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हर एक विद्यार्थी है ख़ास

PAPER WITH SOLUTION

JEE Advanced 2019

CHEMISTRY PAPER - 1

IIT/NIT | NEET/AIIMS | NTSE/IJSO/OLYMPIADS

कोटा का रिपिटर्स (12th पास) का सर्वश्रेष्ठ रिजल्ट देने वाला संस्थान

JEE ADVANCED 2018 RESULT

AIR 82
Sarthak Behera

AIR 120
Pankaj

AIR 146
Varun Goyal

AIR 148
Mukul Kumar

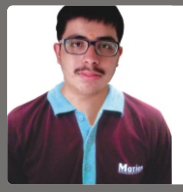
Total Selection
709/2084 = 34.02%

JEE MAIN 2019 RESULT

AIR 79
Shiv Kumar Modi

AIR 85
Anuj Chaudhary

AIR 96
Shubham Kumar



AIR 120
Eeshaan Jain

Students Qualified for JEE ADVANCED
2288/3316 = 68.99%

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CRITERIA FOR DIRECT ADMISSION IN STAR BATCHES

V STAR BATCH
XII Pass (JEE M+A)

ELIGIBILITY

- JEE Main'19 %tile > 98%tile
- JEE Advanced'19 Rank (Gen.) < 15,000

J STAR BATCH
XII Pass (NEET/AIIMS)

ELIGIBILITY

- NEET'19 Score > 450 Marks
- AIIMS'19 %tile > 98%tile

P STAR BATCH
XI Moving (JEE M+A)

ELIGIBILITY

- NTSE Stage-1 Qualified or NTSE Score > 160
- 100 marks in Science or Maths in Board Exam

H STAR BATCH
XI Moving (NEET/AIIMS)

ELIGIBILITY

- NTSE Stage-1 Qualified or NTSE Score > 160
- 100 marks in Science or Maths in Board Exam

Scholarship Criteria

JEE Main Percentile	SCHOLARSHIP+ STIPEND
98 - 99	100%
Above 99	100% + ₹ 5000/ month

JEE Advanced Rank	SCHOLARSHIP+ STIPEND
10000-20000	100%
Under 10000	100% + ₹ 5000/ month

NEET 2019 Marks	SCHOLARSHIP+ STIPEND
450	100%
530-550	100% + ₹ 2000/ month
550-560	100% + ₹ 4000/month
560	100% + ₹ 5000/month

NTSE STAGE-1 2019 Marks	SCHOLARSHIP+ STIPEND
160-170	100% + ₹ 2000/ month
171-180	100% + ₹ 4000/month
180+	100% + ₹ 5000/month

FEATURES :

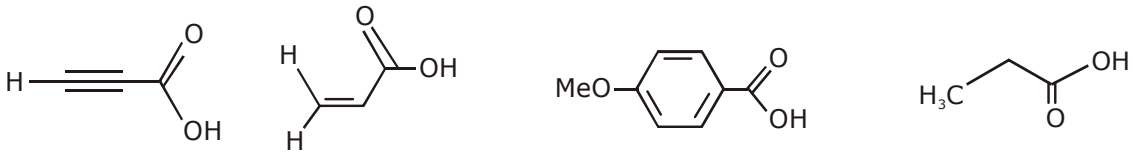
- Batch will be taught by NV Sir & HOD's Only.
- Weekly Quizes apart from regular test.
- Under direct guidance of NV Sir.
- Residential campus facility available.
- 20 CBT (Computer Based Test) for better practice.
- Permanent academic coordinator for personal academic requirement.
- Small batch with only selected student.
- All the top brands material will be discussed.

Section 1 (Maximum Marks : 12)

This section contains **FOUR (04)** questions.

- Each question has **FOUR** options. **ONLY ONE** of these four optiobns is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme :
  Full Makrs : +3 If ONLY the correct option is chosen ;
  Zero Marks : 0 If none of the option is chosen (i.e. the question is unanswered) ;
  Negative Marks : –1 in all other cases.

1. The correct order of acid strength of the following carboxylic acids is :

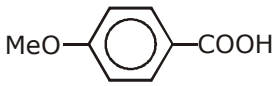


I **II** **III** **IV**

(1) II > I > IV > III (2) III > II > I > IV

(3) I > II > III > IV (4) I > III > II > IV

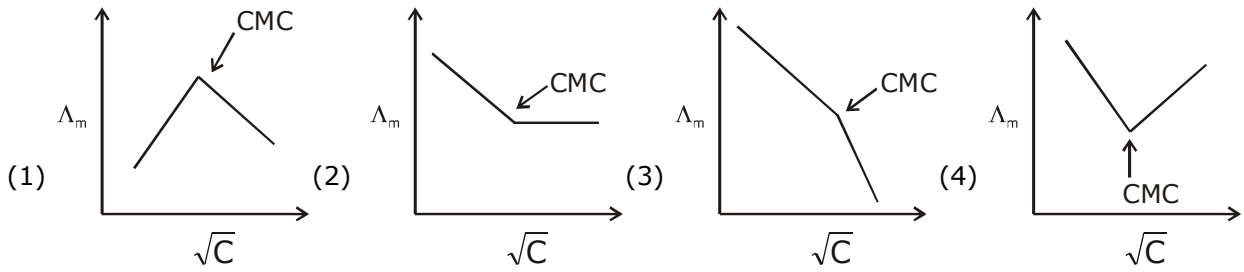
Ans. **3**

	Pka
(I) $HC \equiv C - COOH$	1.89
(II) $H_2C = CH - COOH$	4.3
(III) 	4.5
(IV) CH_3CH_2-COOH	4.87

order of acidic strength I > II > III > IV

Option (3) is correct

2. Molar conductivity (Λ_m) of aqueous solution of sodium stearate, which behaves as a strong electrolyte, is recorded at varying concentrations (c) of sodium stearate. Which one of the following plots provides the correct representation of micelle formation in the solution ?
(critical micelle concentration (CMC) is marked with an arrow in the figures)



Ans. **3**

3. Calamine, malachite, magnetite and cryolite, respectively, are
(1) $ZnCO_3$, $CuCO_3.Cu(OH)_2$, Fe_3O_4, Na_3AlF_6
(2) $ZnSO_4$, $Cu(OH)_2$, Fe_3O_4, Na_3AlF_6
(3) $ZnCO_3$, $CuCO_3$, Fe_2O_3, Na_3AlF_6
(4) $ZnSO_4$, $CuCO_3$, Fe_2O_3, AlF_3

Ans. **1**

Fact

4. The green colour produced in the borax bead test of a chromium (III) salt is due to
(1) $Cr(BO_2)_3$ (2) CrB
(3) $Cr_2(B_4O_7)_3$ (4) Cr_2O_3

Ans. **1**

$Na_2B_4O_7 \xrightarrow{\Delta} 2NaBO_2 + B_2O_3$

$Cr_2O_3 + B_2O_3 \longrightarrow Cr(BO_2)_3$
(green colour)

Section 2 (Maximum Marks : 32)

This section contains **EIGHT (08)** questions.
Each question has **FOUR** options. **ONE MORE THAN ONE** of these four option(s) is (are) correct answer(s).
For each question, choose the option corresponding to (all) the correct answer(s).
Answer to each question will be evaluated according to the following marking scheme :
Full Makrs : +4 If only (all) the correct option(s) is (are) chosen ;
Partial Marks : +3 If all the four option are correct but ONLY three options are chosen :
Partial Marks : +2 If three or more options are correct but ONLY two options are chosen and both of which are correct.
Partial Marks : +1 If two or ore options are correct but ONLY one option is chosen and it is a correct option ;
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered) ;
Negative Marks : –1 in all other cases.
For example, in a question, If (A), (B) and (D) are the ONLY three options corresponding to correct answers, then
choosing ONLY (A), (B) and (D) will get +4 marks ;
choosing ONLY (A) and (B) will get +2 marks ;
choosing ONLY (A) and (D) will get +2 marks ;
choosing ONLY (B) and (D) will get +2 marks ;
choosing ONLY (A) will get +1 marks ;
choosing ONLY (B) will get +1 marks ;
choosing ONLY (D) will get +1 marks ;
choosing no option (i.e. the question is unanswered) will get 0 marks ; and
choosing any other combination of options will get –1 mark.

1. Fusion of MnO_2 with KOH in presence of O_2 produces a salt W. Alkaline solution of W upon electrolytic oxidation yields another salt X. The manganese containing ions present in W and X, respectively, are Y and Z. Correct statement(s) is (are)

(1) In aqueous acidic solution, Y undergoes disproportionation reaction to give Z and MnO_2

(2) In both Y and Z, π-bonding occurs between p-orbitals of oxygen and d-orbitals of manganese

(3) Y is diamagnetic in nature while Z is paramagnetic

(4) Both Y and Z are coloured and have tetrahedral shape

Ans. **1, 2, 4**

$MnO_2 + KOH + O_2 \longrightarrow \underset{(w)}{K_2MnO_4}$ (green colour)

$K_2MnO_4 \longrightarrow K^+ + MnO_4^{2-}$

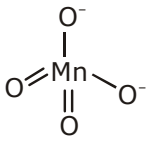
At anode :

$\underset{(y)}{MnO_4^{2-}} \longrightarrow \underset{(z)}{MnO_4^-} + e^-$ (oxidation)

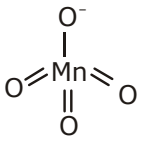
or $\underset{(x)}{KMnO_4}$

$K_2MnO_4 + H^+ \longrightarrow KMnO_4 + MnO_2$

y = MnO_4^{--}, Z = MnO_4^-



(y)



(z)

2. Which of the following statement(s) is (are) correct regarding the root mean square speed (u_{rms}) and average translational kinetic energy (E_{av}) of a molecule in a gas at equilibrium ?

(1) E_{av} at a given temperature does not depend on its molecular mass

(2) U_{rms} is doubled when its temperature is increased four times

(3) E_{av} is doubled when its temperature is increased four times.

(4) U_{rns} is inversely proportional to the square root of its molecular mass

Ans. **1,2,4**

3. Which of the following statement(s) is (are) true ?

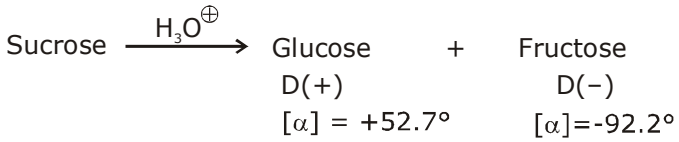
(1) Oxidation of glucose with bromine water gives glutamic acid

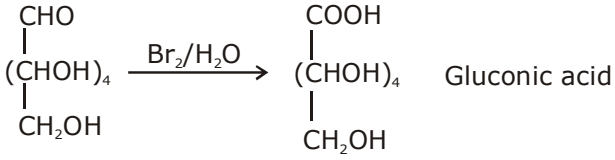
(2) The two six-membered cyclic hemiacetal forms of D-(+)-glucose are called anomers

(3) Monosaccharides cannot be hydrolysed to give polyhydroxy aldehydes and ketones

(4) Hydrolysis of sucrose gives dextrorotatory glucose and laevorotatory fructose

Ans. 2,3,4



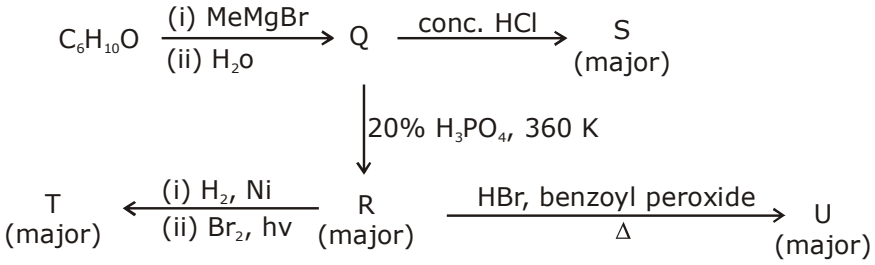


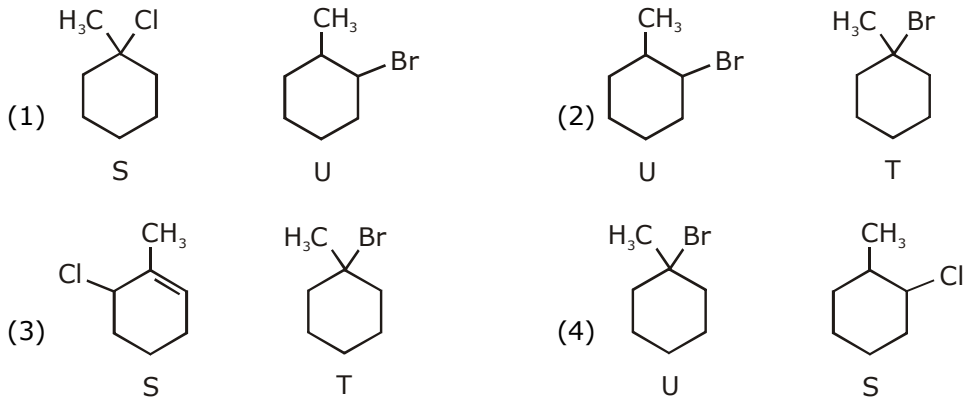
α-D-Glucopyranose β-D-glucopyranone

These are anomer of each other.

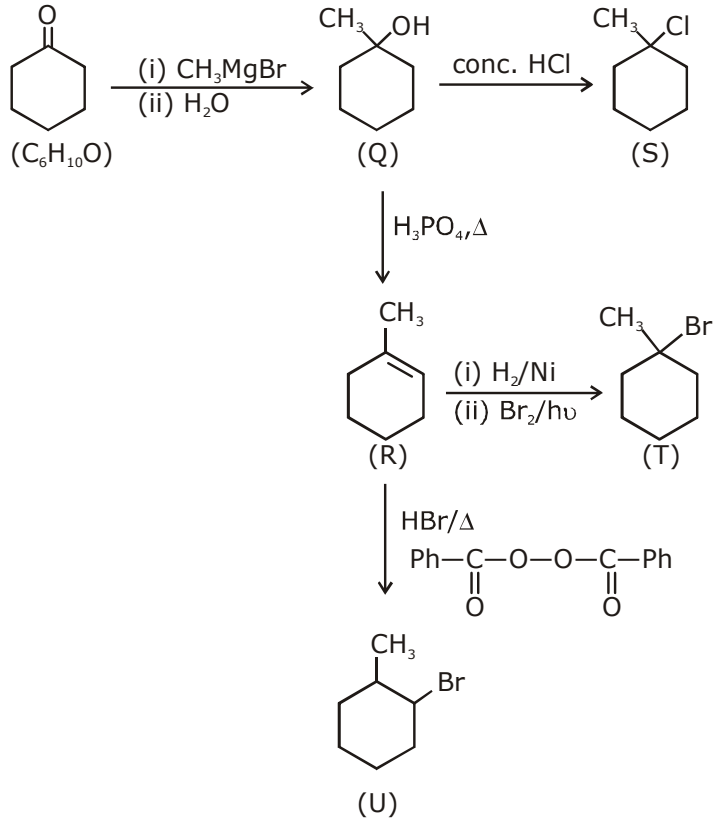
Option (2), (3) and (4) are correct.

4. Choose the correct option(s) for the following set of reactions





Ans. 1,2



Option (1) and (2) are correct

5. In the decay sequence,

$$^{238}_{92}U \xrightarrow{-x_1} {}^{234}_{90}Th \xrightarrow{-x_2} {}^{234}_{91}Pa \xrightarrow{-x_2} {}^{234}Z \xrightarrow{-x_4} {}^{230}_{90}Th$$

x_1, x_2, x_3 are x_4 are particles/radiation emitted by the respective isotopes. The correct options is(are)

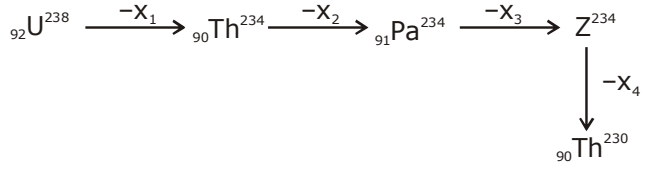
(1) x_3 is γ-ray

(2) x_1 will deflect towards negatively charged plate

(3) Z is an isotope of uranium

(4) x_2 is β^-

Ans. 2,3,4



$x_1 \rightarrow \alpha$ – emission

$x_2 \rightarrow \beta^-$ emission {A 'z' is increasing by 1 & 'A' = constant}

As x_4 is also 'α' emission

$\therefore$ At No. of Z^{234} would be 92

Which implies that x_3 is also

β^- emission

6. A tin chloride 'Q' undergoes the following reactions (not balanced)

$Q + Cl^- \longrightarrow X$ $\quad Q + Me_3N \longrightarrow Y$ $\quad Q + CuCl_2 \longrightarrow Z + CuCl$

X is a monoanion having pyramidal geometry. Both Y and Z are neutral compounds, Choose the correct option(s)

(1) There is a coordinate bond in Y

(2) The oxidation state of the central atom in Z is +2

(3) The central atom in Z has one lone pair of electrons

(4) The central atom in X is sp^3 hybridized

Ans. **1,4**

$SnCl_2 + Cl^- \longrightarrow \underset{(x)}{SnCl_3^-}$

$\underset{LA}{SnCl_2} + \underset{LB}{Me_3N} \longrightarrow \underset{(y)}{Me_3N} \longrightarrow SnCl_2$

$SnCl_2 + 2CuCl_2 \longrightarrow \underset{(z)}{SnCl_4} + 2CuCl$

7. Choose the reaction(s), from the following options, for which the standard enthalpy of reaction is equal to the standard enthalpy of formation

(1) $\frac{1}{8}S_{8(S)} + O_{2(g)} \rightarrow SO_{2(g)}$ (2) $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O(\ell)$

(3) $\frac{3}{2}O_{2(g)} \rightarrow O_{3(g)}$ (4) $2C_{(g)} + 3H_{2(g)} \rightarrow C_2H_{6(g)}$

Ans. **1,3**

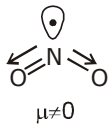
ΔH^o_f = 1 mol of compound must be formed by most stable state of present (constituent) elements.

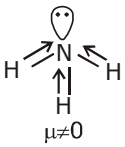
8. Each of the following options contains a set of four molecules. Identify the option(s) where all four molecules possess permanent dipole moment at room temperature.

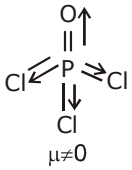
(1) BF_3, O_3, SF_6, XeF_6 (2) NO_2, NH_3, $POCl_3$, CH_3Cl

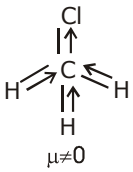
(3) SO_2, C_6H_5Cl, H_2Se, BrF_5 (4) $BeCl_2$, CO_2, BCl_3, $CHCl_3$

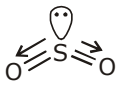
Ans. **2, 3**

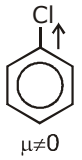


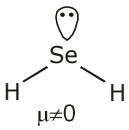


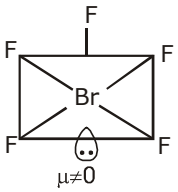










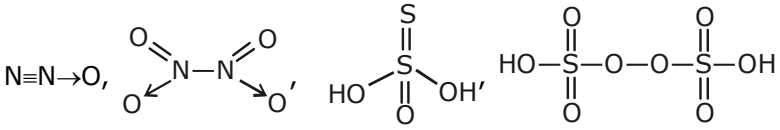


Section 3 [Maximum Marks : 18]

- This section contains **SIX (06)** questions. The answer to each question is a **Numerical Value**.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the palce designated to enter the answer. If the numerical value has more than two decimal places, **truncate/round-**off the value to **TWO** decimal places.
- Answer the each question will be evaluated according to the following marking scheme :
  Full Marks : +3 If ONLY the correct numerical value is entered;
  Zero Marks : 0 In all other cases.

1. Among B_2H_6, $B_3N_3H_6$, N_2O, N_2O_4, $H_2S_2O_3$ and $H_2S_2O_8$, the total number of molecules containing covalent bond between two atoms of the same kind is _____.

Ans. **4**



2. At 143 K, the reaction of XeF_4 with O_2F_2 produces a xenon compound Y. The total number of lone pair(s) of electrons present on the whole molecule of Y is _____.

Ans. **19**

$XeF_4 + O_2F_2 \longrightarrow XeF_6 + O_2$

3. For the following reaction, the equilibrium constant K_c at 298 K is 1.6×10^{17}

$Fe^{2+}(aq) + S^{2-}(aq) \rightleftharpoons FeS(s)$

When equal volumes of 0.06 M Fe^{2+}(aq) and 0.2 M S^{2-} (aq) solutions are mixed, the equilibrium concentration of Fe^{2+} (aq) is found to be $Y \times 10^{-17}$ M. the value of Y is _____.

Ans. **8.93**

	Fe^{+2}_{aq}	+	S^{2-}_{aq}	$\rightleftharpoons$	FeS(s)	$K_c = 1.6 \times 10^{17}$
t = 0	0.06 M		0.2M			
t = 0	0.03		0.1 M			
	L.R.					
t_{eq}	(0.03 - x)		(0.1 – x)			

$x \simeq 0.03$

$$k_c = \frac{1}{(0.07)\left[Fe^{+2}\right]} = 1.6 \times 10^{17}$$

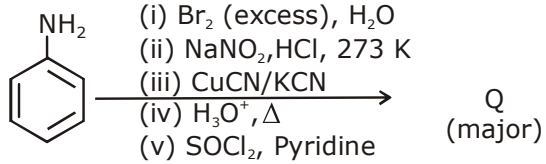
$$[Fe^{+2}] = \frac{1}{0.07 \times 1.6} \times 10^{-17} = \frac{1000}{112} \times 10^{-17}$$

$$= \frac{250}{28} \times 10^{-17} = \frac{125}{14} \times 10^{-17} = 8.93 \times 10^{-17}$$

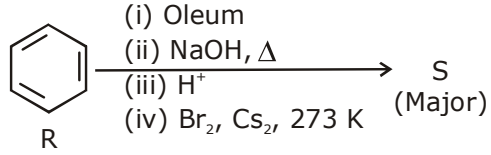
$y = 8.93$

4. Schemes 1 and 2 describe the conversion of P to Q and R to S, respectively. Scheme 3 describes the synthesis of T from Q and S. The total number of Br atoms in a molecule of T is _____.

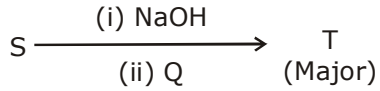
Scheme 1 :



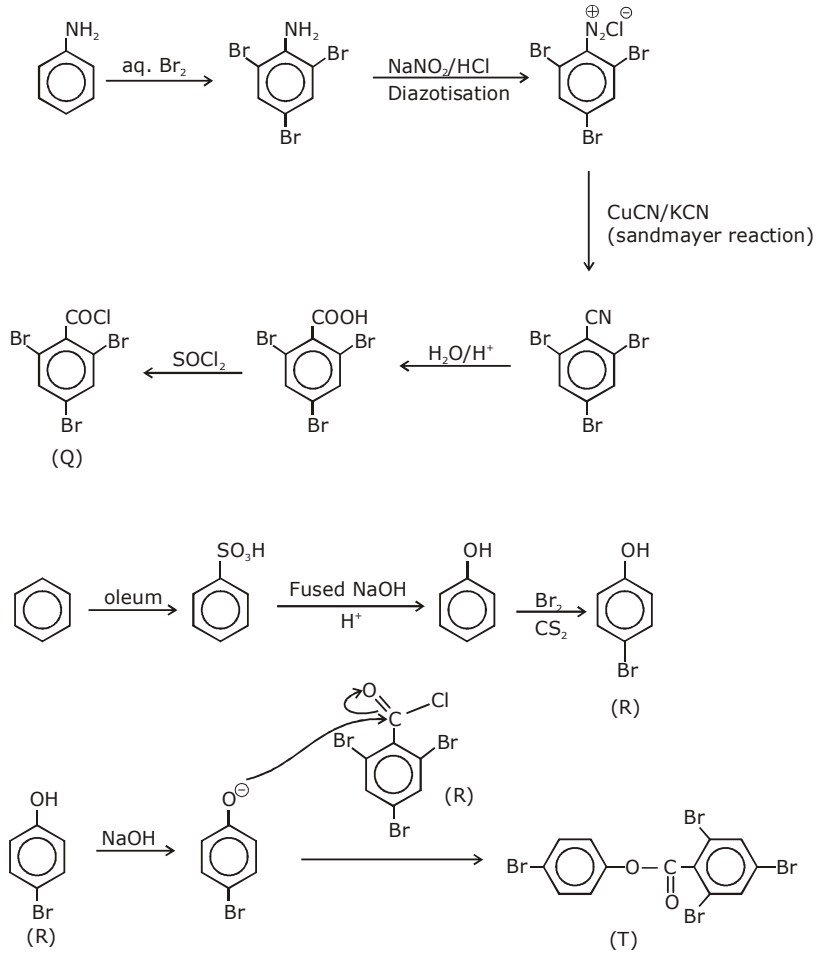
Scheme 2 :



Scheme 3:



Ans. 4



5. Consider the kinetic data given in the following table for the reaction A + B + C → Product

Experiment No.	[A] (mol dm^{-3})	[B] (mol dm^{-3})	[C] (mol dm^{-3})	Rate of reaction (mol dm^{-3}s^{-1})
1	0.2	0.1	0.1	6.0×10^{-5}
2	0.2	0.2	0.1	6.0×10^{-5}
3	0.2	0.1	0.2	1.2×10^{-4}
4	0.3	0.1	0.1	9.0×10^{-5}

The rate of the reaction for [A] = 0.15 mol dm^{-3} [B] = 0.25 mol dm^{-3} and [C] = 0.15 mol dm^{-3} is found to be Y × 10^{-5} mol dm^{-3}s^{-1}. The value of Y is _____.

Ans. **6.75**

Exp. (I) $6 \times 10^{-5} = k(0.2)^x (0.1)^y (0.1)^z$ ....(i)
Exp. (II) $6 \times 10^{-5} = k(0.2)^x(0.2)^y(0.1)^z$ ....(ii)
Exp. (III) $1.2 \times 10^{-4} = k(0.2)^x(0.1)^y(0.2)^z$ ....(iii)
Exp. (IV) $9 \times 10^{-5} = k (0.3)^x (0.1)^y (0.1)^z$ ....(iv)
Equation (i) ÷ (ii)

$$\frac{6\times10^{-5}}{6\times10^{-5}} = \left(\frac{0.1}{0.2}\right)^y \Rightarrow 1 = \left(\frac{1}{2}\right)^y \Rightarrow y = 0$$

equation (i) ÷ (ii)

$$\frac{6\times10^{-5}}{1.2\times10^{-4}} = \left(\frac{1}{2}\right)^z \Rightarrow \frac{1}{2} = \left(\frac{1}{2}\right)^z \Rightarrow Z = 1$$

equation (i) ÷ (iv)

$$\frac{6\times10^{-5}}{9\times10^{-5}} = \left(\frac{0.2}{0.3}\right)^x \quad \frac{2}{3} = \left(\frac{2}{3}\right)^x \Rightarrow x = 1$$

∴ Rate law
ROR = $K[A]^1[B]^0[C]^1$
$6 \times 10^{-5} = K(0.2)\ (0.1)^0\ (0.1)^1$
$k = 3 \times 10^{-3}$
Rate = ROR = $3 \times 10^{-3} \times (0.15)^1 \times (0.15)^1 = 225 \times 3 \times 10^{-7}$
$y \times 10^{-5} = 6.75 \times 10^{-5}$
y = 6.75

6. On dissolving 0.5 g of a non-volatile non-ionic solute to 39 g of benzene, its vapor pressure decreases from 650 mm Hg to 640 mm Hg. The depression of freezing point of benzene (in K) upon addition of the solute is _____.
(Given data : Molar mass and the molal freezing point depression constant of benzene are 78 g mol^{-1} and 5.12 K kg mol^{-1}, respectively)

Ans. **1.02**

$W_{solute} = \frac{1}{2}$ gm $\qquad W_{solvent}$ = 39 gm

Δp = 10 mm of Hg $\qquad P^o$ = 650 mm of Hg $\qquad$ Ps = 640 mm of Hg

$$\frac{10}{640} = \frac{1/2/\text{m.Wt.}}{39/78} = \frac{1}{\text{mwr}}$$ m. wt. of solute = 64 g/mol

$\Delta T_f = K_f \times$ molality $= 5.12 \times \frac{1/128}{39} \times 1000$ $\quad \Delta T_f = \frac{5.12\times1000}{128\times39}$ = 1.0256 K.

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