FIITJEE PROGRESS MONITORING TEST (FPMT–2)

ANSWER KEY (CODE-114036)

Applicable for CPA Batches (A02, C01)

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

HINTS OR SOLUTION
PHYSICS

1. $I_1 = \frac{M}{\pi\left(R^2-r^2\right)}.\pi R^2\frac{R^2}{4}-\frac{M}{\pi\left(R^2-r^2\right)}\pi r^2\frac{r^2}{4}$

$=\frac{M\left(R^2+r^2\right)}{4}$

$dI = dM\left(\frac{R^2+r^2}{4}\right)+dMx^2$

$I=\int_0^L dI$

2. $V_P=\sqrt{\left(R+\frac{R}{2}\cos 60\right)^2+\left(\frac{R}{2}\sin 60\right)^2}\frac{V_0}{R}$

$=\frac{\sqrt{7}}{2}V_0$

3. $t=\frac{2\pi R}{V}$

$0=\frac{MR^2}{2}w+2m\left(V+Rw\right)R$

$w=-\frac{4mv}{(M+4m)R}$

$\theta = wt$

5. $mV_0\left(\frac{L}{2}+x\right)=\frac{ML^2}{3}w$ ..... (1)

$mv_0=M\frac{L}{2}w$ ..... (2)

$\frac{\text{Eq.1}}{\text{Eq.2}}$

$\frac{L}{2}+x=\frac{2L}{3}$

$x=\frac{L}{6}$

6. $mg\frac{L}{2}(1-\cos\theta)=\frac{1}{2}\frac{mL^2}{3}w^2$

$w^2=\frac{3g}{L}(1-\cos\theta)$

7. $2\frac{mL^2}{12}\omega_0=\left(2\frac{mL^2}{12}+mL^2\right)w$

$w=\frac{\omega_0}{7}$

8. $dI = dm\ x^2$

$dI=\frac{m}{\frac{1}{2}L.\frac{L}{2}}\times 2x\ \ dx\ x^2$

$I=\frac{ML^2}{8}$

9. $H = \dfrac{M(2d)^2}{12} w$

11. $\vec{a} = 10\hat{i} + 2R\alpha\hat{j} - Rw^2\hat{k}$

$= 10\hat{i} + 4\hat{j} - 36\hat{k}$

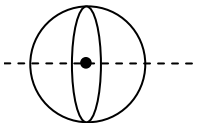
$|\vec{a}| = \sqrt{1412}$

12. $V_A = \dfrac{V}{2}\operatorname{cosec}\theta$

$= \dfrac{6}{2} \times \dfrac{5}{3} = 5$

13. C

Sol. $I_{total} = \underset{\text{For ring 1}}{mr^2} + \underset{\text{For ring 2 by perpendicualr axis theorem}}{\frac{1}{2}mr^2}$



14. C

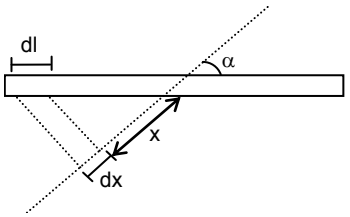
Sol. Here, Radius of A < Radius of B

$\therefore \dfrac{m}{2}R_A^2 < \dfrac{m}{2}R_B^2$

15. A

Sol. $dI = dm \times (x\tan\alpha)^2$

$I = \int\limits_{-l\cos\alpha}^{l\cos\alpha} \dfrac{m}{2l\cos\alpha} \times (x\tan\alpha)^2\, dx$



16. D

Sol. Rotational KE = $\dfrac{1}{2}I\omega^2$

$\therefore$ Total KE = Translation KE + Rotational KE

$\therefore \dfrac{\frac{1}{2}mv^2}{\frac{1}{2}mv^2 + \frac{1}{2}I\omega^2} = \dfrac{5}{7}$

17. C

Sol. By conservation of angular momentum

$I_{\text{initial}} \times \omega = I_{\text{final}} \times \omega'$

$\omega' = \dfrac{I_{\text{initial}}}{I_{\text{final}}} \times \omega = \dfrac{M}{M+2m} \times \omega$

18. B

Sol. $\alpha = \dfrac{\tau}{I} = \dfrac{0.1T}{0.1} \Rightarrow \alpha = T$

For block $mg - T = ma$

$20 - T = 2 \times 0.1 \times T$

$20 - T = 0.2T$

$T = \dfrac{20}{1.2} = 16.66 = \alpha$

19. B

Sol. Since torque about axis = 0, angular momentum is conserved

$\dfrac{ML^2}{12} \times \omega_0 = \left(\dfrac{ML^2}{12} + 2 \times \dfrac{L^2}{4} \times m\right)\omega'$

$$\omega' = \left(\frac{M}{M+6m}\right)\omega_0$$

20. A

Sol. $\tau = I \times \alpha$

$$\frac{100\pi}{4\pi} = I = 25 \text{ kgm}^2$$

21. C

Sol. For disc, $I = \frac{5}{4}mr^2$

for ring, $I = \frac{3}{2}mr^2$

$\therefore$ radius of gyration ratio = $\sqrt{\frac{5}{4} \times \frac{2}{3}} = \sqrt{\frac{5}{6}}$

22. A

Sol. Here, Point P is the centre of mass of the system, as
Torque about CM = 0 for no rotation

23. B

Sol. KE for the plate

$KE_1 = KE_2 = KE_3$

$\Rightarrow I_1\omega_1^2 = I_2\omega_2^2 = I_3\omega_3^2$

Now, $I_1 = I_2 = \frac{I_3}{2}$ (By perpendicular axis theorem)

$\therefore \omega_0 : \omega_2 : \omega_3 = \sqrt{2} : \sqrt{2} : 1$

24. **D**

Sol. Radius of arc = $\frac{r}{2}$

Centre of mass of arc = $\frac{2}{\pi}\left(\frac{r}{2}\right)$ from line of hinge.

Net torque about hinge is zero.

25. **C**

Sol. Velocity of bottom most point on cylinder
= Velocity of plank.
$V_c - \omega R = V_p$
$V_A = V_c + \omega R = V_c + (V_c - V_p) = 2V_c - V_p$.

26. **A**

Sol. $I = \frac{1}{4}\left(\frac{1}{2} \times \text{Mass of complete disc} \times R^2\right)$

$= \frac{1}{4} \times \frac{1}{2} \times 4M \times R^2 = \frac{1}{2}MR^2$

27. **C**

Sol. Conserving angular momentum about axis 0.

$$mV_o \cdot \frac{L}{2} = \left(m\frac{L^2}{4} + \frac{mL^2}{12}\right)\omega$$

28. **D**

Sol. $a = \dfrac{g \sin\theta}{1 + \dfrac{I}{MR^2}}$

FIITJEE PROGRESS MONITORING TEST (FPMT–3)

ANSWER KEY (CODE-114036)

Applicable for CPA Batches (B-Lot)

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1.	D	**1.**	A	**1.**	C
2.	C	**2.**	A	**2.**	A
3.	A	**3.**	C	**3.**	C
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5.	B	**5.**	A	**5.**	C
6.	B	**6.**	B	**6.**	A
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9.	C	**9.**	A	**9.**	A
10.	A	**10.**	B	**10.**	A
11.	B	**11.**	A	**11.**	A
12.	C	**12.**	C	**12.**	D
13.	C	**13.**	A	**13.**	A
14.	C	**14.**	B	**14.**	A
15.	A	**15.**	A	**15.**	C
16.	D	**16.**	A	**16.**	B
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18.	B	**18.**	A	**18.**	D
19.	B	**19.**	A	**19.**	A
20.	A	**20.**	A	**20.**	D
21.	C	**21.**	C	**21.**	A
22.	A	**22.**	A	**22.**	A
23.	B	**23.**	B	**23.**	D
24.	D	**24.**	B	**24.**	A
25.	C	**25.**	C	**25.**	B
26.	A	**26.**	C	**26.**	C
27.	C	**27.**	D	**27.**	C
28.	D	**28.**	C	**28.**	D
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30.	C	**30.**	D	**30.**	C

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PHYSICS

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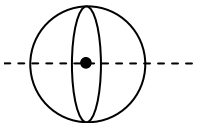

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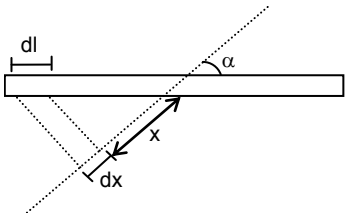

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