water evaporated} = \frac{780}{44} \times 18 = 319 \text{ g}$$

Assuming water is contained in the body.

26.
27.
28.
29.
30.