CHEMISTRY

BOOKS - KVPY PREVIOUS YEAR

QUESTION PAPER 2013

Part I Chemistry

1. The moelcule having a formyl group is

    A. acetone

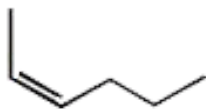   B. acetaldehyde

    C. acetic acid

D. acetic anhydride

Answer: B

2. The structure of cis-3-hexene is

A.
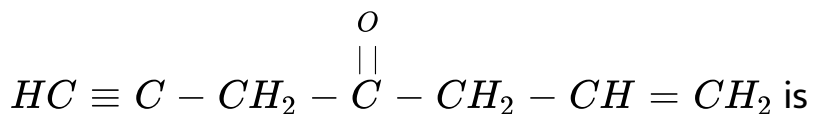

B.

C.

D.

Answer: C

3. The number of sp^2 hybridized carbon atoms in

$$HC \equiv C - CH_2 - \overset{\overset{O}{||}}{C} - CH_2 - CH = CH_2 \text{ is}$$

A. 3

B. 5

C. 4

D. 6

Answer: A

4. The number of valence electrons in an atom with electronic configuration

$1s^2 2s^2 2p^6 3s^2 3p^3$ is
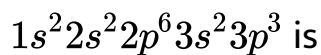
    A. 2

    B. 3

    C. 5
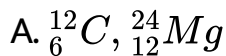
    D. 11

Answer: C

▶ **Watch Video Solution**

---

5. The pair of atoms having the same number of neutrons is

A. $_6^{12}C$, $_{12}^{24}Mg$

B. $_{11}^{23}Na$, $_9^{19}F$

C. $_{11}^{23}Na$, $_{12}^{24}Mg$

D. $_{11}^{23}Na$, $_{19}^{39}K$
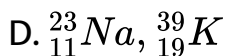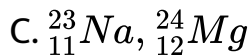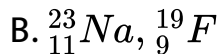
Answer: C

▶ **Watch Video Solution**

6. Which of the following molecules has no dipole moment ?
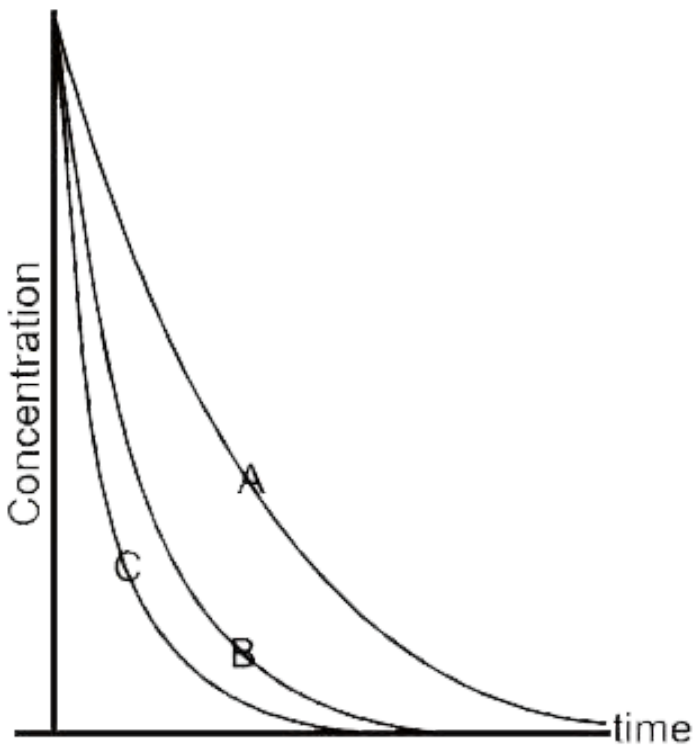
A. CH_3Cl

B. $CHCl_3$

C. CH_2Cl_2

D. CCl_4

Answer: D

▶ **Watch Video Solution**

7. The decay profiles of three radioactive species A, B and C are given below :

These profiles imply that the decay constants k_A, k_B and k_C

follow the order

A. $K_A > K_B > K_C$

B. $K_A > K_C > K_B$

C. $K_B > K_A > K_C$

D. $K_C > K_B > K_A$

Answer: D

8. A specific volume of H_2 requires 24 s to diffuse out of a container. The time required by an equal volume of O_2 to diffuse out under identical conditions, is
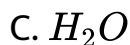
A. $24s$

B. 96 S

C. 384 S

D. 192 S

Answer: B

9. Acetic acid reacts with calcium metal at room temperature to produce

A. CO_2

B. H_2

C. H_2O

D. CO

Answer: B

> ▶ **Watch Video Solution**

10. The equilibrium constant K_C for $3C_2H_2(g) \Leftrightarrow C_6H_6(g)$ is $4L^2 \text{mol}^{-2}$ .If the equilibrium concentration of benzene is

0.5 mol L^{-1}, that of accetylene in mol L^{-1} must be

A. 0.025

B. 0.25

C. 0.05

D. 0.5

Answer: D

▶ Watch Video Solution

11. The weight percent of sucrose (formula weight = 342 g mol^{-1} in an aqueous solution is 3.42. The density of the solution is 1 g mL^{-1}, the concentration of sucrose in the solution in mol L^{-1} is

A. 0.01

B. 0.1

C. 1

D. 10

Answer: B

▶ **Watch Video Solution**

---

12. The order of reactivity of K, Mg, Au and Zn with water is

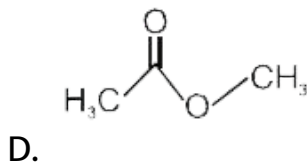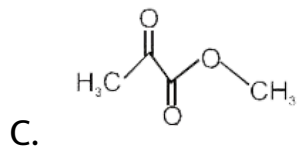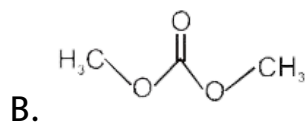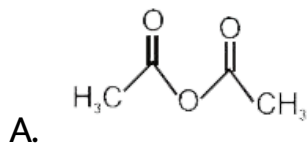A. $K > Zn > Mg > Au$

B. $K > Mg > Zn > Au$

C. $K > Au > Mg > Zn$

D. $Au > Zn > K > Mg$

Answer: B

13. Which of the following is an anhydride ?

A.

B.

C.

D.

Answer: A

14. Which of the following metals will precipitate copper from copper sulphate solution?

A. Hg

B. Sn

C. Au

D. Pt

Answer: B

15. The radii of the first Bohr orbit of H (r_H), $He^+ (r_{He^+})$ and $Li^{2+} (r_{Li}^{2+})$ are in the order

A. $r_{He}^+ > r_H > r_{Li}^{2+}$

B. $r_H < r_{He}^+ < r_{Li}^{2+}$

C. $r_H > r_{He}^+ > r_{Li}^{2+}$

D. $r_{He}^+ < r_H < r_{Li}^{2+}$

Answer: C

▶ **Watch Video Solution**

Part Ii Chemistry

1. The degree of dissociation of acetic acid (0.1 mol L^{-1}) in water (K_a of acetic acid is 10^{-5}) is
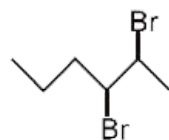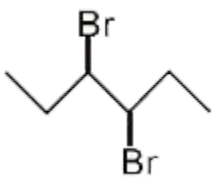
A. 0.01

B. 0.5

C. 0.1

D. 1

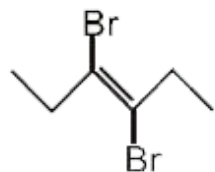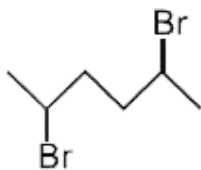**Answer: A**

▶ **Watch Video Solution**

---

2. Compound 'X' on heating with Zn dust gives compound 'Y' which on treatment with O_3 followed by reaction with Zn dust gives propionaldehyde. The structure of 'X' is

A.

B.

C.

D.

Answer: C

▶ **Watch Video Solution**

3. The amount of metallic Zn (Atomic weight = 65.4) required to react with aqueous sodium hydroxide to produce 1 g of H_2, is

A. 32.7 g

B. 98.1 g

C. 65.4 g

D. 16.3 g

Answer: A

▶ **Watch Video Solution**

**4.** Natural abundances of ^{12}C and ^{13}C isotopes of carbon are 99% and 1%, respectively. Assuming they only

contributes to the mol. wt. of C_2F_4, the percentage of C_2F_4 having a molecular mass of 101 is

A. 1.98

B. 98

C. 0.198

D. 99

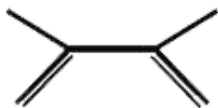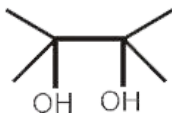**Answer: A**

▶ **Watch Video Solution**

5. 2, 3-Dimethylbut-2-ene when reacted with bromine forms a compound which upon heating with alcoholic KOH produce the following major product.
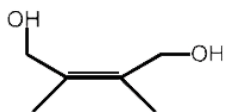
A.

Br OH

B.

C.

OH OH

D.

OH
OH

Answer: B

▶ **Watch Video Solution**

Part I Chemistry
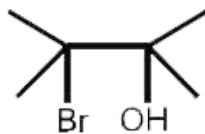
1. Among the following, the set of isoelectronic ions is

A. Na^+, Mg^{2+}, F^-, Cl^-

B. Na^+, Ca^{2+}, F^-O^{2-}

C. Na^+, Mg^{2+}, F^-, O^{2-}

D. Na^+, K^+, S^{2-}, Cl^-
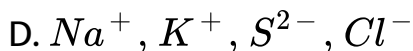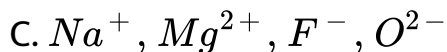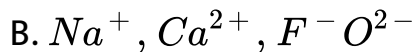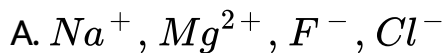
Answer: C

▶ **Watch Video Solution**

---

2. For a zero-order reaction with rate constant k, the slope of the plot of reactant concentration against time is

A. $k/2.303$

B. k

C. $-k/2.303$

D. $-k$

Answer: D

▶ **Watch Video Solution**

3. The compound which reacts with excess bromine to produce 2, 4, 6-tribromophenol, is

A. 1, 3-cyclohexadiene

B. 1, 3-cyclohexanedione

C. salicylic acid

D. cyclohexanone

Answer: C

---

4. Ethyl acetate reacts with $NH_2NHCONH_2$ to form

   A. $CH_3CONHCONHNH_2$

   B. $CH_3CON(NH_2)CONH_2$

   C. $CH_3CONHNHCONH_2$

   D. $CH_3CH_2NHNHCONH_2$
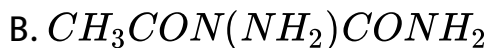
Answer: C

5. The variation of solubility of four different gases (G1, G2, etc.) in a given solvent with pressure at a constant temperature is shown in the plot.

The gas with the highest value of Henrys law constant is

A. G4

B. G2

C. G3

D. G1

Answer: D

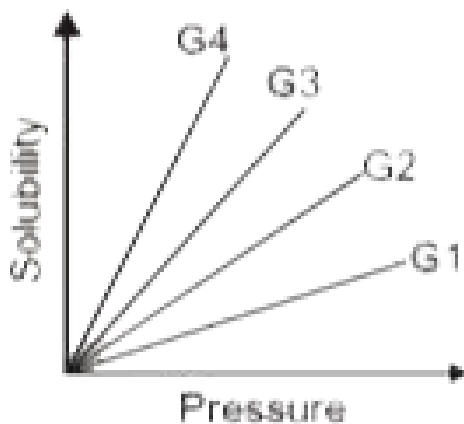**6.** For the reaction, $A \Leftrightarrow nB$ the concentration of A decreases from 0.06 to 0.03 mol L^{-1} and that of B rises from 0 to 0.06 mol L^{-1} at equilibrium. The values of n and the equilibrium constant for the reaction, respectively, are

   A. 2 and 0.12

   B. 2 and 1.2

   C. 3 and 0.12
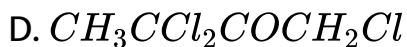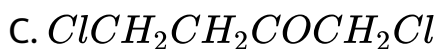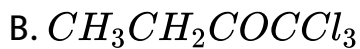
   D. 3 and 1.2

Answer: A

7. The reaction of ethyl methyl ketone with $Cl_2 / \text{excess} OH^-$ gives the following major product

A. $ClCH_2CH_2COCH_3$

B. $CH_3CH_2COCCl_3$

C. $ClCH_2CH_2COCH_2Cl$

D. $CH_3CCl_2COCH_2Cl$

Answer: B

8. The compound that readily tautomerizes is

A. $CH_3COCH_2CO_2C_2H_5$

B. $CH_3COCH_2CH_2CH_3$

C. $CH_3COCH_2CH_2CH_3$

D. $(CH_3)_3CCOC(CH_3)_3$

Answer: A

▶ **Watch Video Solution**

9. Hydrolysis of BCl_3 gives X which on treatment with sodium carbonate produces Y, X and Y, respectively, are

A. H_3BO_3 and $NaBO_2$

B. H_3BO_3 and $Na_2B_4O_7$
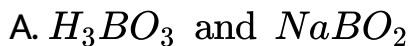
C. B_2O_3 and $NaBO_2$

D. B_2O_3 and $Na_2B_4O_7$

Answer: B

> ▶ Watch Video Solution

10. The numbers of lone pair(s) on Xe in XeF_2 and XeF_4 are, respectively

A. 2 and 3

B. 4 and 1

C. 3 and 2

D. 4 and 2

Answer: C

11. The entropy change in the isothermal reversible expansion of 2 moles of an ideal gas from 10 to 100 L at 300 K is
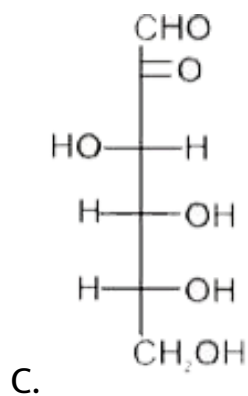
A. $42.3 JK^{-1}$

B. $35.8 JK^{-1}$

C. $38.3 JK^{-1}$
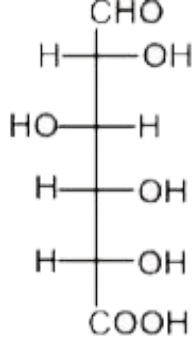
D. $32.3 JK^{-1}$

Answer: C

12. D-Glucose upon treatment with bromine-water gives

A.

```
        COOH
    H——OH
   HO——H
    H——OH
    H——OH
        CH₂OH
```

B.

```
        CHO
    H——OH
   HO——H
    H——OH
    H——OH
        CHO
```

C.

```
        CHO
        ═O
   HO——H
    H——OH
    H——OH
        CH₂OH
```

D.

$$
\begin{array}{c}
\text{CHO} \\
\text{H}\!-\!\!\!\!-\!\text{OH} \\
\text{HO}\!-\!\!\!\!-\!\text{H} \\
\text{H}\!-\!\!\!\!-\!\text{OH} \\
\text{H}\!-\!\!\!\!-\!\text{OH} \\
\text{COOH}
\end{array}
$$
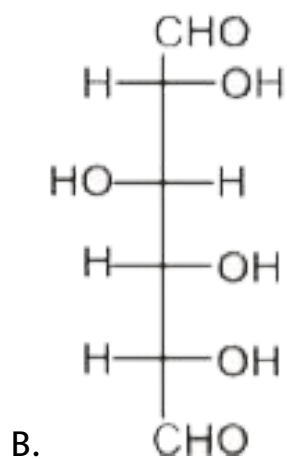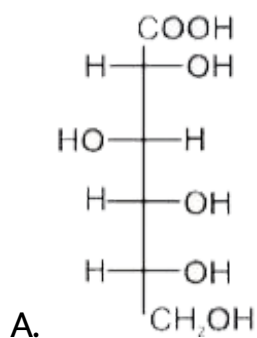
Answer: A

▶ **Watch Video Solution**

13. In the structure of borax, the numbers of boron atoms and B-O-B units, respectively, are
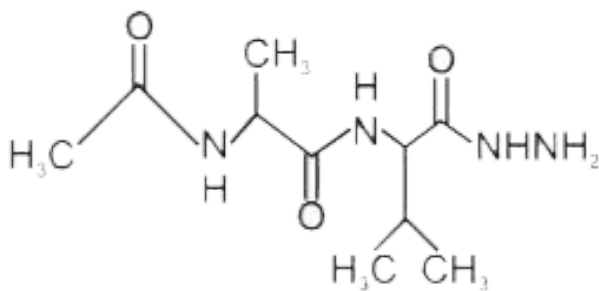
A. 4 and 5

B. 4 and 3

C. 5 and 4

D. 5 and 3

Answer: A

14. The number of peptide bonds in the compound

is

A. 1

B. 2

C. 3

D. 4

Answer: A

▶ Watch Video Solution

15. For the isothermal reversible expansion of an ideal gas

A. $\Delta H > 0$ and $\Delta U = 0$

B. $\Delta H > 0$ and $\Delta U < 0$

C. $\Delta H = 0$ and $\Delta U = 0$

D. $\Delta H = 0$ and $\Delta U > 0$

Answer: C

▶ Watch Video Solution

16. If the angle of incidence of X-ray of wavelength 3Å which produces a second order diffracted beam from the (100) planes in a simple cubic lattice with interlayer spacing a = 6 Å is $30°$, the angle of incidence that produ ces a first-order diffracted beam from the (200) planes is

A. $15°$

B. $45°$

C. $30°$

D. $60°$

Answer: C

▶ Watch Video Solution

17. The number of ions produced in water by dissolution of the complex having the empirical formular, $COCl_3 4NH_3$ is

A. 1

B. 2

C. 4

D. 3

Answer: B

▶ Watch Video Solution

18. The spin-only magnetic moment of $[Fe(NH_3)_6]^{3+}$ and $[FeF_6]^{3-}$ (in units of BM) respectively are
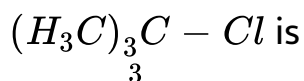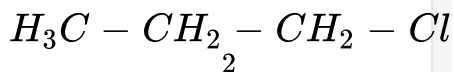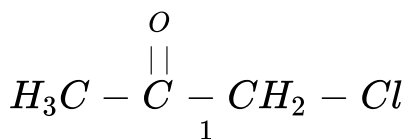
A. 1.73 and 1.73

B. 5.92 and 1.73

C. 1.73 and 5.92

D. 5.92 and 5.92

Answer: C

▶ **Watch Video Solution**

---

19. The order of $,S_N1$ reactivity in aqueous acetic acid

solution for the compounds

$$H_3C - \overset{\overset{\displaystyle O}{\displaystyle ||}}{C} - CH_2 - Cl \qquad\qquad H_3C - CH_2 - CH_2 - Cl$$
$$\underset{1}{} \qquad\qquad\qquad\qquad \underset{2}{}$$

$(H_3C)_3C - Cl$ is
$\underset{3}{}$

A. $1 > 2 > 3$

B. $1 > 3 > 2$

C. $3 > 2 > 1$

D. $3 > 1 > 2$

Answer: C

▶ **Watch Video Solution**

---

20. An ionic compound is formed between a metal M and a non-metal Y. If M occupies half the octahedral voids in the cubic close-packed arrangement formed by Y, the chemical formula of the ionic compound is
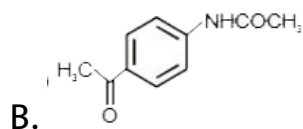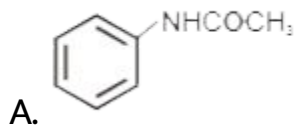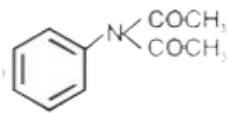
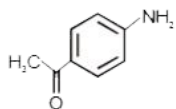A. MY

B. MY_2

C. M_2Y

D. MY_3

Answer: B

▶ **Watch Video Solution**

Part Ii Chemistry

1. The major product obtained in the reaction of aniline with acetic anhydride is

A.

B.

C.

D. .

Answer: A

> ▶ Watch Video Solution

2. The maximum number of isomers that can result from monobromination of 2-methyl-2-pentene with N bromosuccinimide in boilingCCl_4 is
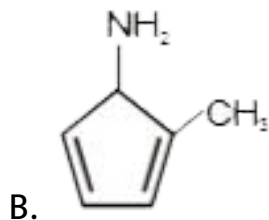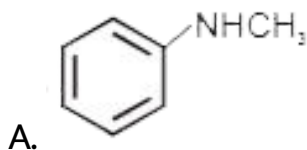
A. 1

B. 2

C. 3
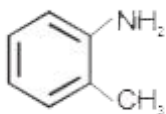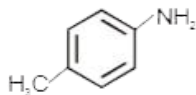
D. 4

Answer: D

▶ **Watch Video Solution**

---

3. The compound $X(C_7H_9N)$ reacts with benzensulfonyl

chloride to give $Y(C_{13}H_{13}NO_2S)$ which is insoluble in

alkali. The compound X is-

A.

NHCH$_3$

B.

NH$_2$

CH$_3$

C.

D.

Answer: A

▶ **Watch Video Solution**

---

4. In 108 g of water, 18 g of a non-volatile compound is dissolved. At $100°C$ the vapor pressure of the solution is 750 mm Hg. Assuming that the compound does not undergo association or dissociation, the molar mass of the compound in g mol^{-1} is

A. 128

B. 182

C. 152

D. 228

Answer: D

▶ **Watch Video Solution**

5. The standard electrode potential of Zn^{2+}/Zn is -0.76V and that of Ca^{2+}/Cu is 0.34V . The emf(V) and the free energy change $(kJmol^{-1})$, respectively , for a Daniel cell will be
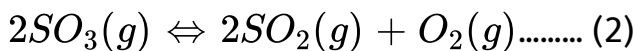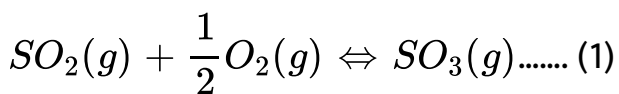
A. -0.42 and 81

B. 1.1 and -213

C. -1.1 and 213

D. 0.42 and -81

Answer: B

6. Consider the equilibria (1) and (2) with equilibrium constants K_1 and K_2, respectively

$$SO_2(g) + \frac{1}{2}O_2(g) \Leftrightarrow SO_3(g) .... (1)$$

$$2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g) .... (2)$$

K_1 and K_2 are related as

A. $2K_1 = 2K_2^2$
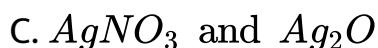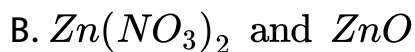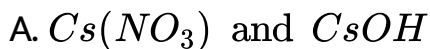
B. $K_1^2 = \dfrac{1}{K_2}$

C. $K_2^2 = \dfrac{1}{K_1}$

D. $K_2 = \dfrac{2}{K_1^2}$

Answer: B

▶ **Watch Video Solution**

---

7. Aqueous solution of metallic nitrate X reacts with NH_4OH to form Y which dissolves in excess NH_4OH. The resulting complex is reduced by acetaldehyde to deposit the metal. X and Y, respectively, are

A. $Cs(NO_3)$ and $CsOH$

B. $Zn(NO_3)_2$ and ZnO

C. $AgNO_3$ and Ag_2O

D. $Mg(NO_3)_2$ and $Mg(OH)_2$

Answer: C

> ▶ Watch Video Solution

8. The density of eq. wt of a metal are 10.5 g cm^{-3} and 100, respectively. The time required for a current of 3 amp to deposit a 0.005 mm thick layer of the same metal on an area of 80 cm^2 is closest to

A. 120s

B. 135s

C. 67.5s

D. 270s

Answer: B

9. The amount of $Na_2S_2O_3 \cdot 5H_2O$ required to completely reduce 100 mL of 0.25 N iodine solution, is

A. $6.20g$

B. $9.30g$

C. $3.10g$

D. $7.75g$

Answer: A

10. In aqueous solution, $[Co(H_2O)_6]^{2+}$ (X) reacts with molecular oxygen in the presence of excess liquor NH_3 to give a new complex Y. The number of unpaired electrons in X and Y are, respectively

A. 3, 1

B. 3, 0

C. 3, 3

D. 7, 0

Answer: B

▶ Watch Video Solution