AIEEE Sample Paper-2 (Answer Key)

1. (A)	**2.** (D)	**3.** (C)	**4.** (A)	**5.** (C)
6. (B)	**7.** (B)	**8.** (B)	**9.** (B)	**10.** (A)
11. (B)	**12.** (B)	**13.** (D)	**14.** (B)	**15.** (D)
16. (B)	**17.** (A)	**18.. (B)**		

Solution

PHYSICS

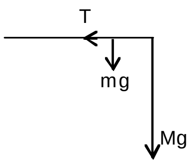
1. i and V will be in same phase

$\therefore$ $\cos 0° = 1$

$V = \sqrt{V_R^2 + (V_L \sim V_C)^2}$ at resonance $V_L \sim V_C = 0$

$\because$ V = 40 Volt

2. $F = \sqrt{(Mg + mg)^2 + T^2}$, $T = Mg$



3. $E = -\dfrac{dv}{dr}$

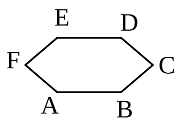
$dv = -Edr$

$$\int_{v_a}^{v_b} dv = -\int_r^{2r} \frac{\lambda}{2\pi\varepsilon_0 r} dr = -\frac{\lambda \ln 2}{2\pi\varepsilon_0}$$

$$W = q\Delta v = \frac{q\lambda \ln 2}{2\pi\varepsilon_0} = \frac{1}{2}mv^2$$

$$\Rightarrow \; v = \sqrt{\frac{\lambda q \ln 2}{\pi\varepsilon_0 m}}$$

4.



$$R_{AB} = \frac{25\times 5}{30} = \frac{125}{30} = \frac{12.5}{3} = 4.2\Omega$$

$$R_{FC} = \frac{15\times 15}{30} = \frac{225}{30} = \frac{22.5}{3} = 7.5\Omega$$

5. Consider the motion along the common normal:

$-e = \dfrac{v\cos\theta}{-u\sin\theta}$, $\Rightarrow v\cos\theta = e\,u\sin\theta$ . . . (1)

Similarly for the motion along thse common tangent

$u\cos\theta = v\sin\theta$ . . . (2)

$\therefore$ $e\tan\theta = \cot\theta$, or $\tan^2\theta = \dfrac{1}{e}$

$$\theta = \tan^{-1}\sqrt{\frac{1}{e}}$$

6. $f_r = \mu mg$

$\therefore$ $a = -\mu g$; $\alpha = -\dfrac{2\mu g}{r}$

$W = \dfrac{2r_0}{r} + \alpha t$; $v = v_0 - \mu gt$

At t = $\frac{v_0}{\mu g}$; V = 0 and ω = 0;

It will stop.

$\therefore$ Correct answer is (B)

Mathematics

7. **(B)** Let $f(x) = 1 + 2x + 3x^2 + 4x^3 + \ldots + 100x^{99}$, $x \neq 1$
and $g(x) = x + x^2 + x^3 + x^4 + \ldots + x^{100}$, $x \neq 1$
Then $f(x) = g'(x)$

Now, $g(x) = \dfrac{x\left(x^{100} - 1\right)}{x - 1}$

$$\Rightarrow \quad f(x) = g'(x) = \frac{100\,x^{101} - 101\,x^{100} + 1}{(x-1)^2}$$

The given series is $f(2) = 100.2^{101} - 101.2^{100} + 1 = 99.2^{100} + 1$

8. **(B)** Let $I = \displaystyle\int_0^{\frac{\pi}{2n}} \frac{1}{(\tan nx)^n + 1}\,dx$ ... (1)

$$\therefore \quad I = \int_0^{\frac{\pi}{2n}} \frac{1}{(\cot nx)^n + 1}\,dx \quad \ldots (2)$$

$$(1) + (2) \Rightarrow 2I = \int_0^{\frac{\pi}{2n}} 1.\,dx = \frac{\pi}{2n}$$

$$\Rightarrow \quad I = \frac{\pi}{4n}$$

9. **(B)** Rewrite $f(x)$ to get

$$f(x) = \begin{cases} x^2 - x - 6 \ , & x \geq -1 \\ 3x - x^2 \ , & x < -1 \end{cases}$$

The critical points of f are $x = \dfrac{3}{2}$ and $x = -1$

Graph $y = f(x)$ to see the truth of the assertion.
R is true but, obviously, not an explanation of A

10. **(A)**

$$\frac{1}{n^3 - n} = \frac{1}{(n-1)\,n\,(n+1)}$$
$$= \frac{1}{2}\left(\frac{1}{(n-1)\,n} - \frac{1}{n\,(n+1)}\right)$$

Take Σ on both sides and let n run from 2 through N

$$\therefore \quad \sum_{n=2}^{N} \frac{1}{n^3 - n} = \frac{1}{2}\left(\frac{1}{2} - \frac{1}{N(N+1)}\right)$$

A is true and R is true. R is a correct explanation of A.

11. **(B)** $\alpha_1, \alpha_2, \ldots, \alpha_9$ are the roots of the equation
$z^9 + z^8 + \ldots + z + 1 = 0$

Take the transformation $z \to \dfrac{t-1}{2}$.

The equation changes to

$$\left(\frac{t-1}{2}\right)^9 + \left(\frac{t-1}{2}\right)^8 + \ldots + \left(\frac{t-1}{2}\right) + 1 = 0$$

$\Rightarrow \quad (t-1)^9 + 2(t-1)^8 + \ldots + 2^8(t-1) + 2^9 = 0$

The roots of this equation are $2\alpha_1 + 1$, $2\alpha_2 + 1$, ... , $2\alpha_9 + 1$

Hence $-(2\alpha_1 + 1)(2\alpha_2 + 1) \ldots (2\alpha_9 + 1)$

$$= \frac{2^9 - 2^8 + \ldots + 2 - 1}{1} = 341$$

12. **(B)** From the equation of the tangent, one obtains
$A = (a \sec\theta , 0)$ and $B = (0 , b \operatorname{cosec}\theta)$.

P bisects AB $\Rightarrow a\cos\theta = \dfrac{a\sec\theta}{2}$ and $b\sin\theta$

$\Rightarrow \dfrac{b \operatorname{cosec}\theta}{2}$

Hence $\cos^2\theta = \dfrac{1}{2}$ (& $\sin^2\theta = \dfrac{1}{2}$)

CHEMISTRY

13. **(D)** Cu^{2+} and SO_4^{2-} have coulombic forces of attraction giving rise to ionic bond. Four H_2O molecules form coordinate bonds with Cu^{2+}. One H_2O molecule joins to H_2O related to Cu^{2+} and also SO_4^{2-} by H-bonds. H_2O itself has covalent bonds.

15. **(D)** $N_2 + 3H_2 \xrightleftharpoons{K_1} 2NH_3$

$$\Rightarrow \quad 2NH_3 \xrightleftharpoons{K'} N_2 + 3H_2 ; K' = \frac{1}{K_1} \quad \ldots \text{(i)}$$

$$N_2 + O_2 \xrightleftharpoons{K_2} 2NO ; K_2 \quad \ldots \text{(ii)}$$

$$H_2 + \frac{1}{2}O_2 \xrightleftharpoons{K_3} H_2O \quad \ldots \text{(iii)}$$

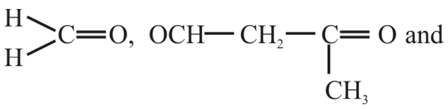
$$\Rightarrow \ 3H_2 + \frac{3}{2}O_2 \underset{}{\overset{K''}{\rightleftharpoons}} 3H_2O; K'' = K_3^3 \qquad \text{... (iv)}$$

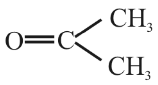
Adding (i), (ii) and (iv)

$$2NH_3 + \frac{5}{2}O_2 \overset{K'}{\rightleftharpoons} 2NO + 3H_2O \ ; \ K' = \frac{1}{K_1}.K_2.K_3^3$$

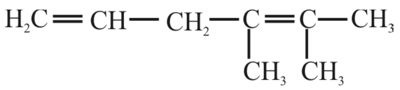
$$= \frac{K_2.K_3^3}{K_1}$$

16. (B)

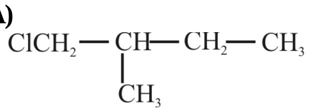




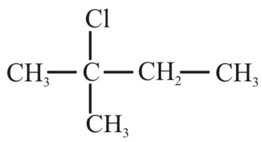
can be obtained by the ozonolysis of

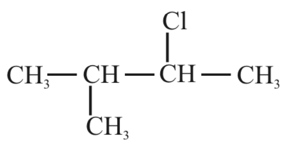


17. (A)



(d and *l*)





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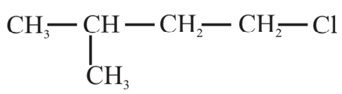

18. **(B)** In *fcc*, $2\left(r^+ + r^-\right) = \sqrt{2}\,a$

$2\left(110 + r^-\right) = 508 \times 1.414$

$r^- = 359 - 110 = 249 \ pm$