Sri Chaitanya IIT Academy, India

A.P, TELANGANA, KARNATAKA, TAMILNADU, MAHARASHTRA, DELHI, RANCHI

A right Choice for the Real Aspirant

ICON CENTRAL OFFICE, MADHAPUR-HYD

Sec: Sr.IPLCO | **Dt: 01-11-15**

Time: 09:00 AM to 12:00 Noon | **RPTA-10** | **Max.Marks: 180**

PAPER-1

KEY & SOLUTIONS

PHYSICS

1	**ABD**	2	**BC**	3	**A**	4	**BC**	5	**D**	6	**ABC**
7	**AC**	8	**C**	9	**AD**	10	**AC**	11	**5**	12	**3**
13	**8**	14	**6**	15	**3**	16	**0**	17	**6**	18	**6**
19	**3**	20	**0**								

CHEMISTRY

21	**ABCD**	22	**CD**	23	**ABC**	24	**ABCD**	25	**ACD**	26	**ABD**
27	**ABD**	28	**AB**	29	**ABC**	30	**ABD**	31	**4**	32	**3**
33	**4**	34	**5**	35	**7**	36	**2**	37	**8**	38	**3**
39	**9**	40	**3**								

MATHS

41	**BCD**	42	**AC**	43	**ABC**	44	**ABD**	45	**ABCD**	46	**ABD**
47	**BCD**	48	**AB**	49	**AD**	50	**ABCD**	51	**3**	52	**5**
53	**2**	54	**7**	55	**1**	56	**6**	57	**1**	58	**9**
59	**2**	60	**3**								

SOLUTIONS
PHYSICS

1. After imparting impulse

$$V_{C_1} = \frac{J}{m}$$

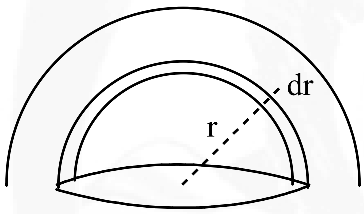
About C.M C_1 moves in circle with speed $\frac{J}{2m}$

So, $\frac{Gm^2}{4R^2} - N = \frac{m\left(\frac{J}{2m}\right)^2}{R}$

$$\Rightarrow N = \frac{Gm^2}{8R^2}$$

2. Field due to hollow hemispherical shell at its curvature is $\pi G\sigma = \frac{GM}{2R^2}$

So due to thin differential shell of thickness dr



$$\int dE = \int \frac{GdM}{2r^2}$$

$$= \int \frac{G\rho 2\pi r^2 dr}{2r^2} = G\rho\pi R$$

$$= \frac{GM}{\frac{2}{3}\pi R^3}\pi R = \frac{3GM}{2R^2}$$

3. For a bound system, M.E of the system in C.M frame should be strictly negative

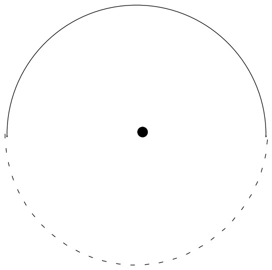
8. $E.4\pi r^2 = \int \frac{\rho 4\pi r^2 dr}{\varepsilon_0}$

$$\Rightarrow n = \frac{1}{2}$$

9. Use symmetry and dimensional analysis

10. Using super position

$E_A = 0$ due to both hemricylinder so E due to each at A should be perpendicular to OA



11. Radii are R and 4R and angular velocities are $w \text{ and } \frac{w}{8}$

$\omega_{rel} = \frac{V_{rel}}{R} = \frac{R\omega - \frac{R\omega}{2}}{3R}$

$= \frac{\omega}{6}$

$\omega_{rel} = \frac{R\omega + \frac{R\omega}{2}}{5R}$

$= \frac{3\omega}{10}$

12. $\frac{x}{y} = \frac{\frac{1}{2}(PS)^2 d\theta}{\frac{1}{2}(SQ)^2 d\theta} = \frac{(PS)^2}{(SQ)^2}$

13. $\frac{GM}{R^2} = \frac{G(m+M)}{(R+h)^2}$ here

$M = \rho \frac{4}{3}\pi R^3$

$m = \sigma 4\pi R^2 h$

14. Take field due to each sheet and integrate or use G gravitational equivalent of gauss law

$\int \vec{E}.d\vec{s} = -4\pi G m_{enclosed}$

15. $\dfrac{GMm^1}{(R-r)^2}-\dfrac{Gmm^1}{r^2}=m^1(R-r)\dfrac{GM}{R^3}$

$(M-earth, m-moon, m'-object)$

$\dfrac{GMm'}{R^2}\left(1-\dfrac{r}{R}\right)^{-2}-\dfrac{Gmm'}{r^2}=\dfrac{GMm'}{R^2}-\dfrac{GMm'r}{R^3}$

$\dfrac{GMm'}{R^2}\left(1+\dfrac{2r}{R}\right)-\dfrac{Gmm'}{r^2}=\dfrac{GMm'}{R^2}-\dfrac{GMm'r}{R^3}$

$\Rightarrow x=3$

16. Zero due to symmetry

17. $\dfrac{q_1q_2}{4\pi\varepsilon_0 r^2}\propto v\dfrac{dv}{dr}$

$\Rightarrow v^2\propto\dfrac{q_1q_2}{4\pi\varepsilon_0 r}$

$\Rightarrow\dfrac{dr}{dt}\propto\sqrt{\dfrac{q_1q_2}{4\pi\varepsilon_0 r}}\Rightarrow r^{3/2}\propto\sqrt{\dfrac{q_1q_2}{4\pi\varepsilon_0}}t$

18. Assume the energy missing in the conductor's material volume to be present and substract these values from initial to final situation

19. $E_{hollow}=\dfrac{\sigma}{4\varepsilon_0}$

$E_{solid}=\dfrac{\rho R}{4\varepsilon_0}$

$\sigma=\rho R$

$\dfrac{Q_1}{4\pi R^2}=\dfrac{Q_2R}{\frac{4}{3}\pi R^3}$

$\Rightarrow\dfrac{Q_1}{Q_2}=3$

20. $\vec{E}=\vec{O}$ inside conductor.