RJ VISION PVT. LTD.

(MOST STABLE & INNOVATIVE INSTITUTE)

PT – 3
JEE
CBSE, GSEB

PCM

SOLUTION

COURSE NAME: 12TH **DATE : 24th July 2017**

Physics :

1. (3)
2. (4)
3. (2)
4. (3)
5. (1)
6. (3)
7. (4)
8. (3)
9. (2)
10. (3)
11. (4)
12. (1)
13. (1)
14. (3)
15. (2)
16. (3)

Total charge in r < R region

$$q = \int \rho dV = \int_0^r \rho_0 \left(\frac{5}{4} - \frac{r}{R}\right) 4\pi r^2 dr$$

$$= 4\pi\rho_0 \left[\frac{5}{4}\left(\frac{r^3}{3}\right) - \frac{1}{R}\left(\frac{r^4}{4}\right)\right] = \pi\rho_0 r^3 \left(\frac{5}{3} - \frac{r}{R}\right)$$

Electric field $E = \frac{kq}{r^2} = \frac{\rho_0 r}{4\varepsilon_0}\left(\frac{5}{3} - \frac{r}{R}\right)$

17. (3)

Net flux = 0, so required flux = (E) (πR^2)

18. (1)

$$\phi = \vec{E}.\vec{S} = ES\cos 90^o = 0.$$

19. (1)

Here, $\vec{E} \perp$ Area vector.

20. (3)

$$required\ \ potential = \frac{Q}{4\pi\varepsilon_0\left(\frac{R}{2}\right)} + \frac{q}{4\pi\varepsilon_0 R}$$

21. (1)
22. (1)

Loss in potential energy

$$= \left[\frac{4kq^2}{a} + \frac{2kq^2}{a\sqrt{2}}\right] - \left[\frac{4kq^2}{(2a)} + \frac{2kq^2}{(2a\sqrt{2})}\right]$$

$$= \left(2 + \frac{1}{\sqrt{2}}\right)\frac{kq^2}{a}$$

As gain in kinetic energy = loss in potential energy

So, $4 \times \frac{1}{2}mv^2 = \left(2 + \frac{1}{\sqrt{2}}\right)\frac{kq^2}{a}$

$$\Rightarrow v = \sqrt{\left(1 + \frac{1}{2\sqrt{2}}\right)\frac{q^2}{4\pi\varepsilon_0 ma}}$$

23. (4)

$$\vec{E} = \frac{\partial V}{\partial x}\hat{i} - \frac{\partial V}{\partial y}\hat{j} - \frac{\partial V}{\partial z}\hat{k}$$

$$= -[(6 - 8y)\hat{i} + (-8x - 8 + 6z)\hat{j} + (6y)\hat{k}]$$

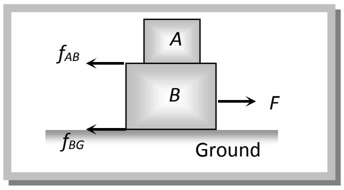
At (1, 1, 1); $\vec{E} = 2\hat{i} + 10\hat{j} - 6\hat{k}$

$$\Rightarrow \vec{E} = \sqrt{2^2 + 10^2 + 6^2} = \sqrt{140} = 2\sqrt{35}$$

24. (4)

$$S = \frac{u^2}{2\mu g} = \frac{m^2u^2}{2\mu g m^2} = \frac{P^2}{2\mu m^2 g}$$

25. (3)



Two frictional force will work on block *B*.

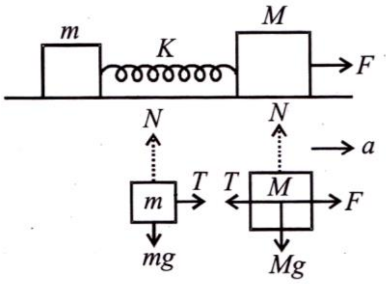
$$F = f_{AB} + f_{BG} = \mu_{AB} m_a g + \mu_{BG}(m_A + m_B)g$$

= 0.2 × 100 × 10 + 0.3 (300) × 10

= 200 + 900 = 1100*N*. (This is the required minimum force)

26. (4)

Drawing free body-diagrams for m & M.



we get T = ma and F – T = Ma

where T is force due to spring

$\Rightarrow$ F – ma = Ma or, F = Ma + ma

$\therefore a = \dfrac{F}{M+m}$.

Now, force acting on the block of mass m is

$ma = m\left(\dfrac{F}{M+m}\right) = \dfrac{mF}{m+M}$

27. (1)

$mg\sin\theta = ma \therefore a = g\sin\theta$

where a is along he inclined plane

$\therefore$ vertical component of acceleration is g $\sin^2\theta$

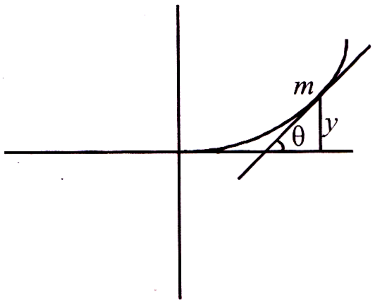
$\therefore$ relative vertical acceleration of A with respect to B is

$g(\sin^2 60 - \sin^2 30] = \dfrac{g}{2} = 4.9$ m/s^2 in vertical direction.

28. (1)

At limiting equilibrium, $\mu = \tan\theta$

$\tan\theta = \mu = \dfrac{dy}{dx} = \dfrac{x^2}{2}$ (from question)



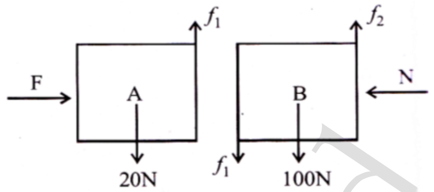
$\because$ Coefficient of friction $\mu = 0.5$

$\therefore\ 0.5 = \dfrac{x^2}{2}$

$\Rightarrow\ x = \pm 1$

Now, $y = \dfrac{x^3}{6} = \dfrac{1}{6}m$

29. (1)

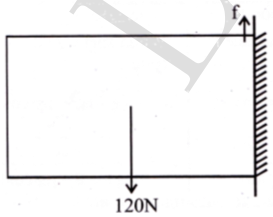


Assuming both the blocks are stationary

N = F

$f_1 = 20N$

$f_1 = 100N + 20 = 120N$



Considering the two blocks as one system and due to equilibrium f = 120 N.

30. (1)

Loss in P.E. = Work done against friction from $P \rightarrow Q$ + work done against friction from $Q \rightarrow R$

mgh = μ (mgcosθ) PQ + μmg (QR)

$h = \mu\cos\theta \times PQ + \mu(QR)$

$2 = \mu \times \dfrac{\sqrt{3}}{2} \times \dfrac{2}{\sin 30^o} + \mu x$

$2 = 2\sqrt{3}\mu + \mu x$ .... (i)

$[\sin 30^o = \dfrac{2}{PQ}]$

Also work done $P \rightarrow Q$ = work done $Q \rightarrow R$

$\therefore 2\sqrt{3}\mu = \mu x$

$\therefore x \approx 3.5m$

From (i) $2 = 2\sqrt{3}\mu + 2\sqrt{3}\mu = 4\sqrt{3}\mu$

$\mu = \dfrac{2}{4\sqrt{3}} = \dfrac{1}{2\times 1.732} = 0.29$

Chemistry :

31. (3)
32. (1)
33. (1)
34. (2)
35. (4)
36. (1)
37. (1)
38. (3)
39. (3)
40. (3)
41. (1)
42. (3)
43. (3)
44. (2)
45. (3)
46. (1)
47. (3)
48. (3)
49. (1)
50. (4)
51. (1)

    $Z = 114\ [Rn]^{86}\ 7s^2\ 5f^{14}\ 6d^{10}\ 7p^2$ 14^{th} gp.

    (Carbon family)

52. (3)
53. (3) I < Br < Cl < F (given Δ Heg order)

    I < Br < F < Cl (Correct)

54. (4)
55. (2)

    $C\ell_2 > Br_2 > F_2 > I_2$

    ↓

    Due to high ℓp-ℓp repulsion

56. (4)
57. (1)
58. (1)
59. (2)
60. (2)

Maths :

61. (4)
62. (1)
63. (3)
64. (2)
65. (1)
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89. (3)
90. (2)