TARGET IIT-JEE
HINT & SOLUTION

CLASS XII **DATE : 13-06-2010**

ANSWER KEY WITH SOLUTION

MATHEMATICS

SECTION – A

1.	C	**2.**	B	**3.**	B	**4.**	B	**5.**	C	**6.**	B	**7.**	D
8.	B	**9.**	A,B,D	**10.**	A,C	**11.**	B,C,D	**12.**	A,B,C,D	**13.**	B	**14.**	A
15.	B												

SECTION – B

1. (A)– Q; (B)– P, Q, R, S ; (C)– P, S (D)– P

SECTION – C

1. 0004 **2.** 0128

PHYSICS

SECTION - A

1.	A	**2.**	A	**3.**	C	**4.**	B	**5.**	D	**6.**	D	**7.**	C
8.	B	**9.**	A,D	**10.**	A,B	**11.**	A,D	**12.**	A,B	**13.**	A	**14.**	C
15.	B												

SECTION - (B)

1. (A) $\rightarrow$ P,S,R ; (B) $\rightarrow$Q ; (C) $\rightarrow$ P,Q,S ; (D) $\rightarrow$ P,S,R

SECTION - (C)

1. 3 **2.** 8

CHEMISTRY

SECTION - A

1.	C	**2.**	B	**3.**	B	**4.**	D	**5.**	D	**6.**	C	**7.**	C
8.	A	**9.**	A,D	**10.**	A,B,D	**11.**	A,B,D	**12.**	C	**13.**	A	**14.**	B
15.	B												

SECTION - B

1. (A)–P; (B) -T (C)–Q,R (D) –Q,R

SECTION C

1. 13 **2.** 5

SOLUTIONS

PHYSICS

SECTION - A

1. **A**

(i) The initial phase is

$$\phi = 60° = \frac{\pi}{3}\text{rad}$$

(ii) The phase of the point after a time t is,

$\theta = \omega t + \phi$

Then the equation of Q is

$$x = A\cos(\omega t + \phi)$$

where A = R = 0.5 m, ω = 10 rad/s and $\phi = \frac{\pi}{3}$

or, $$x = 0.5\cos\left(10t + \frac{\pi}{3}\right)$$

2. **D**

3. **C**

4. **B**

Minimum time interval $\Delta t = \frac{2L}{v} = \frac{1.6}{v}$

$v = \sqrt{\frac{T}{\mu}} = 16\ ms^{-1}$

$\Rightarrow \Delta t = 100$ ms.

5. **C**

6. **D**

7. **C**

8. **B**

9. **A,D**

10. **A,B**

11. **A,D**

Observer A cannot see the object if $\mu > \sin \pi/4$ or $\mu > \sqrt{2}$.

Observer B cannot see the object if $\mu > \sin \pi/6$ or $\mu > 2$.

12. **A,B**

[A] $\Delta x = d \sin \phi + d \sin \theta - (\mu - 1)\, t$ ...(1)

For central maximum, $\Delta x = 0$ and $\phi = 30°$

$\Rightarrow$ by eq. (1) $\theta = 30°$

[B] At C, $\theta = 0$

$\therefore$ By eq. (1) $\Delta x = -0.025$ mm

$= n\lambda$

$\Rightarrow n = 49$

13. **A**

To dislodge bird 2 without disturbing bird 1, she needs an antinode at the position of bird 2 and a node at the position of bird 1. With a node at both ends of the wire, the longest wavelength is in the figure shown above. From the figure, $3\lambda/2 = 36$ cm, $\lambda = 24$ cm.

14. **C**

$f = v/\lambda = 48\ m/s/\ 24\ m = 2\ s^{-1}$.

15. **B**

For a standing wave, $y(x,t) = y_m \sin 2\pi x/\lambda \cos 2\pi ft$.

$dy/dt = -2\pi y_m \sin 2\pi x/\lambda \sin 2\pi ft$.

$a = d^2y/dt^2 = -(2\pi f)^2 y_m \sin 2\pi x/\lambda \cos 2\pi ft$.

The maximum value of the sine and cosine is 1. If the maximum absolute value of the acceleration bird 2 can withstand is 48 m/s^2, then 48 $m/s^2 = (2\pi f)^2 y_{max}$, where y_{max} is the maximum amplitude he can withstand. $y_{max} = 48\ m/s^2/(4\pi s^{-1})^2 = 0.30$m. Any amplitude slightly greater than this is the smallest amplitude needed to dislodge the bird.

SECTION - (B)

1. (A) $\rightarrow$ P,S,R,T ; (B) $\rightarrow$Q ; (C) $\rightarrow$ P,Q,S ; (D) $\rightarrow$ P,S,R,T

SECTION - (C)

1. 3

2. 8 mm

SECTION - A

1. **C**

$V_f = \frac{150+400}{1.25} = \frac{550}{1.25}$ ml

$M = \frac{0.1}{550} \times 1.25 \times 10^3 = 0.227$

2. **B**

3. **B**

118% oleum

$H_2SO_4 + SO_3 = 100$ gm

$SO_3 + H_2O \rightarrow H_2SO_4$

1 mole $\frac{18}{18}$ = 1 mole

= 80 gm

SO_3 = 80 gm H_2SO_4 = 20 gm

Mass of O in SO_3 = 48 gm

Mass of O in $H_2SO_4 = \frac{64}{98} \times 20 = 13.06$ gm

Total wt. of O in oleum = 48 + 13.06 = 61.06 gm

4. **D**

$nC_v dT = -nC_v dT - PdV$

$2nC_v dT = -\frac{nRT}{V} dV$

$2n \times \frac{R}{\gamma - 1} \times dT = -nRT \frac{dV}{V}$

$\int 2\frac{dT}{T} = -\int (\gamma - 1)\frac{dV}{V}$

$\ln T = -\frac{(\gamma-1)}{2} \ln V + \text{const.}$

$\ln T + \ln V^{(\gamma-1)/2} = \text{const.}$

$\Rightarrow TV^{(\gamma-1)/2} = \text{const.}$

5. **D**

6. **C**

7. **C**

8. **A**

9. **A**,D

10. **A,B,D**

11. **A,B,D**

12. **C**

13. **A**

14. **B**

15. **B**

$Fe + \frac{1}{2}O_2 \rightarrow FeO$; $\Delta H = -65$ kcal mol^{-1} .....(i)

$2Fe + \frac{3}{2}O_2 \rightarrow Fe_2O_3$; $\Delta H = -197$ kcal mol^{-1} .....(ii)

By Eq. (ii) – 2 × (i)

Also, $2Fe + \frac{1}{2}O_2 \rightarrow Fe_2O_3$; $\Delta H = -67$ kcal mol^{-1} .....(iii)

Let a mole of FeO and b mole Fe_2O_3 are present such that

$a + b = 1$ and $\frac{a}{b} = 2$

$a = \frac{2}{3}$ and $b = \frac{1}{3}$

	$2FeO$	+	$\frac{1}{2}O_2 \rightarrow Fe_2O_3$
Initial	a		b
After oxidation	$(a-2a')$		$b + a'$

Given, $\frac{a}{b} = 2$ and $\frac{a-2a'}{b+a'} = \frac{1}{2}$

$\therefore \quad \frac{a-2a'}{\frac{a}{2}+a'} = \frac{1}{2}$ $\quad \therefore 2a - 4a' = \frac{a}{2} + a'$

$\therefore \quad a' = \frac{3a}{10} = \frac{3\times 2}{10\times 3} = \frac{1}{5}$ $\quad \therefore$ FeO used $= \frac{2}{5}$

$\therefore$ 2 moles FeO gives heat = 67 kcal

$\therefore \quad \frac{2}{5}$ mole FeO gives heat $= \frac{67\times 2}{2\times 5}$

= **13.4 kcal heat**

SECTION - B

1. **(A)–P; (B) -T (C)–Q,R (D) –Q,R**

SECTION C

1. **13**

Hint.- Only 1º and 2º amides will show tautomerism.

2. **5**

Total secondary amyl alcohol = 3

Total GI = 2

Therefore x + y = 2 + 3 = 5