AVIRAL CLASSES

IIT-JEE | NEET | FOUNDATIONS

ULTIMATE TEST SERIES NEET -2020
TEST-2 SOLUTION

Test Date :04-03-2020

[PHYSICS]

1. $f = \mu \times 250 = 0.3 \times 250 = 75\ N$

2. $R = 4H$

$$\frac{U^2 \times 2\sin\theta\cos\theta}{g} = 4 \times \frac{U^2 \sin^2\theta}{2g}$$

$\tan\theta = 1$ $\boxed{\theta = 45°}$

3. For equilibrium :- $f \geq mg$

$\mu\, Kd \geq mg$ $\quad K \geq \frac{mg}{\mu d}$

Hence $\quad K_{min} = \frac{mg}{\mu d}$

4.
$$a = \sqrt{a_c^2 + a_t^2} = \sqrt{\left(\frac{V^2}{r}\right)^2 + a_t^2}$$

$$a = \sqrt{\left(\frac{900}{450}\right)^2 + (2)^2} = 2.8\ m/s^2$$

5.
$$\vec{F_A} + \vec{F_B} + \vec{F_C} + \vec{F_D} + \vec{F_E} = (100 \times 3)\,\hat{i} = 300\,\hat{i} \quad \text{---- (1)}$$

$$\vec{F_B} + \vec{F_C} + \vec{F_D} + \vec{F_E} = (100 \times 1)(-\hat{i}) = -100\,\hat{i} \quad \text{---- (2)}$$

$$\vec{F_A} + \vec{F_C} + \vec{F_D} + \vec{F_E} = (100 \times 24)\,\hat{j} = 2400\,\hat{j} \quad \text{---- (3)}$$

From (1) & (2) $\Rightarrow \vec{F_A} = 400\,\hat{i}$

From (1) & (3) $\Rightarrow \vec{F_B} = 300\,\hat{i} - 2400\,\hat{j}$

So, when A & B pulling the cart then acceleration

$$\vec{a} = \frac{\vec{F_A} + \vec{F_B}}{m} = \frac{700\,\hat{i} - 2400\,\hat{j}}{100} = (7\,\hat{i} - 24\,\hat{j})\ m/s^2$$

$|\vec{a}| = 25\ m/s^2$

6. D

7. $\frac{mV^2}{r} = mg \qquad V = \sqrt{rg} = \sqrt{1.6 \times 10}$

$V = 4\ m/s$

8. $v\cos45° = 150\cos60° \Rightarrow v = 75\sqrt{2}\ m/s$

$v_y = u_y + a_y t \Rightarrow v\sin45° = 150\sin60° - g \times t$

$$t = \frac{150\sin60° - v\sin45°}{10} = 7.5\left(\sqrt{3} - 1\right)\sec$$

9. $v = u + at \Rightarrow 1000 = 0 + a \times 10$

$a = 100\ m/s^2$

$$m = \frac{F}{a} = \frac{10^5}{100} = 10^3\ kg$$

10. $m_1 g = \mu m_2 g \qquad m_1 \rightarrow$ mass of hanged part

$m_2 \rightarrow$ mass of remaining part

$$\mu = \frac{m_1}{m_2} = \frac{\frac{M}{L} \times \ell}{\frac{M}{L}(L - \ell)} = \frac{\ell}{L - \ell}$$

11. $T = W' = m(g - a)$

$T = 1500\,(9.8 - 1.8)$

$T = 1500 \times 8 = 12000\ N$

12.
$$W = \Delta K \Rightarrow O = \int_0^S (mg\sin\theta - \mu mg\cos\theta)\,dx$$

$$(mg\sin\theta)S = (mg\cos\theta)\frac{KS^2}{2}$$

$$S = \frac{2\tan\theta}{K}$$

13. For looping the loop minimum velocity at top point $v = \sqrt{gL}$

time taken by particle

$$t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2\times 2L}{g}} = 2\sqrt{\frac{L}{g}}$$

$\therefore$ horizontal range $x = vt = \sqrt{gL}\times 2\sqrt{\frac{L}{g}} = 2L$

14. Force on bullets $= \frac{\Delta P}{\Delta t} = \frac{N(-mv-mv)}{t}$

$= -2\,nmv$

by Newton's third law

force on wall = – force on bullets

$= 2\,mnv$

15. **D**

16. $u\cos\theta = 1$

$u\sin\theta = 2$

$\Rightarrow \tan\theta = 2,\ u = \sqrt{5}$

equation of trajectory $y = x\tan\theta - \frac{1}{2}g\left(\frac{x}{u\cos\theta}\right)^2$

$y = x\times 2 - \frac{1}{2}\times 10\times\left(\frac{x}{1}\right)^2$

$y = 2x - 5x^2$

17. $W = f = \mu N$

$W = 0.2\times 10 = 2N$

18. $\frac{H_1}{H_2} = \tan^2\theta$

$H_2 - H_1 = 50$

$H_2(1 - \tan^2\theta) = 50$

$$\Rightarrow \frac{u^2\cos^2\theta}{2g}\times\left(\frac{\cos^2\theta - \sin^2\theta}{\cos^2\theta}\right) = 50$$

$\Rightarrow 1 - 2\sin^2\theta = \frac{5}{8}$

$\Rightarrow \sin^2\theta = \frac{3}{16}$

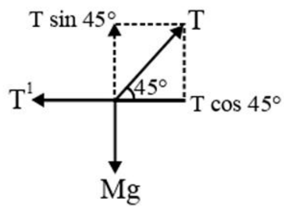
so $H_1 = \frac{u^2\sin^2\theta}{2g} = \frac{(40)^2}{2\times 10}\times\frac{3}{16} = 15$ m

so $H_2 = 65$ m.

19. $\alpha = \frac{\omega_2 - \omega_1}{t}$ and $a_T = \alpha r$

20. **D**

21.



$T\sin 45° = Mg$ .....(1)

$T\cos 45° = T^1$ .....(2)

From (1) & (2)

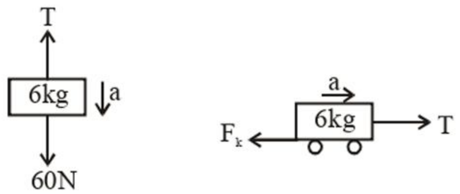
$\because\ \tan 45° = \frac{Mg}{T^1}$ $\therefore\ T^1 = Mg = 100\ g$

22. **A**

23. **C**

24. **D**

25.



$60 - T = 6a$ .....(i)

$T = f_K = 30a$

$T - 30 \times 0.1 \times 10 = 30a$

$T - 30 = 5(6a)$

$T - 30 = 5(60 - T)$ (by eq. i)

$T - 30 = 300 - 5T$

$6T = 330$

$T = 55$ N

26. Impulse $= \Delta p = m(v_f - v_i)$

$= 0.5\left[-\frac{10}{5} - \frac{10}{5}\right]$

27. $KE_f = \frac{1}{4}\ KE_i$

$\frac{1}{2}\ mV^2 = \frac{1}{4}\left(\frac{1}{2}mV_0^2\right)$

$V = \frac{V_0}{2}$

$V = u + at \quad (a = \mu g)$

$\frac{V_0}{2} = V_0 - \mu g t_0$

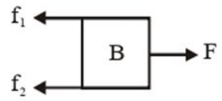
$\mu g\ t_o = \frac{V_0}{2}$

$\mu = \frac{V_0}{2gt_0}$

28. $H_1H_2 = \frac{u^2\sin^2\theta}{2g} \times \frac{u^2\cos^2\theta}{2g} = \left(\frac{u^2 2\sin\theta\cos\theta}{g}\right)^2 \times \frac{1}{16} = \frac{R^2}{16}$

$\therefore\ R^2 = 16H_1H_2 \Rightarrow R = 4\sqrt{H_1H_2}$

29.

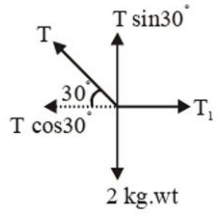


$F = f_1 + f_2$

$= 0.2 \times 100 \times g + 0.3(100+200)g$

$= 1100$N

30.



$T\sin 30° = 2$ ....(1)

$T\cos 30° = T_1$.............(2)

(1)÷(2)

$\tan 30° = \frac{2}{T_1}$

$T_1 = 2\sqrt{2}$ kg-wt.

31. D

32. $V_{max} = 0 + \theta T$

$\because$ acc^n. & decceleration are const.

$\therefore\ V_{avg} = \frac{0 + V_{max}}{2} = \frac{aT}{2}$

33. $\frac{T_{up}}{T_{down}} = \frac{m(g+a)}{m(g-a)} = \frac{9.8+4.9}{9.8-4.9} = \frac{3}{1}$

34. time $= \frac{\text{Separation covered}}{\text{relative speed}}$

$= \frac{100}{10-9} = 100$ sec.

35. C

36. $3m(200\cos 60°)\,\hat{i} = (m \times 100)\,\hat{j} + (m \times 100)\left(-\hat{j}\right) + m\vec{v}$

$\vec{v} = \left(300\,\hat{i}\right)$ m/s

300 m/s in the horizontal direction.

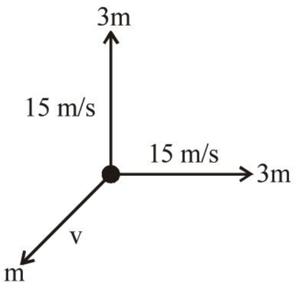
37. For 20 Kg block :-

$100 - \mu \times 20 \times g = 20a$

38. $y = 16x\left(1 - \frac{5x}{64}\right)$

so, $R = \frac{64}{5} = 12.8m$

39.

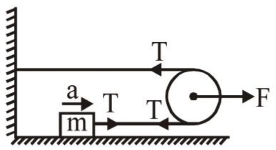


$mv = \sqrt{(3m \times 15)^2 + (3m \times 15)^2}$

$mv = 45m\sqrt{2}$

$v = 45\sqrt{2}\ m/s$

40.



Block : T = ma

$F = 2T \Rightarrow T = F/2$

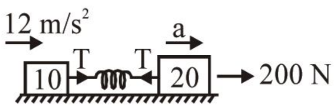
$a = \frac{F}{2m}$

If the block moves by a distance d, pulley moves by d/2

$a_p = \frac{a}{2} = \frac{F}{4m}$

41. $T_P = M_{below} \times (g + a) = (3 + 5)(10 + 10) = 160N$

42.



$T = 10 \times 12 = 120$

$200 - T = 20a \Rightarrow a = 4\ m/s^2$

43. A

44. B

45. $a = \frac{(M_{big} - M_{small})g}{M_{big} + M_{small}}$

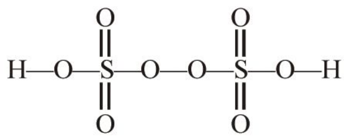
[CHEMISTRY]

46. B

47. B

48. B

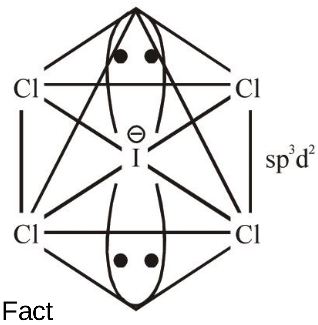
49.



50. $O_2(n = 2), B_2(n = 2), O_2^-(n = 1)$

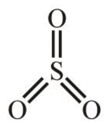
[n = unpaired e^- number $\propto$ paramagnetic nature]

51.



52. Fact

53.



sp^2-hybrid (1 Pπ-Pπ)

54. Valency remains constant in a group.

55. $OF_2 < H_2O < NH_3 < Cl_2O$

56. Fact

57. $\pi^* 2p_x^1 = \pi^* 2p_y^1$

58. Fact

59. The conditions required for the formation of an ionic bond.

(i) Ionization enthalpy $[M(g) \rightarrow M^+(g) + e^-]$ of electropositive element must be low.

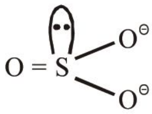
(ii) Negative value of electron gain enthalpy $[X(g) + e^- \rightarrow X^-(g)]$ of electronegative element should be high.

60. Fact

61. N_2^+ (Number of unpaired $e^- \Rightarrow \sigma 2p_z^{\ 1}$)

= 1 = Paramegnetic

62. IP order $F^- < Cl^-$

63.  sp^3 hybride

64. **A**

65. $BeSO_4 > MgSO_4 > CaSO_4 > SrSO_4 > BaSO_4$ (Solubility)

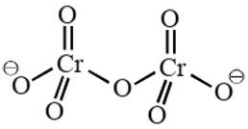
66. $(v_{rms})SO_2 = (v_{rms})O_2$

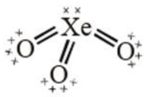
$$\sqrt{\frac{3RT_{SO_2}}{64}} = \sqrt{\frac{3R \times 303}{32}}$$

67. [Metallic charater $\propto$ size]
NCERT XI Para-II Pg. # 292

68. **B**

69. **A**

70. $Cr_2O_7^{-2}$ 

71. XeO_3 sp^3 hybridised 

72. **D**

73. **D**

74. **C**

75. **D**

76. Intermolecular attraction $\propto$ a

77. **D**

78. **C**

79. **C**

80. **B**

81. **D**

82. **C**

83. **D**

84. **B**

85. **A**

86.

$$\frac{r_B}{r_A} = \sqrt{\frac{M_A}{M_B}} = \frac{V_B / t_B}{V_A / t_A} \Rightarrow \sqrt{\frac{49}{M_B}} = \frac{20}{10}$$

$M_B = 12.25$ u

87. In the ClF_3, Cl atom is sp^3d hybridised, having trigonal bipyramidal geometry, in which axial bonds are longer than equitorial bonds.

88. Given ions

	(i) C_2^{2-}	(ii) He_2^+	(iii) O_2^-	(iv) NO
Total e^-	14	3	17	15
Bonding e^-	10	2	10	10
Anti	4	1	7	5

89. **A**

90. Bond angle $\propto \frac{1}{\text{Number of lp}}$