# PART – C (CHEMISTRY)

## SECTION - A

**(One Options Correct Type)**

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

*61. Given below are two statements:
**Statement (I) :** Aqueous solution of ammonium carbonate is basic.
**Statement (II) :** Acidic/basic nature of salt solution of a salt of weak acid and weak base depends on $K_a$ and $K_b$ value of acid and the base forming it.
In the light of the above statements, choose the **most appropriate** answer from the options given below:
(1) **Statement I** is incorrect but **Statement II** is correct
(2) **Statement I** is correct but **Statement II** is incorrect
(3) Both **Statement I** and **Statement II** are correct
(4) Both **Statement I** and **Statement II** are incorrect

**Ans. (3)**

**Sol.** $pK_a$ of carbonic acid 6.36 & 10.33.

$pK_b$ of ammonium hydroxide = 4.74

So, $pH = 7 + \frac{1}{2}(pK_a - pK_b)$

pH > 7 $\rightarrow$ (Basic)

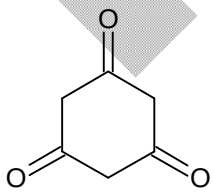
62. Yellow compound of lead chromate gets dissolved on treatment with hot NaOH solution. The product of lead formed is a:
(1) Neutral complex with coordination number four
(2) Dianionic complex with coordination number six
(3) Dianionic complex with coordination number four
(4) Tetraanionic complex with coordination number six

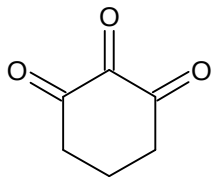
**Ans. (3)**

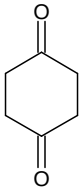
**Sol.** $PbCrO_4 + 4NaOH \longrightarrow Na_2CrO_4 + \underset{(\text{Lead complex})}{Na_2\left[Pb(OH)_4\right]}$

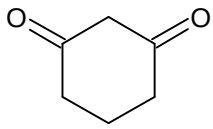
Dianionic with CN = 4.

*63. Highest enol content will be shown by:

(1) 

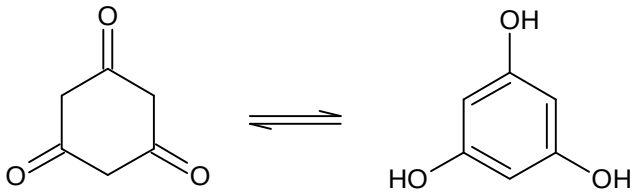
(2) 

(3) 

(4) 

**Ans. (1)**

**Sol.**



Aromatic
So, more stable

64. The electronic configuration for Neodymium is:
[Atomic Number for Neodymium 60]
(1) $[Xe]4f^4 6s^2$ (2) $[Xe]4f^1 5d^1 6s^2$
(3) $[Xe]4f^6 6s^2$ (4) $[Xe]5f^7 7s^2$

**Ans. (1)**

**Sol.** $Nd \equiv [Xe]4f^4 6s^2$

65. A solution of two miscible liquids showing negative deviation from Raoult's law will have:
(1) decreased vapour pressure, increased boiling point
(2) increased vapour pressure, decreased boiling point
(3) decreased vapour pressure, decreased boiling point
(4) increased vapour pressure, increased boiling point

**Ans. (1)**

**Sol.** $P_s < x_A P_A^o + x_B P_B^o$
So, vapour pressure is decreased and boiling point is increased.

66. The correct statement regarding nucleophilic substitution reaction in a chiral alkyl halide is:
(1) Racemisation occurs in $S_N1$ reaction and retention occurs in $S_N2$ reaction.
(2) Racemisation occurs in $S_N1$ reaction and inversion occurs in $S_N2$ reaction.
(3) Racemisation occurs in both $S_N1$ and $S_N2$ reactions.
(4) Retention occurs in $S_N1$ reaction and inversion occurs in $S_N2$ reaction.

**Ans. (2)**

**Sol.** $\left.\begin{array}{l}\text{In } S_N1 \text{ mech.} \longrightarrow \text{Racemisation occurs} \\ \text{In } S_N2 \text{ mech.} \longrightarrow \text{Inversion takes place}\end{array}\right\}$ if chiral alkyl halide is used.

*67. Choose the polar molecule from the following:
(1) $CCl_4$ (2) $CH_2 = CH_2$
(3) $CO_2$ (4) $CHCl_3$

**Ans. (4)**

**Sol.** $CCl_4 \longrightarrow \mu = 0,$ non polar
$CH_2 = CH_2 \longrightarrow \mu = 0,$ non polar
$CO_2 \longrightarrow \mu = 0,$ non polar
$CHCl_3 \longrightarrow \mu \neq 0,$ polar

68. Consider the following complex ions

$P = [FeF_6]^{3-}$

$Q = \left[V(H_2O)_6\right]^{2+}$

$R = \left[Fe(H_2O)_6\right]^{2+}$

The correct order of the complex ions, according to their spin only magnetic moment values (in B.M.) is:

(1) R < P < Q (2) Q < P < R

(3) Q < R < P (4) R < Q < P

**Ans. (3)**

**Sol.** $P = [FeF_6]^{3-}$

$Fe^{3+}; F \rightarrow WFL$

$\downarrow$

$d^5 \rightarrow 5$ unpaired electron

$Q = \left[V(H_2O)_6\right]^{2+}$

$V^{2+}; H_2O$

$\downarrow$

$Fe^{2+} \rightarrow d^6 \rightarrow 4$ unpaired electron

So, order of spin only magnetic moment

P > R > Q

*69. Which of the following electronic configuration would be associated with the highest magnetic moment?

(1) $[Ar]3d^7$ (2) $[Ar]3d^3$

(3) $[Ar]3d^8$ (4) $[Ar]3d^6$

**Ans. (4)**

**Sol.** 1. $[Ar]3d^7 \rightarrow 3$ unpaired electron

2. $[Ar]3d^3 \rightarrow 3$ unpaird electron

3. $[Ar]3d^8 \rightarrow 2$ unpaired electron

4. $[Ar]3d^6 \rightarrow 4$ unpaired electron

*70. Given below are two statements:

**Statement (I) :** p-nitrophenol is more acidic than m-nitrophenol and o-nitrophenol.

**Statement (II) :** Ethanol will give immediate turbidity with Lucas reagent.

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

(1) **Statement I** is true but **Statement II** is false

(2) Both **Statement I** and **Statement II** are false

(3) Both **Statement I** and **Statement II** are true

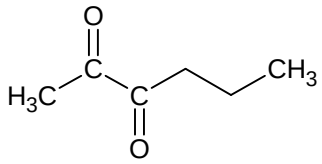
(4) **Statement I** is false but **Statement II** is true

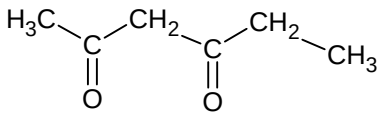
**Ans. (1)**

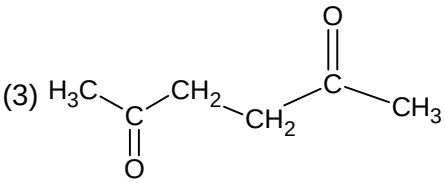
**Sol.** **Statement (I)** is correct.

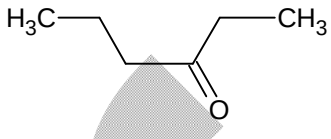
$C_2H_5OH$ is $1^o$ alcohol so does not give turbidity.

*71. Which of the following has highly acidic hydrogen?

(1) 

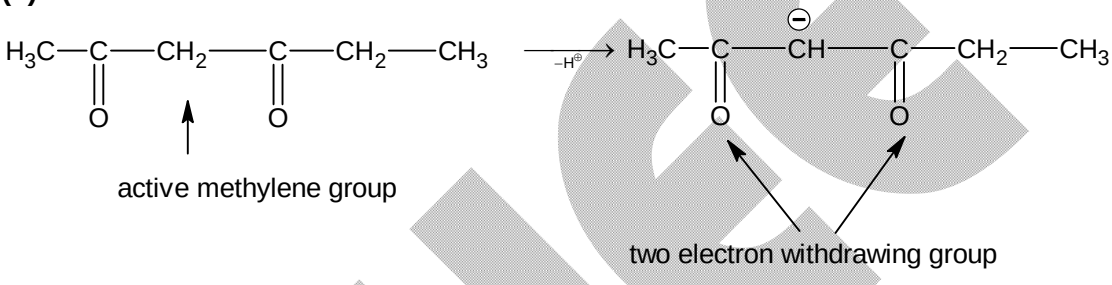
(2) 

(3) 

(4) 

**Ans. (2)**

**Sol.**

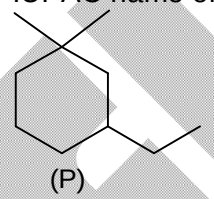



72. Element not showing variable oxidation state is:
(1) Chlorine (2) Fluorine
(3) Bromine (4) Iodine

**Ans. (2)**

**Sol.** Fluorine does not show variable oxidation state.

*73. IUPAC name of following compound (P) is:

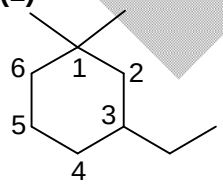


(P)

(1) 3-Ethyl-1,1-dimethylcyclohexane (2) 1-Ethyl-3,3-dimethylcyclohexane
(3) 1,1-Dimethyl-3-ethylcyclohexane (4) 1-Ethyl-5,5-dimethylcyclohexane

**Ans. (1)**

**Sol.**




IUPAC name 3-ethyl-1,1-dimethylcyclohexane

*74. Given below are two statements:
**Statement (I) :** The 4*f* and 5*f*-series of elements are placed separately in the Periodic table to preserve the principle of classification.
**Statement (II) :** s-block elements can be found in pure form in nature.

In the light of the above statements, choose the most appropriate answer from the options given below:
(1) **Statement I** is true but **Statement II** is false
(2) **Statement I** is false but **Statement II** is true
(3) Both **Statement I** and **Statement II** are true
(4) Both **Statement I** and **Statement II** are false

**Ans.** **(1)**

**Sol.** **Statement I** is true but **Statement II** is false

75. NaCl reacts with conc. $H_2SO_4$ and $K_2Cr_2O_7$ to give reddish fumes (B), which react with NaOH to give yellow solution (C). (B) and (C) respectively are:
(1) $CrO_2Cl_2, Na_2Cr_2O_7$ (2) $CrO_2Cl_2, Na_2CrO_4$
(3) $CrO_2Cl_2, KHSO_4$ (4) $Na_2CrO_4, CrO_2Cl_2$

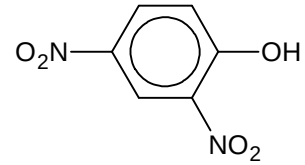
**Ans.** **(2)**

**Sol.** $NaCl + \text{conc. } H_2SO_4 + K_2Cr_2O_7 \longrightarrow \underset{\text{(reddish fumes)}}{\underset{(B)}{CrO_2Cl_2}} \xrightarrow{NaOH} \underset{\text{(Yellow)}}{\underset{(C)}{Na_2CrO_4}}$

*76. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**
**Assertion (A) :** Melting point of Boron (2453 K) is unusually high in group 13 elements.
**Reason (R) :** Solid Boron has very strong crystalline lattice.
In the light of the above statements, choose the **most appropriate** answer from the options given below:
(1) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A).**
(2) **(A)** is false but **(R)** is true.
(3) **(A)** is true but **(R)** is false.
(4) Both **(A)** and **(R)** are correct but **(R)** is **not** the correct explanation of **(A).**

**Ans.** **(1)**

**Sol.** Assertion is correct, Reason is also correct and correct explanation as well.

*77. The ascending order of acidity of – OH group in the following compounds is:
(A) Bu – OH
(B) 
(C) 
(D) 
(E) 

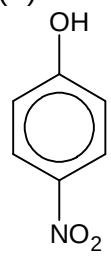
Choose the correct answer from the options given below:
**Options:**

(1) (C) < (A) < (D) < (B) < (E)
(2) (C) < (D) < (B) < (A) < (E)
(3) (A) < (D) < (C) < (B) < (E)
(4) (A) < (C) < (D) < (B) < (E)

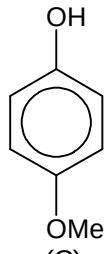
**Ans. (4)**

**Sol.** Bu – OH

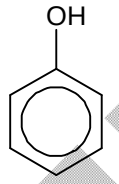
(A)



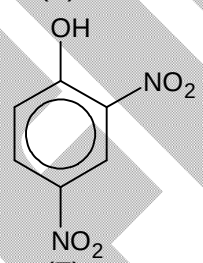

(B)




(C)

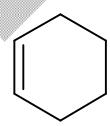



(D)



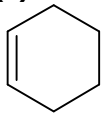

(E)

Order of A < C < D < B < E

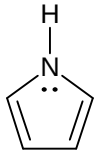
*78. Cyclohexene  is_____type of an organic compound.

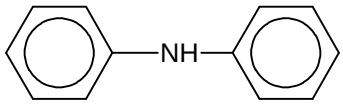
(1) Benzenoid aromatic
(2) Acyclic
(3) Alicyclic
(4) Benzenoid non-aromatic

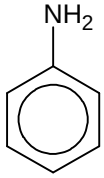
**Ans. (3)**

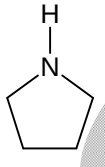
**Sol.**  is Alicyclic

*79. Which of the following is strongest Bronsted base?

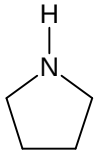
(1) 

(2) 

(3) 

(4) 

**Ans. (4)**

**Sol.**  is strongest base as its lone pair electron are localised

80. Two nucleotides are joined together by a linkage known as:
(1) Phosphodiester linkage (2) Disulphide linkage
(3) Peptide linkage (4) Glycosidic linkage

**Ans. (1)**

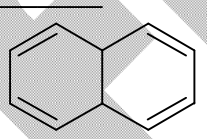
**Sol.** Nucleotides are joined together by phosphodiester linkage between 5′ and 3′ carbon atoms of pentose sugar.

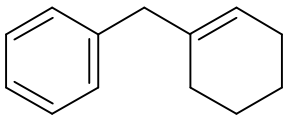
## SECTION - B

**(Numerical Answer Type)**

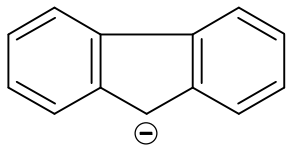
This section contains **10** Numerical based questions. The answer to each question is rounded off to the nearest integer value.

*81. Among the given organic compounds, the total number of aromatic compounds is_____

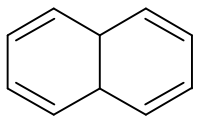
(1) 

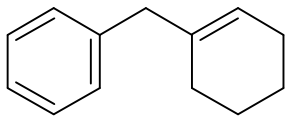
(2) 

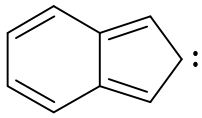
(3) 

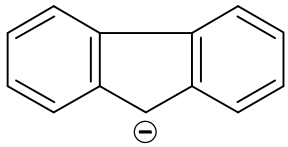
(4) 

**Ans. 3**

**Sol.**  ⟶ Non-Aromatic


Aromatic


Aromatic


Aromatic

*82. From the given list, the number of compounds with +4 oxidation state of Sulphur is_____

$SO_3, H_2SO_3, SOCl_2, SF_4, BaSO_4, H_2S_2O_7$

**Ans. 3**

**Sol.** $SO_3 \rightarrow +6$

$H_2SO_3 \rightarrow +4$

$SOCl_2 \rightarrow +4$

$SF_4 \rightarrow +4$

$BaSO_4 \rightarrow +6$

$H_2S_2O_7 \rightarrow +6$

*83. If three moles of an ideal gas at 300 K expand isothermally from $30\ dm^3$ to $45\ dm^3$ against a constant opposing pressure of 80 kPa, then the amount of heat transferred is_____J.

**Ans. 1200**

**Sol.** $W = -P_{ext}\Delta V$

$= -80\times10^3\times15\times10^{-3}\ N/m^2\times m^3$

$= -1200\ J$

$T \rightarrow$ constant $\Rightarrow \Delta U=0$

$q = -W \Rightarrow q = 1200\ J$

*84. Sum of bond order of CO and $NO^+$ is_____.

**Ans. 6**

**Sol.** Bond order of $CO \equiv 3$

Bond order of $NO^+ \equiv 3$

*85. Mass of methane required to produce 22 g of $CO_2$ after complete combustion is_____g.

[Given Molar mass in $g\ mol^{-1}$ C = 12.0, H = 1.0, O = 16.0]

**Ans. 8**

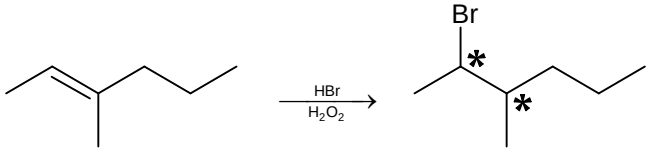
**Sol.** $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

Mass of $CH_4$ required $= \frac{22}{44} \times 16 = 8$ g.

*86. 3-Methylhex-2-ene on reaction with HBr in presence of peroxide forms an addition product (A). The number of possible stereoisomers for 'A' is_____.

**Ans. 4**

**Sol.**




2 Chiral centre

87. The mass of silver (Molar mass of Ag : 108 $gmol^{-1}$) displaced by a quantity of electricity which displaces 5600 mL of $O_2$ at S. T. P. will be_____g.

**Ans. 108**

**Sol.** $\left(\frac{W}{E}\right)_{Ag} = \left(\frac{W}{E}\right)_{O_2}$ ; $W_{O_2} = \frac{5600}{22400} \times 32 = 8$ g

$\frac{W}{108} = \frac{8}{8}$

$W = 108$ g

88. Consider the following data for the given reaction

| | $2HI(g) \longrightarrow$ | $H_2(g)$ + | $I_2(g)$ |
|---|---|---|---|
| | 1 | 2 | 3 |
| $HI\left(mol\ L^{-1}\right)$ | 0.005 | 0.01 | 0.02 |
| $Rate\left(mol\ L^{-1}\ s^{-1}\right)$ | $7.5 \times 10^{-4}$ | $3.0 \times 10^{-3}$ | $1.2 \times 10^{-2}$ |

The order of the reaction is_____.

**Ans. 2**

**Sol.** $r = k[HI]^x$

$r_1 = k[HI]_1^x$; $7.5 \times 10^{-4} = k[0.005]^x$ … (1)

$r_2 = k[HI]_2^x$; $3.0 \times 10^{-3} = k[0.01]^x$ … (2)

$\frac{(1)}{(2)} \Rightarrow \frac{1}{4} = \left(\frac{1}{2}\right)^x \Rightarrow x = 2$

*89. The number of electrons present in all the completely filled subshells having $n = 4$ and $s = +\frac{1}{2}$ is_____

(where n = principal quantum number and s = spin quantum number)

**Ans. 16**

**Sol.** For n = 4 possible subshells are 4s, 4p, 4d and 4f. So, number of electron with $s = +\frac{1}{2}; = 16$

*90. Among the following, total number of meta directing functional groups is_____. (Integer based)

$-OCH_3, -NO_2, -CN, -CH_3, -NHCOCH_3, -COR, -OH, -COOH, -Cl$

**Ans. 4**

**Sol.** $-NO_2, -CN, -COR, -COOH$ are meta directing.