JEE EXPERT

ANSWER KEY

JEE Advanced

MODULE TEST (MT - 01)

Batch : 11TH (Zenith - A01 & A02)

Date 25.08.2019

PHYSICS

1	(C)	2	(D)	3	(A)	4	(B)	5	(C)
6	(B)	7	(C)	8	(D)				
9	(ABC)	10	(ABD)	11	(ABCD)	12	(BC)		
13	(0300)	14	(0004)	15	(0004)	16	(0003)		
17	(0002)	18	(0022)						

CHEMISTRY

19	(A)	20	(C)	21	(D)	22	(C)	23	(C)
24	(A)	25	(A)	26	(A)				
27	(CD)	28	(ABD)	29	(ABCD)	30	(ABCD)		
31	(0006)	32	(0006)	33	(0100)	34	(0001)		
35	(0007)	36	(0005)						

MATHEMATICS

37	(B)	38	(C)	39	(D)	40	(A)	41	(A)
42	(D)	43	(B)	44	(C)				
45	(AB)	46	(BC)	47	(AC)	48	(BD)		
49	(0005)	50	(0007)	51	(0001)	52	(0011)		
53	(1601)	54	(0050)						

JEE EXPERT

SOLUTIONS

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PART - I : PHYSICS

1. **Sol. (C)**

2. **Sol. (D)**

3. **Sol. (A)**

4. **Sol. (B)**

$a_{max} = \mu_s g = 0.2 \times 10 = 2 m/s^2$

$t_{min} = \frac{u}{a_{max}} = \frac{4}{2} = 2sec$]

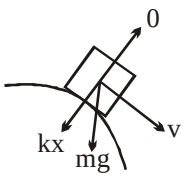
5. **Sol. (C)** It must be constant]

6. **Sol. (B)**

$WD = \Delta k$ $\theta = 60°$

$mgR(1-\cos\theta) = \frac{1}{2} mv^2 - 0 - (1)$

$\therefore v = \sqrt{gR}$



$mg\cos\theta + kx = \frac{mv^2}{R}$

$x = \frac{mg}{2k} = \frac{1}{2} m$ $\therefore$ Natural length $= R - x = 1.5\ m$

7. **Sol.: (C)**

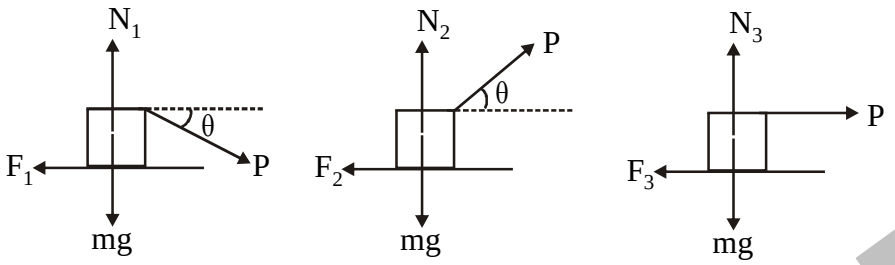
$$h_1 = \frac{u^2}{2g},\ h_2 = \frac{(u\sin 30°)^2}{2g} = \frac{u^2}{8g}$$

$$h_1 : h_2 = 4 : 1$$

8. **Sol.: (D)**

$$w = \int_0^5 F.dx = \int_0^5 \left(7 - 2x + 3x^2\right)dx = 135\,\text{J}$$

9. Sol. **(A, B, C)**



$N_1 = P\sin\theta + mg$ $\quad$ $N_2 = mg - P\cos\theta$ $\quad$ $N_3 = mg$

$F_1 = P\cos\theta$ $\quad$ $F_2 = P\cos\theta$ $\quad$ $F_3 = P$: rest

$F_1 = \mu N_1$ $\quad$ $F_2 = \mu N_2$ $\quad$ $F_3 = \mu N_3$: motion]

10. Sol. **(A, B, D)**

11. Sol. **(A, B, C, D)**

12. Sol. **(B, C)**

(A) $\quad -\frac{1}{2}k(x^2 - x_0^2) = \frac{1}{2}mv^2 - 0$

$\therefore \quad v = \sqrt{\frac{k}{m}(x_0^2 - x^2)}$

$\therefore \quad P = F.v = kx\ \sqrt{\frac{k}{m}(x_0^2 - x^2)}$

(B) $\quad P = k\ \sqrt{\frac{k}{m}(x_0^2\,x^2 - x^4)}$

(C) $\quad y = x_0^2\,x^2 - x^4$

$\frac{dy}{dx} = 0 \qquad \Rightarrow x = \frac{x_0}{\sqrt{2}}$

$\therefore \quad P_{max}$ is at $x = \frac{x_0}{\sqrt{2}}$]

13. Sol. **[Ans. 0300]**

$r = 20\sqrt{3}$

$\tan\theta = 60°$ (θ is angle made by string with vertical)

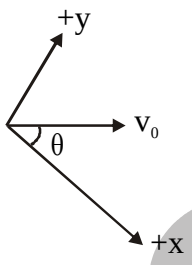
$Fy_{net} = 3F\cos 60° = 3 \times 200 \times \frac{1}{2}$

$Fy_{net} = 300$ N (Fy_{net} is force along vertical direction)

14. **Sol. [Ans. 0004]**

B	C	BC
$v_x = v_0\cos\theta$	$v_x = v$	$v_0\cos\theta - v$
$v_y = v_0\sin\theta$	$v_y = 0$	$v_0\sin\theta$
$a_x = g\sin\theta$	$a_x = g\sin\theta$	0
$a_y = -g\cos\theta$	$a_y = 0$	$-g\cos\theta$
		$a_y = 0$

$0 = v_0\sin\theta\, t - \frac{1}{2} g\cos\theta\, t^2$



$\therefore \quad t = \frac{3}{2}$ s

$x = (v_0\cos\theta - v)t$

$\therefore \quad v = 4$ m/s

15. **Sol. [Ans 0004]**

$$a = \frac{20g\sin 37° - 0.5\times 10g\cos 37° - 0.4g\cos 37°}{20}$$

for m_1

$T + 10g\sin 37° - 0.5 \times 10g\cos 37° = 10a$

16. **Sol. [Ans. 0003]**

Time taken $T = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2\times 20}{10}}$

$T = 2$ sec

$S = 30 \times 2 = 60$ cm

Hence 3 poles away.

17. **Sol. [Ans. 0002]**

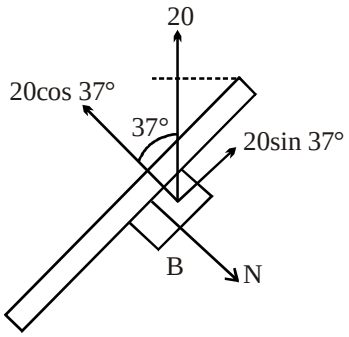
$N = 20\cos 37°$

$N = 20 \times \frac{4}{5} = 16$

$f_{s\,max} = 9.6$

$f_k = 8$

$20\sin 37° - f_k = 2a$



$20 \times \frac{3}{5} - 8 = 2a$

$a = 2\ m/s^2$

18. **Sol. [Ans. 0022]**

Motion will start when $F \geq \mu_s mg$ at $t = 1s$

after that $F - \mu_k mg = ma$

$3t^2 - 2 = a$ or $3t^2 - 2 = \frac{dV}{dt} \Rightarrow V = \int_1^3 (3t^2 - 2)dt = 22\ m/s$

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