Section A

Q.No.	(a)	(b)	(c)	(d)	Q.No.	(a)	(b)	(c)	(d)
1	☐	☐	☐	☒	16	☐	☒	☐	☐
2	☐	☐	☒	☐	17	☐	☐	☐	☒
3	☒	☐	☐	☐	18	☐	☐	☒	☐
4	☐	☐	☒	☐	19	☐	☐	☐	☒
5	☐	☒	☐	☐	20	☐	☐	☐	☒
6	☐	☐	☒	☐	21	☒	☐	☐	☐
7	☐	☐	☐	☒	22	☒	☐	☐	☐
8	☐	☐	☒	☐	23	☐	☒	☐	☐
9	☒	☐	☐	☐	24	☐	☒	☐	☐
10	☐	☒	☐	☐	25	☐	☒	☐	☐
11	☐	☐	☐	☒	26	☒	☐	☐	☐
12	☒	☐	☐	☐	27	☐	☒	☐	☐
13	☐	☒	☐	☐	28	☐	☐	☐	☒
14	☐	☐	☐	☒	29	☐	☒	☐	☐
15	☐	☐	☐	☒	30	☒	☐	☐	☐

Section A (continued)

Q.No.	(a)	(b)	(c)	(d)	Q.No.	(a)	(b)	(c)	(d)
31	☐	☒	☐	☐	46	☐	☒	☐	☐
32	☐	☐	☐	☒	47	☒	☐	☐	☐
33	☐	☐	☐	☒	48	☒	☐	☐	☐
34	☒	☐	☐	☐	49	☐	☒	☐	☐
35	☐	☐	☐	☒	50	☒	☐	☐	☐
36	☐	☐	☐	☒	51	☐	☐	☐	☒
37	☐	☒	☐	☐	52	☐	☐	☒	☐
38	☐	☐	☒	☐	53	☐	☐	☒	☐
39	☐	☐	☐	☒	54	☐	☐	☒	☐
40	☒	☐	☐	☐	55	☒	☐	☐	☐
41	☒	☐	☐	☐	56	☐	☐	☐	☒
42	☐	☒	☐	☐	57	☐	☒	☐	☐
43	☒	☐	☐	☐	58	☐	☒	☐	☐
44	☐	☒	☐	☐	59 *	☐	☐	☐	☐
45	☐	☐	☐	☒	60	☐	☒	☐	☐

* **Question 59 has been dropped**

INJSO Answer key

PART B

Ans 61.

Each part carries 1 mark

1. y
2. n
3. n
4. y
5. n

Ans 62.
a)

Without catalyst	or	With catalyst
Threshold energy = 260 $KJmol^{-1}$		Threshold energy = 220 $KJmol^{-1}$
Energy of reactants = 160 $KJmol^{-1}$		Energy of reactants = 160 $KJmol^{-1}$
E_a (forward) = $E_t - E_r$ = 260 – 160 = 100 $KJmol^{-1}$		E_a (forward) = $E_t - E_r$ = 220 – 160 = 60 $KJmol^{-1}$
Energy of products = 200 $KJmol^{-1}$		Energy of products = 200 $KJmol^{-1}$
E_a (backward) = $E_t - E_p$ = 260 – 200 = 60 $KJmol^{-1}$		E_a (backward) = $E_t - E_p$ = 220 – 200 = 20 $KJmol^{-1}$

b) Energy of reactants A_2 and B_2 = 160 $KJmol^{-1}$

Energy of products AB = 200 $KJmol^{-1}$

$\Delta H = E_p - E_r$
$= 200 - 160 = 40\ KJmol^{-1}$

Hence the reaction is endothermic.

c) In the presence of catalyst threshold energy becomes 220 $KJmol^{-1}$

E'_a (forward) = 220 – 160 = 60 $KJmol^{-1}$

E'_a (backward) = 220 – 200 = 20 $KJmol^{-1}$

Hence, Lowering in activation energy = 60 – 20 = 40 $KJmol^{-1}$

d) As the reaction does not involve any change in number of moles of gaseous species hence **increased pressure does not have any effect on equilibrium.**

e) If temperature is raised by 10°C the rate of reaction will become double.

f) Method I :

In the presence of catalyst threshold energy becomes 220 $KJmol^{-1}$

E'_a (forward) = 220 – 160 = 60 $KJmol^{-1}$
E'_a (backward) = 220 – 200 = 20 $KJmol^{-1}$

E_a (forward) - E'_a (forward) = 100 – 60 = 40 $KJmol^{-1}$
without catalyst with catalyst

E_a (backward) - E'_a (backward) = 60 – 20 = 40 $KJmol^{-1}$
without catalyst with catalyst

Position of equilibrium will remain same because activation energy for the forward reaction and the backward reaction have decreased equally.

OR

Method II :

E_a (in absence of catalyst) = 260 – 160 = 100 $KJmol^{-1}$

E'_a (in presence of catalyst) = 220 – 160 = 60 $KJmol^{-1}$

Lowering in activation energy = E_a - E'_a = 100 – 60 = 40 $KJmol^{-1}$

OR

Method III :

Energy of activation in absence of catalyst is 260 $KJmol^{-1}$

Energy of activation in presence of catalyst is 220 $KJmol^{-1}$

Hence, Lowering in activation energy is $260 - 220 = 40$ KJmol^{-1}

Ans 63.

a)

1. $a = \frac{2s}{t} = \frac{2(2s)}{(5)^2} = 2 m/s^2$

Now, $a = 2 m/s^2$ $\Rightarrow s_1 = 25$ m

2. $v = a \times t = 2 \times 5 = 10$ m/s $\Rightarrow s_2 = 150$ m

3. $a = -\frac{v^2}{2s} = -\frac{1}{2} \times \frac{10^2}{18} = -2.78 m/s^2$ It is negative

4. $18 = \frac{1}{2} \times 2.78 \times t^2 \Rightarrow t = 3.60$ sec

Also, $s_3 = 17.98 \approx 18$ m

b)

v_u = const
$a_s = 1.5$ m/s
$x_u - x_s = 12$ m
Usha catches up with Shiney after time t
$x_u = v_u \times t$
$x_s = 0.5\ a_s.t^2$
$v_u\ t - 0.75\ t^2 = 12$

at time t, $v_u = v_s = 1.5$ t (since Usha is over taking Shiney)

$1.5\ t^2 - 0.75\ t^2 - 12 = 0$
$0.75\ t^2 = 12$
$t = 4$ sec
$v_u = at = 6$ m/s

Ans 64.

a) $\dfrac{3 \times (3^{\frac{3}{3x+2}})^{x+1} + (3^{\frac{3}{3}}) \times 3^{\frac{3x}{3}}}{3 \times 3^{3x+2} - (1/3)(3^{3})^{x+1}}$

$= \dfrac{3 \times 3^{3x+3} + 3^{3} \times 3^{3x}}{3^{3x+3} - 1/3 \times 3^{3x+3}}$

$= \dfrac{3^{3x+3}(3+1)}{3^{3x+3}(1-1/3)} = \dfrac{4}{2/3} = 6$

b)

$$\frac{a+b}{a-b} + \frac{a-b}{a+b}$$

$$= \frac{a+b}{a-b} + \frac{1}{\sqrt{\frac{a+b}{a-b}}}$$

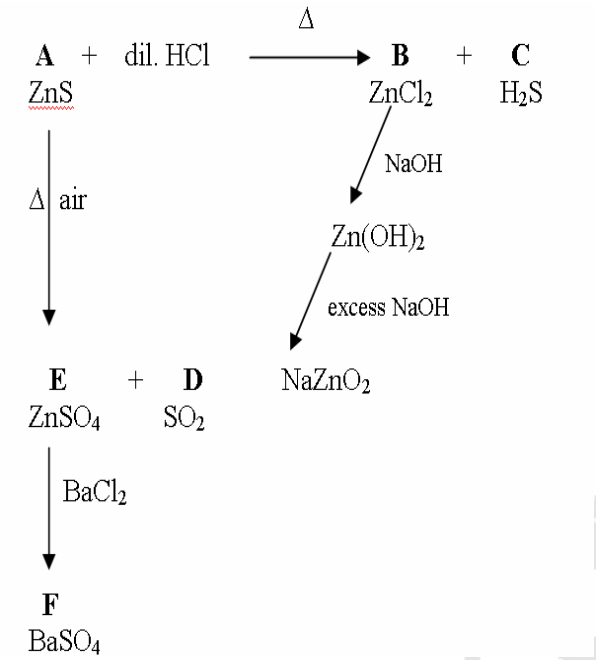
$$= \frac{\left(\frac{a+b}{a-b}\right) + 1}{\sqrt{\frac{a+b}{a-b}}} = \frac{2a}{\sqrt{a-b} \times \sqrt{a+b}}$$

$$= \frac{2a}{\sqrt{1-\tan x} \times \sqrt{1+\tan x}} = \frac{2\sqrt{\cos x}}{\sqrt{\cos^2 x - \sin^2 x}}$$

$$= \frac{2\cos x}{\sqrt{\cos 2x}} = \frac{2\cos x}{\sqrt{2\cos^2 x - 1}}$$

Ans 65.

a)



b) **X ≡ $HgCl_2$ Y ≡ NH_4^+**

$$HgCl_2 + H_2S \xrightarrow{H^+} HgS\downarrow + 2HCl$$
(Black ppt)

$$HgCl_2 + SnCl_2 \longrightarrow Hg_2Cl_2\downarrow + SnCl_4$$
(White ppt)

$$Hg_2Cl_2 + SnCl_2 \longrightarrow Hg + SnCl_4$$

$$HgCl_2 + KI \longrightarrow \underset{\text{(red)}}{HgI_2\downarrow} \xrightarrow{KI} \underset{\text{(colourless soln.)}}{K_2HgI_4}$$

Ans 66.

a) $0.5\ mv^2 = q\ (2-0)$

$v = 8.4 \times 10^5$ m/s

($8.3 \leftarrow\rightarrow 8.5 \times 10^5$ m/s

($8.0 \leftarrow\rightarrow 8.3$ and $8.5 \leftarrow\rightarrow 8.8 \times 10^5$ m/s

b) Heat required to raise the temp. of ice to $0^oC = 20 \times 0.5 \times 10 = 100$ cal

Heat supplied by water coming to $0^oC = 100 \times 1 \times 10 = 1000$ cal

Remaining heat to melt ice = 900 cal

Amount of ice that will melt = 900 / 80 = 11.25 gm

Total water amount at end = 111.25gm

Ans. 67

1. a)
2. b)
3. a)False b)False
4. a)
5. c)

Ans 68.

a) $2^n - 615$ is positive
n =12

b)
a) 11
b) 2n + 1