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**JEE MAIN (JAN) 2023 (29-01-2023-Session-1)**

*Memory Based Question Paper*

**CHEMISTRY**



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## JEE-Mains-29-01-2023 (Memory Based) [Morning Shift]

### Chemistry

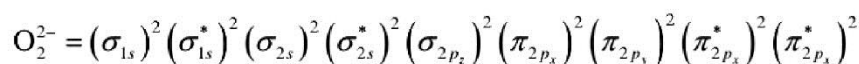
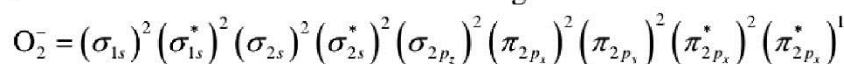
**Question:** Which of the following is paramagnetic in nature?

**Options:**

- (a)  $\text{Na}_2\text{O}_2$
- (b)  $\text{KO}_2$
- (c) Both (a) and (b)
- (d) None of the above

**Answer: (b)**

**Solution:** The molecular electronic configuration of



Since  $\text{O}_2^-$  has unpaired electron in its antibonding molecular orbital, thus it is paramagnetic and oppositely  $\text{O}_2^{2-}$  is diamagnetic.

**Question:** Arrange the following (increasing order of  $\text{PK}_a$ )

Phenol, 2,4-dinitrophenol, 2,4,5-trimethyl phenol, 4-nitrophenol, 4-chlorophenol

**Options:**

- (a) Phenol < 2,4-dinitrophenol < 2,4,5-trimethyl phenol < 4-nitrophenol < 4-chlorophenol
- (b) 2,4-dinitrophenol < Phenol < 2,4,5-trimethyl phenol < 4-nitrophenol < 4-chlorophenol
- (c) 2,4,5-trimethyl phenol < 4-chlorophenol < Phenol < 2,4-dinitrophenol < 4-nitrophenol
- (d) 2,4-dinitrophenol < 4-nitrophenol < Phenol < 4-chlorophenol < 2,4,5-trimethyl phenol

**Answer: (d)**

**Solution:**

Compound	$\text{PK}_a$ value
Phenol	9.98
2,4-dinitrophenol	4.114
2,4,5-trimethyl phenol	10.57
4-nitrophenol	7.14
4-chlorophenol	10.07

**Question:** At low pressure Van der Waals equation will be

**Options:**

(a)  $\left[ 1 + \frac{a}{RTV} \right]$

(b)  $\left[ 1 - \frac{RTV}{a} \right]$

(c)  $\left[1 - \frac{a}{RTV}\right]$

(d)  $\left[1 + \frac{RTV}{a}\right]$

**Answer: (c)**

**Solution:**

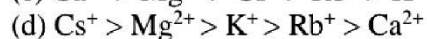
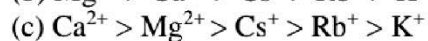
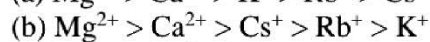
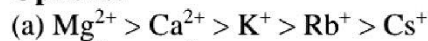
$$pV + \frac{a}{v} = RT$$

$$\therefore \frac{pV}{RT} + \frac{a}{RTV} = 1 \quad \therefore Z = \frac{pV}{RT}$$

$$= \left[1 - \frac{a}{RTV}\right]$$

**Question:** Order of Hydration:  $Mg^{2+}$ ,  $K^+$ ,  $Rb^+$ ,  $Cs^+$ ,  $Ca^{2+}$

**Options:**



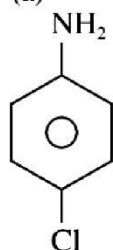
**Answer: (a)**

**Solution:**  $Mg^{2+} > Ca^{2+} > K^+ > Rb^+ > Cs^+$

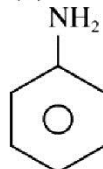
**Question:** Which compound will give both lassaige test of nitrogen and halogen?

**Options:**

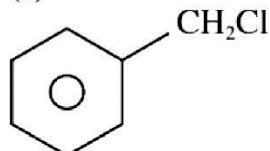
(a)



(b)



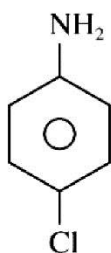
(c)



(d) None of these

**Answer: (a)**

**Solution:**



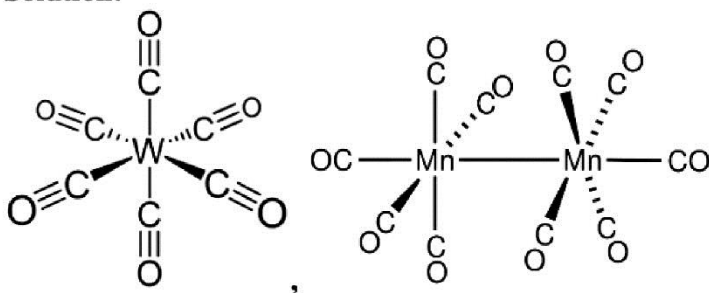
**Question:** Number of Bridging CO in  $W(CO)_6$  and  $Mn_2(CO)_{10}$

**Options:**

- (a) 0
- (b) 1
- (c) 2
- (d) 3

**Answer: (a)**

**Solution:**



**Question:** Order of bond dissociation enthalpy of  $Cl_2$ ,  $Br_2$ ,  $I_2$ ,  $F_2$

**Options:**

- (a)  $I_2 > Br_2 > Cl_2 > F_2$
- (b)  $Cl_2 > Br_2 > F_2 > I_2$
- (c)  $Br_2 > I_2 > F_2 > Cl_2$
- (d)  $F_2 > Cl_2 > Br_2 > I_2$

**Answer: (b)**

**Solution:** Fluorine which is an exception for this order, due to the high electronegativity of fluorine atom it tends to break the bond present between the fluorine molecule hence requiring less energy for the breaking of the bond which results in requiring low bond dissociation enthalpy.

**Question:** Which of the following ions does not liberate hydrogen gas on reaction with dilute acids?

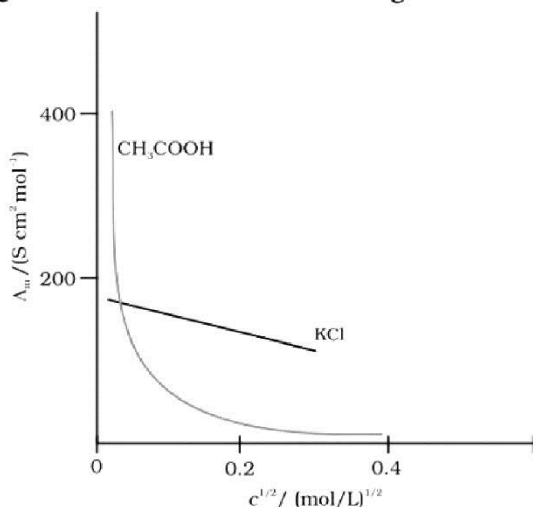
**Options:**

- (a)  $Cr^{2+}$
- (b)  $Mn^{2+}$
- (c)  $Ti^{2+}$
- (d)  $V^{2+}$

**Answer: (b)**

**Solution:**  $Mn^{2+}$  does not liberate hydrogen gas on reaction with dilute acids. +2 oxidation state of Mn is very stable due to exactly half filled electronic configuration.

**Question:** Which of the following is incorrect statement about the following graph?



**Options:**

- (a)  $\lambda^{\circ}$ m value of weak electrolyte can be determined by extrapolating the graph
- (b)  $\lambda^{\circ}$ m value of weak electrolyte cannot be determined by extrapolating the graph
- (c)  $\lambda^{\circ}$ m value of strong electrolyte can be determined by extrapolating as linear graph is obtained
- (d) All of these

**Answer: (a)**

**Solution:** For weak electrolyte molar conductivity at infinite dilution cannot be determined experimentally and by extrapolation because graph is not linear, maximum value of molar conductivity at infinite dilution cannot be obtained.

**Question:** Match the following.

Reaction (Column-I)	Reagents (Column-II)
(A) Hofmann Degradation	(i) Conc KOH
(B) Clemmensen reaction	(ii) NaOH, Br <sub>2</sub>
(C) Cannizzaro reaction	(iii) Zinc-Hg, HCl
(D) Reimer-Tiemann reaction	(iv) CHCl <sub>3</sub> , NaOH

**Options:**

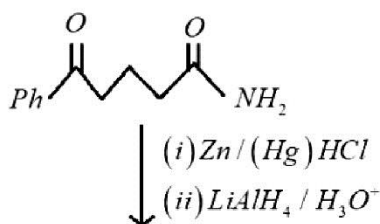
- (a) A – (ii); B – (i); C – (iii); D – (iv)
- (b) A – (iii); B – (i); C – (ii); D – (iv)
- (c) A – (iv); B – (iii); C – (ii); D – (i)
- (d) A – (ii); B – (iii); C – (i); D – (iv)

**Answer: (d)**

**Solution:**

Reaction (Column-I)	Reagents (Column-II)
(A) Hofmann Degradation	(i) NaOH, Br <sub>2</sub>
(B) Clemmensen reaction	(ii) Zinc-Hg, HCl
(C) Cannizzaro reaction	(iii) Conc KOH
(D) Reimer-Tiemann reaction	(iv) CHCl <sub>3</sub> , NaOH

**Question:**

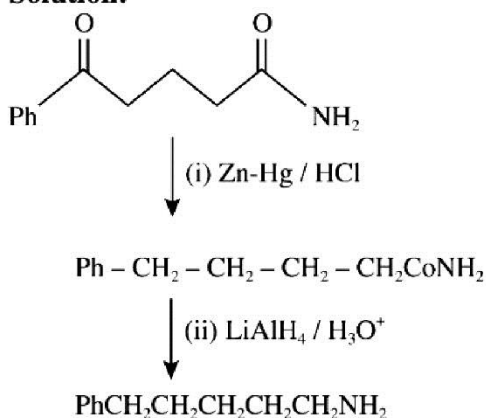


**Options:**

- (a)  $\text{PhCOCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$
- (b)  $\text{PhCH}_2\text{CH}_2\text{CH}_2\text{NH}_2$
- (c)  $\text{PhCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$
- (d)  $\text{PhCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$

**Answer: (d)**

**Solution:**



**Question:** Number of millimoles of  $\text{Ca(OH)}_2$  in 100 mL solution, given  $\text{pH} = 12$

**Options:**

- (a) 1
- (b) 0.5
- (c) 0.05
- (d) 2

**Answer: (b)**

**Solution:**

$$\text{pH} = 12$$

$$\text{pOH} = 14 - \text{pH} = 14 - 12 = 2$$

$$\therefore [\text{OH}^-] = 10^{-2} \text{ M}$$

$$\therefore [\text{Ca(OH)}_2] = 0.5 \times 10^{-2} \text{ M}$$

Mili moles of  $\text{Ca(OH)}_2$  in solution

$$= \text{MV (in mL)}$$

$$= 0.5 \times 10^{-2} \times 100 = 0.5$$

**Question:**  $K_f = 10^3$ ,  $K_b = 10^2$  find  $\Delta G^\circ$  at  $\Delta T = 27^\circ\text{C}$

**Options:**

- (a)  $-700 \text{ R}$
- (b)  $-500 \text{ R}$
- (c)  $-690 \text{ R}$
- (d)  $-400 \text{ R}$

**Answer: (c)**

**Solution:**

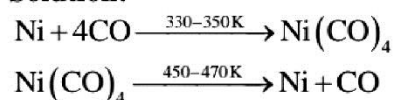
$$\begin{aligned}\Delta G^{\circ} &= -2.303 RT \log K_c \\ &= -2.303 R \times 300 \log \frac{K_F}{K_b} \\ &= -2.303 R \times 300 \log \frac{10^3}{10^2} \\ &= -2.303 R \times 300 \log_{10} 10 \\ &= -2.303 R \times 300 \times 1 = -690 R\end{aligned}$$

**Question:** Which of the following metal is purified by Mond Process

**Options:**

- (a) Ti
- (b) Ge
- (c) Ni
- (d) Zr

**Answer: (c)**

**Solution:**


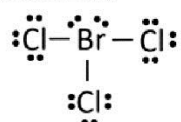
**Question:** Which of the following is not odd electron?

NO, NO<sub>2</sub>, NO<sub>2</sub><sup>+</sup>, ClO<sub>2</sub>, BrCl<sub>3</sub>

**Options:**

- (a) BrCl<sub>3</sub>
- (b) NO
- (c) NO<sub>2</sub>
- (d) NO<sub>2</sub><sup>+</sup> and ClO<sub>2</sub>

**Answer: (a)**

**Solution:**


**Question:** Which of the following compound used as Narrow spectrum antibiotics?

**Options:**

- (a) Penicillin
- (b) Gentamycin
- (c) Erythromycin
- (d) All of these

**Answer: (d)**

**Solution:** Narrow spectrum antibiotics are used against only limited pathogens. Penicillin, gentamycin and erythromycin are used to treat only certain pathogens such as Staphylococci, Clostridia, Streptococci and hence fall under the class of narrow spectrum antibiotics.

**Question:** Select the correct statement among the following

**Options:**

- (a) Photochemical smog has high concentration of oxidising agent
- (b) Classical smog has high concentration of oxidising agent
- (c) Classical smog contains  $\text{NO}_2$
- (d) None of these

**Answer: (a)**

**Solution:**

**Smog:** The word smog is derived from smoke and fog.

This is the most common example of air pollution that occurs in many cities throughout the world.

There are two types of smog:

- (a) Classical smog occurs in cool humid climate. It is a mixture of smoke, fog and sulphur dioxide. Chemically it is a reducing mixture and so it is also called as reducing smog.
  - (b) Photochemical smog occurs in warm, dry and sunny climate. The main components of the photochemical smog result from the action of sunlight on unsaturated hydrocarbons and nitrogen oxides produced by automobiles and factories. Photochemical smog has high concentration of oxidising agents and is, therefore, called as oxidising smog.
- Formation of photochemical smog, when fossil fuels are burnt, a variety of pollutants are emitted into the earth's

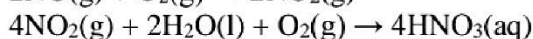
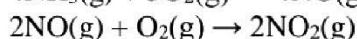
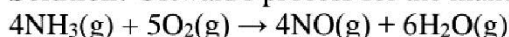
**Question:** In Ostwald's process Ammonia is oxidized to give A and oxidised again to give B and forms an oxoacid of nitrogen. B gives positive brown ring test. What are A and B?

**Options:**

- (a) A = NO, B =  $\text{NO}_2$
- (b) A =  $\text{NO}_2$ , B = NO
- (c) A =  $\text{HNO}_2$ , B = NO
- (d) A =  $\text{HNO}_2$ , B =  $\text{NO}_2$

**Answer: (b)**

**Solution:** Ostwald's process for the manufacture of nitric acid.



**Question:** Which of the following tank use to store hydrogen?

**Options:**

- (a) High pressure tank
- (b) Low pressure tank
- (c) High temperature tank
- (d) Low temperature tank

**Answer: (a)**

**Solution:** Hydrogen can be stored physically as either a gas or a liquid. Storage of hydrogen as a gas typically requires high-pressure tanks (350-700 bar [5,000-10,000 psi] tank pressure). Storage of hydrogen as a liquid requires cryogenic temperatures because the boiling point of hydrogen at one atmosphere pressure is  $-252.8^\circ\text{C}$ .

**Question:** The compound formed in borax bead test, of  $\text{CuSO}_4$  in oxidizing flame is \_\_\_\_\_

**Options:**

- (a)  $\text{Cu}(\text{BO}_2)_2$
- (b)  $\text{Cu}_3\text{B}_2$
- (c)  $\text{Cu}(\text{BO})_2$
- (d)  $\text{Cu}(\text{BO}_3)_2$



**Answer: (a)**

