FIITJEE PROGRESS MONITORING TEST (FPMT–4)

ANSWER KEY

Code : 114034

Applicable for 1820 Batches (A-LOT)

PHYSICS		CHEMISTRY		MATHEMATICS	
1.	D	1.	B	1.	A
2.	A	2.	A	2.	C
3.	D	3.	C	3.	B
4.	D	4.	A	4.	A
5.	D	5.	B	5.	B
6.	D	6.	A	6.	B
7.	A	7.	A	7.	C
8.	B	8.	A	8.	B
9.	A	9.	B	9.	D
10.	C	10.	A	10.	A
11.	D	11.	B	11.	D
12.	C	12.	B	12.	D
13.	A	13.	D	13.	D
14.	B	14.	A	14.	B
15.	D	15.	A	15.	B
16.	B	16.	B	16.	B
17.	A	17.	D	17.	B
18.	D	18.	B	18.	B
19.	B	19.	B	19.	B
20.	D	20.	C	20.	B
21.	C	21.	D	21.	A
22.	A	22.	A	22.	A
23.	A	23.	B	23.	C
24.	B	24.	C	24.	B
25.	D	25.	C	25.	C
26.	D	26.	C	26.	C
27.	D	27.	C	27.	A
28.	C	28.	C	28.	C
29.	C	29.	C	29.	A
30.	B	30.	D	30.	C

Hints or Solution

Chemistry

1. From Le Chatelier's Principle, on adding NH_3 equilibrium will shift to backward direction so formation of $[Cu(NH_3)_3SO_3]$ will decrease so option B is incorrect.

2. For the reaction $2x(g) + Y(g) \rightleftharpoons 2Z(g)$ $K_c = 2.25$

$$\text{So } K_c = \frac{[Z]^2}{[X]^2[Y]}$$

$$\text{So } 2.25 = \frac{3^2}{2^2[Y]}$$

$[Y] = 1 \text{ mole/L}$

3. Factual

4. $\Delta n_g = -1$

5. Factual

8. $CO_2(g) + H_2(g) \rightleftharpoons CO(g) + H_2O(g)$

C	C	0	0	Initially
C – C x	C-Cx	Cx	Cx	at equilibrium total moles ⇒ 2C

$P_{CO_2} = \chi_{CO_2} \times P \Rightarrow \frac{1-X}{2}P = P_{H_2}$

9. $\Delta G^o = -2.303\, RT \log K$
If $\Delta G^o = 0$ then $K = 1$

11. $K_1 = \frac{[SO_3]}{[SO_2][O_2]^{1/2}}$ and $K_2 = \frac{[SO_2]^2[O_2]}{[SO_3]^2}$

So $K_2 = \frac{1}{K_1^2} = \frac{1}{\left(4 \times 10^{-3}\right)^2} = 6.25 \times 10^4$

13. $\underset{C}{2HI(g)} \rightleftharpoons \underset{0}{H_2(g)} + \underset{0}{I_2(g)}$

$C - C\alpha \qquad \frac{C\alpha}{2} \qquad \frac{C\alpha}{2}$

$P_{H_2} = P_{I_2} = \frac{C\alpha/2}{2}.P = \frac{\alpha}{2}.P$

$P_{HI} = (1-\alpha)P$ Now $K_P = \left(\frac{\alpha}{2}.P\right)^2 \Big/ \left[(1-\alpha)P\right]^2$

$$\sqrt{K_P} = \frac{\alpha}{(1-\alpha)2}$$

$$\frac{\alpha}{1-\alpha} = 2\sqrt{K_P}$$

Or $\left(1 + 2\sqrt{K_P}\right)\alpha = 2\sqrt{K_P}$

$$\alpha = \frac{2\sqrt{K_P}}{1 + 2\sqrt{K_P}}$$

14. $H_2O(g) + CO(g) \rightleftharpoons H_2(g) + CO_2(g)$

1	1	0	0	(Initially)
1 – 0.4	1-0.4	0.4	0.4	equilibrium

So $K_c = \dfrac{\left(\frac{0.4}{5}\right)\left(\frac{0.4}{5}\right)}{\left(\frac{0.6}{5}\right)\left(\frac{0.6}{5}\right)} = 0.444$

15. $K_1 = 10^x = [K^+][Cl^-]$

$K_2 = 10^y = \dfrac{1}{\left[Ag^+\right]\left[Cl^-\right]}$

Equilibrium constant for the reaction $K_3 = \dfrac{\left[K^+\right]}{\left[Ag^+\right]} = K_1.K_2 = 10^{x+y}$

16. $\Delta G^o = - RT \ln K_P = - RT \ln P_{CO_2}$

23. Factual

29. In presence of catalyst equilibrium can be achieved easily.

FIITJEE PROGRESS MONITORING TEST (FPMT–4)

ANSWER KEY

Code : 114035

Applicable for 1820 Batches (B01)

PHYSICS		CHEMISTRY		MATHEMATICS	
1.	C	**1.**	B	**1.**	B
2.	A	**2.**	A	**2.**	B
3.	A	**3.**	C	**3.**	C
4.	D	**4.**	A	**4.**	C
5.	C	**5.**	B	**5.**	B
6.	C	**6.**	A	**6.**	C
7.	D	**7.**	A	**7.**	C
8.	B	**8.**	A	**8.**	A
9.	C	**9.**	B	**9.**	B
10.	A	**10.**	A	**10.**	B
11.	B	**11.**	B	**11.**	C
12.	A	**12.**	B	**12.**	C
13.	D	**13.**	D	**13.**	A
14.	C	**14.**	A	**14.**	B
15.	D	**15.**	A	**15.**	A
16.	C	**16.**	B	**16.**	B
17.	B	**17.**	D	**17.**	D
18.	A	**18.**	B	**18.**	B
19.	A	**19.**	B	**19.**	B
20.	C	**20.**	C	**20.**	A
21.	B	**21.**	D	**21.**	B
22.	D	**22.**	A	**22.**	C
23.	C	**23.**	B	**23.**	B
24.	C	**24.**	C	**24.**	B
25.	C	**25.**	C	**25.**	B
26.	C	**26.**	C	**26.**	A
27.	A	**27.**	C	**27.**	A
28.	B	**28.**	C	**28.**	B
29.	B	**29.**	C	**29.**	C
30.	A	**30.**	D	**30.**	B

HINTS OR SOLUTIONS
PHYSICS

1. C

$$F_{avg} = \frac{2mv\sin\theta}{t} = \frac{2\times3\times10\sin60^\circ}{0.2} = 150\sqrt{3}\ \text{N}$$

2. A

Before explosion, particle was moving along x-axis, i.e., it has no y-component of velocity. Therefore, the centre of mass will not move in y-direction or we can say $y_{com} = 0$.

Now, $y_{com} = \frac{m_1y_1 + m_2y_2}{m_1+m_2}$ $\Rightarrow$ $0 = \frac{(m/4)(+15)+(3m/4)(y)}{(m/4+3m/4)}$ or $y = -5\text{cm}$

3. A

$$\text{Impulse} = \begin{pmatrix}\text{Area of force-time graph} \\ \text{under the specified interval}\end{pmatrix}$$

$$= \frac{1}{2}(800+200)\times2\times10^{-6} + \frac{1}{2}\times800\times10\times10^{-6} = 5\times10^{-3}\ \text{N-s}$$

4. D

Since no external force acts, initially both particle at rest. So speed of centre of mass of system is zero.

5. C

Let man moves distance x relative to ground. The distance moved by Planck is (L – x). As no external force acts, so centre of mass should not change.

$$Mx = \frac{M}{3}(L-x)$$

$$\Rightarrow \left(M+\frac{M}{3}\right)x = \frac{M}{3}L$$

$$\frac{4M}{3}x = \frac{M}{3}L$$

$$\Rightarrow x = \frac{L}{4}$$

6. C P110606/P110607

Collision is elastic. So, velocity of separation = velocity of approach. So, relative velocity before and after collision remains same.

$\therefore$ Time in which the next collision will take place

$$\frac{2\pi R}{V}$$

7. D

Maximum loss in kinetic energy when, e = 0

8. B

$$x_2 = \frac{\sigma\pi cb^2}{\sigma\pi(a^2-b^2)}$$

9. C

$$v_{cm} = \frac{m_1v_1+m_2v_2}{m_1+m_2} = \frac{10\times14+4\times0}{14} = 10\ \text{m/s}$$

10. A

$$e = \frac{p_2^f - p_1^f}{p_1^i - p_2^i} = \frac{J-(P-J)}{P}$$

11. B

$e=\frac{12-10}{10-V}$

$10-v=2 \Rightarrow v=8$ m/s

12. A

From conservation of momentum $mv_0=mv'+2mv'$

From conservation of energy $\frac{1}{2}mv_0^2=\frac{1}{2}kx^2+\frac{1}{2}(3m)\left(\frac{v_0}{3}\right)^2$

$v_0\sqrt{\frac{2m}{3k}}=x$

13. D

$v_{CM}=\frac{20-6}{7}=2\,m/s$ .... (i)

$\frac{1}{2}5(4)^2+\frac{1}{2}(2)(3)^2=\frac{1}{2}5v_1^2+\frac{1}{2}2v_2^2$ .... (ii)

$v_{CM}=2=\frac{5v_1+2v_2}{7}$ .... (iii)

Solving (ii) and (iii), we lead to desired result.

Chemistry

1. From Le Chatelier's Principle, on adding NH_3 equilibrium will shift to backward direction so formation of $[Cu(NH_3)_3SO_3]$ will decrease so option B is incorrect.

2. For the reaction $2x(g) + Y(g) \rightleftharpoons 2Z(g)$ $K_c = 2.25$

So $K_c = \frac{[Z]^2}{[X]^2[Y]}$

So $2.25 = \frac{3^2}{2^2[Y]}$

$[Y]=1$ mole /L

3. Factual
4. $\Delta n_g = -1$
5. Factual
8. $CO_2(g)+H_2(g) \rightleftharpoons CO(g)+H_2O(g)$

C C 0 0 Initially

C – C x C-Cx Cx Cx at equilibrium total moles $\Rightarrow$ 2C

$P_{CO_2}=\chi_{CO_2}\times P \Rightarrow \frac{1-X}{2}P=P_{H_2}$

9. $\Delta G^o = -2.303$ RT log K

If $\Delta G^o = 0$ then K = 1

11. $K_1 = \frac{[SO_3]}{[SO_2][O_2]^{1/2}}$ and $K_2=\frac{[SO_2]^2[O_2]}{[SO_3]^2}$

So $K_2=\frac{1}{K_1^2}=\frac{1}{\left(4\times10^{-3}\right)^2}=6.25\times10^4$

13. $\underset{C}{2HI(g)} \rightleftharpoons \underset{0}{H_2(g)}+\underset{0}{I_2(g)}$

C-Cα $\frac{C\alpha}{2}$ $\frac{C\alpha}{2}$

$$P_{H_2} = P_{I_2} = \frac{C\alpha/2}{2}.P = \frac{\alpha}{2}.P$$

$P_{HI} = (1-\alpha)P$ Now $K_P = \left(\frac{\alpha}{2}.P\right)^2 \Big/ \left[(1-\alpha)P\right]^2$

$$\sqrt{K_P} = \frac{\alpha}{(1-\alpha)2}$$

$$\frac{\alpha}{1-\alpha} = 2\sqrt{K_P}$$

Or $\left(1+2\sqrt{K_P}\right)\alpha = 2\sqrt{K_P}$

$$\alpha = \frac{2\sqrt{K_P}}{1+2\sqrt{K_P}}$$

14. $H_2O(g) + CO(g) \rightleftharpoons H_2(g) + CO_2(g)$

1	1	0	0	(Initially)
1 – 0.4	1-0.4	0.4	0.4	equilibrium

So $K_c = \dfrac{\left(\frac{0.4}{5}\right)\left(\frac{0.4}{5}\right)}{\left(\frac{0.6}{5}\right)\left(\frac{0.6}{5}\right)} = 0.444$

15. $K_1 = 10^x = [K^+]\,[Cl^-]$

$$K_2 = 10^y = \frac{1}{\left[Ag^+\right]\left[Cl^-\right]}$$

Equilibrium constant for the reaction $K_3 = \dfrac{\left[K^+\right]}{\left[Ag^+\right]} = K_1.K_2 = 10^{x+y}$

16. $\Delta G^o = -RT \ln K_P = -RT \ln P_{CO_2}$

23. Factual

29. In presence of catalyst equilibrium can be achieved easily