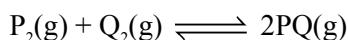




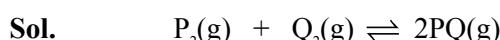
55. Consider the following gaseous equilibrium in a closed container of volume "V" at T(K).



2 moles each of  $P_2(g)$ ,  $Q_2(g)$  and  $PQ(g)$  are present at equilibrium. Now one mole each of ' $P_2$ ' and ' $Q_2$ ' are added to the equilibrium keeping the temperature at T(K). The number of moles of  $P_2$ ,  $Q_2$  and  $PQ$  at the new equilibrium, respectively, are -

(1) 2.67, 2.67, 2.67      (2) 1.21, 2.24, 1.56  
 (3) 1.66, 1.66, 1.66      (4) 2.56, 1.62, 2.24

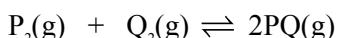
**Ans. (1)**



$$t = t_{eq} \quad 2 \text{ mole} \quad 2 \text{ mole} \quad 2 \text{ mole}$$

$$K_{eq} = \frac{2^2}{2.2} = 1$$

Now 1 mole of each  $P_2$  and  $Q_2$  is added  
 So reaction will move in forward direction



$$t = t'_{eq.} \quad 3 - x \quad 3 - x \quad 2 + 2x$$

$$K_c = 1 = \frac{(2 + 2x)^2}{(3 - x)(3 - x)}$$

$$\frac{2 + 2x}{3 - x} = 1$$

$$2 + 2x = 3 - x$$

$$x = \frac{1}{3}$$

At new equilibrium :

$$\text{Moles of } P_2 = \frac{8}{3} = 2.67$$

$$\text{Moles of } Q_2 = \frac{8}{3} = 2.67$$

$$\text{Moles of } PQ = \frac{8}{3} = 2.67$$

56. Pair of species among the following having same bond order as well as paramagnetic character will be-

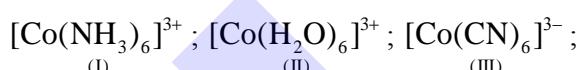
(1)  $O_2^+, N_2^{2-}$       (2)  $O_2^-, N_2^+$   
 (3)  $O_2^+, N_2^-$       (4)  $O_2^-, N_2^-$

**Ans. (3)**

**Sol.**

Species	Bond order	Magnetic Nature
$O_2^+$	2.5	Paramagnetic
$O_2^-$	1.5	Paramagnetic
$O_2^+$	2.5	Paramagnetic
$N_2^-$	2.5	Paramagnetic
$N_2^{2-}$	2	Paramagnetic

57. The wavelength of light absorbed for the following complexes are in the order



$$(1) \text{III} < \text{I} < \text{II} < \text{IV} < \text{V}$$

$$(2) \text{III} < \text{I} < \text{IV} < \text{V} < \text{II}$$

$$(3) \text{III} < \text{IV} < \text{I} < \text{II} < \text{V}$$

$$(4) \text{III} < \text{I} < \text{IV} < \text{II} < \text{V}$$

**Ans. (4)**

**Sol.** Wavelength of light absorbed increases as C.F.S.E of complex decreases.

$[\text{Co}(\text{CN})_6]^{3-}$  has maximum CFSE

$[\text{CoF}_6]^{3-}$  has least CFSE

Ligand field strength  $\uparrow$ ; C.F.S.E  $\uparrow$

Correct wavelength order.

$$\text{V} > \text{II} > \text{IV} > \text{I} > \text{III}$$

58. One mole of  $\text{Cl}_2(g)$  was passed into 2 L of cold 2M KOH solution. After the reaction, the concentrations of  $\text{Cl}^-$ ,  $\text{ClO}^-$  and  $\text{OH}^-$  are respectively (assume volume remains constant)

(1) 0.75 M, 0.75 M, 1 M  
 (2) 0.5 M, 0.5 M, 0.5 M  
 (3) 0.5 M, 0.5 M, 1 M  
 (4) 1 M, 1 M, 1 M

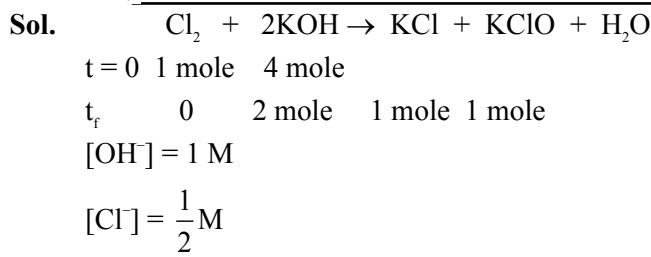
**Ans. (3)**



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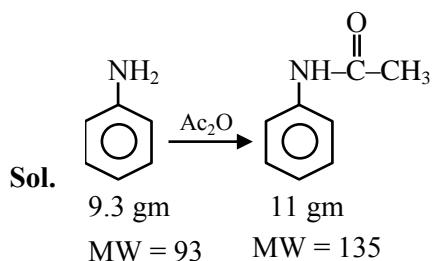
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59. A student has planned to prepare acetanilide from aniline using acetic anhydride. The student has started from 9.3g of aniline. However, the student has managed to obtain 11 g of dry acetanilide. The % yield of this reaction is :-

(1) 81.5% (2) 97.5%  
(3) 59.5% (4) 72.5%

Ans. (1)



$$n = \frac{9.3}{93} = 0.1 \quad n = \frac{11}{135} = 0.08148$$

$$\% \text{ yield} = \frac{0.08148}{0.1} \times 100 = 81.5\%$$

60. Find out the statements which are **not** true.

A. Resonating structure with more number of covalent bonds and lesser charge separation are more stable.

B. In electromeric effect, an unsaturated system shows + E effect with nucleophile and -E effect with electrophile.

C. Inductive effect is responsible for high melting point, boiling point and dipole moment of polar compounds.

D. The greater the number of alkyl groups attached to the doubly bonded carbon atoms, higher is the heat of hydrogenation.

E. Stability of carbanion increases with the increase in s-character of the carbon carrying the negative charge.

Choose the **correct** answer from the options given below.

(1) A, D & E only (2) B, D & E only  
(3) A, C & D only (4) B & D only

Ans. (4)

Sol. Statement B & D are not true

61. The correct order of C, N, O and F in terms of second ionisation potential is

(1) F < N < C < O (2) C < O < N < F  
(3) C < N < F < O (4) C < F < N < O

Ans. (2)

Sol. To compare second ionization potential configuration of mono-cation is observed

C <sup>+</sup>	N <sup>+</sup>	O <sup>+</sup>	F <sup>+</sup>
[He] 2s <sup>2</sup> sp <sup>1</sup>	[He] 2s <sup>2</sup> 2p <sup>2</sup>	[He] 2s <sup>2</sup> 2p <sup>3</sup> Half-filled stable.	[He] 2s <sup>2</sup> 2p <sup>4</sup>

2<sup>nd</sup> IE order

O > F > N > C

62. In the Group analysis of cations, Ba<sup>2+</sup> & Ca<sup>2+</sup> are precipitated respectively as

(1) sulphide & sulphide  
(2) hydroxide & carbonate  
(3) carbonate & carbonate  
(4) chromate & sulphide

Ans. (3)

Sol. To identify Ba<sup>2+</sup> & Ca<sup>2+</sup>

Reagent (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub> + NH<sub>4</sub>Cl is used BaCO<sub>3</sub> & CaCO<sub>3</sub> are obtained as precipitates

63. The wavelength of spectral line obtained in the spectrum of Li<sup>2+</sup> ion, when the transition takes place between two levels whose sum is 4 and difference is 2, is

(1)  $2.28 \times 10^{-7}$  cm  
(2)  $2.28 \times 10^{-6}$  cm  
(3)  $1.14 \times 10^{-7}$  cm  
(4)  $1.14 \times 10^{-6}$  cm

Ans. (4)



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**Sol.**  $n_1 \rightarrow$  lower energy level  
 $n_2 \rightarrow$  higher energy level  
 $n_1 + n_2 = 4, n_2 = 3$   
 $n_2 - n_1 = 2, n_1 = 1$

Rydberg's formula :

$$\frac{1}{\lambda} = R_H Z^2 \left[ \frac{1}{n_1^2} - \frac{1}{n_2^2} \right]$$

$$\frac{1}{\lambda} = R_H (3)^2 \left[ \frac{1}{1^2} - \frac{1}{3^2} \right]$$

$$\frac{1}{\lambda} = 8R_H$$

$$\lambda = \frac{1}{8R_H}$$

$$\lambda = \frac{1}{8 \times 1.1 \times 10^5}$$

$$\lambda = \frac{1000}{8.8} \times 10^{-8} \text{ cm}$$

$$\lambda = 113.63 \times 10^{-8} \text{ cm}$$

$$\lambda \approx 1.14 \times 10^{-6} \text{ cm}$$

**64.** Given below are two statements :

**Statement I :** Cross aldol condensation between two different aldehydes will always produce four different products.

**Statement II :** When semicarbazide reacts with a mixture of benzaldehyde and acetophenone under optimum pH, it forms a condensation product with acetophenone only.

In the light of the above statements, choose the *correct* answer from the options given below :

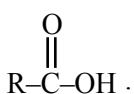
- (1) Both Statement I and Statement II are false
- (2) Statement I is false but Statement II is true
- (3) Both Statement I and Statement II are true
- (4) Statement I is true but Statement II is false

**Ans. (1)**

**Sol.** **Statement I :** False  
Cross aldol can give 2 or 4 products  
**Statement II :** False  
Benzaldehyde & Acetone both react with semi carbazide.

**65.** Given below are two statements :

**Statement I :** The dipole moment of R-CN is greater than R-NC and R-NC can undergo hydrolysis under acidic medium to produce



**Statement II :** R-CN hydrolyses under acidic medium to produce a compound which on treatment with  $\text{SOCl}_2$ , followed by the addition of  $\text{NH}_3$  gives another compound(x). This compound (x) on treatment with  $\text{NaOCl}/\text{NaOH}$  gives a product, that on treatment with  $\text{CHCl}_3/\text{KOH}/\Delta$  produces R-NC

In the light of the above statements, choose the *correct* answer from the options given below :

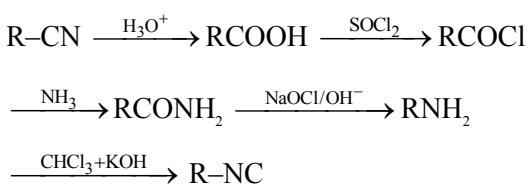
- (1) Both Statement I and Statement II are false
- (2) Both Statement I and Statement II are true
- (3) Statement I is true but Statement II is false
- (4) Statement I is false but Statement II is true

**Ans. (4)**

**Sol.** **Statement I :** False



**Statement II :** True



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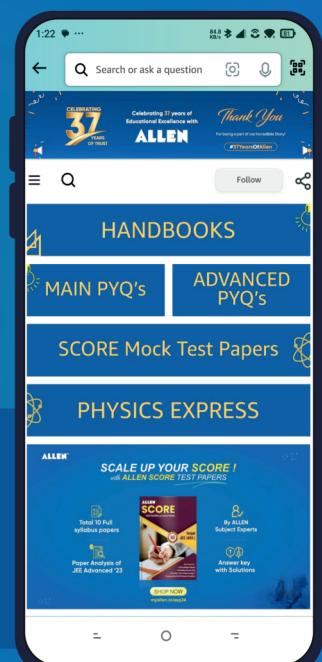
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