SOLUTIONS

Mentors Eduserv

All India Test Series 2018

Part Test-2

NEET PATTERN

Test Date: 03-12-2017

Mentors Eduserv: Plot No.-136/137, Parus Lok Complex, Boring Road Crossing,
Patna-1, Ph. No. : 0612-3223680 / 81, 7781005550 / 51

PHYSICS

1. **(1)**

$a = \sqrt{a_1^2 + a_n^2}$

a_t = rate of change of speed = 2 m/s^2

$a_n = \frac{v^2}{R} = \frac{(5)^2}{10} = 2.5 m/s^2$

$\therefore\ a = \sqrt{a_1^2 + a_n^2} = \sqrt{(2)^2 + (2.5)^2} = 3.2\ m/s^2$

2. **(3)**

$h_{AB} = (r\cos\alpha - r\sin\beta)$

Velocity of particle at B

$v = \sqrt{2gh_{AB}} = \sqrt{2g(r\cos\alpha - r\sin\beta)}$

Particle will have contact at B if component of weight is just equal to centripetal force (towards centre).

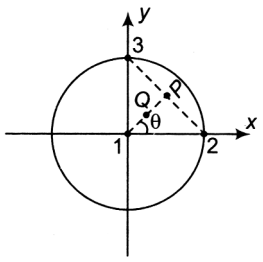
or $mg\sin\beta = \frac{mv^2}{r}$

or $\sin\beta = 2\cos\alpha - 2\sin\beta$

$\therefore$ $3\sin\beta = 2\cos\alpha$

3. **(1)**

P is the position of centre of mass of particle at 2 and 3. Q is position of centre of mass of all three particles



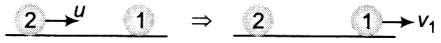
$\tan\theta = \frac{y_{CM}}{x_{CM}} = \frac{m_1y_1 + m_2y_2 + m_3y_3}{m_1x_1 + m_2x_2 + m_3x_3}$

$= \frac{6\times0 + 2\times0 + 2\times a}{6\times0 + 2\times a + 2\times0} = 1$

or $\theta = 45°$

4. **(2)**

From conservation of linear momentum:



or $mu = mv_1 + mv_2$

From definition of e:

$$v_1 - v_2 = eu$$

Solving these two equations, we get

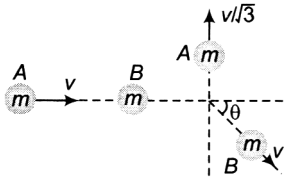
$$v_1 = \left(\frac{1+e}{2}\right)u$$

and $$v_2 = \left(\frac{1-e}{2}\right)u$$

$\therefore$ $$\frac{v_1}{v_2} = \left(\frac{1+e}{1-e}\right)$$

5. **(1)**

Let mass A moves with velocity v and collides inelastically with mass B, which is at rest



According to problem mass A moves in a perpendicular direction and let the mass B moves at angle θ with the horizontal with velocity v.

Initially in horizontal momentum of system

(before collision) mv ...(i)

Final horizontal momentum of system]

(after collision) = mv $\cos\theta$ ...(ii)

From the conservation of linear momentum

$mv = mV\cos\theta \Rightarrow v = v\cos\theta$ ...(iii)

Initial perpendicular direction momentum of system (before collision) is zero.

Final momentum of sytem in this direction is

$$\frac{mv}{\sqrt{3}} - mV\sin\theta$$

From conservation of momentum

$$\frac{mv}{\sqrt{3}} - mV\sin\theta = 0$$

$$\Rightarrow \quad \frac{v}{\sqrt{3}} - V\sin\theta \qquad ...(iv)$$

By solving Eqs. (iii) and (iv), we have

$$v^2 + \frac{v^2}{3} = V^2(\sin^2\theta + \cos^2\theta)$$

$$\Rightarrow \quad \frac{4v^2}{3} = V^2 \Rightarrow V = \frac{2}{\sqrt{3}}v$$

6. (3)

$$V_A = \left(\frac{M-m}{M+m}\right)u$$

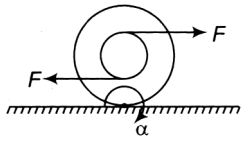
Velocity of C at maximum compression

$$v_C = \frac{1}{2}\left[\frac{2M}{M+m}\right]u = \left(\frac{M}{M+m}\right)u$$

$$\therefore \quad v_{CA} = v_C - v_A = \left(\frac{m}{M+m}\right)u$$

7. (2)

About bottommost point net torque is clockwise. Hence, centre of mass moves with acceleration a = $R\alpha$ towards right



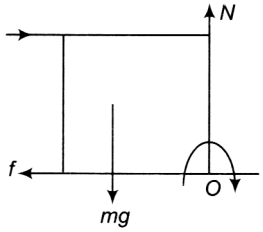
8. (3)

Moment of inertia of remaining portion

$$I = \frac{1}{2}MR^2 - \left[\frac{1}{2}\left(\frac{M}{4}\right)\left(\frac{R}{2}\right)^2 + \left(\frac{M}{4}\right)\left(\frac{R}{2}\right)^2\right] = \frac{13}{32}MR^2$$

9. (3)

Cube will slide, if F > μmg



Cube will topple about O if

$$\tau_F > \tau_{mg}$$

$\therefore \quad F.a > mg\left(\frac{a}{2}\right)$

or $\quad F > \frac{1}{2}mg$

If $\mu > \frac{1}{2}$, Eq,(ii) will be satisfied earlier.

10. (4)

$\alpha = \frac{d\omega}{dt} = -b$

$a_t = R\alpha = -Rb$

At $t = \frac{2a}{b}, \omega = -a$

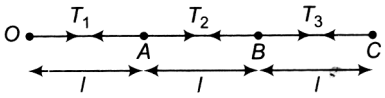
$a_n = R\omega^2 = Ra^2$

Now $\quad a = \sqrt{a_t^2 + a_n^2}$

$= R\sqrt{a^4 + b^2}$

11. (4)

Let ω is the angular speed of revolution.



$T_3 = m\omega^2(3l)$

$T_2 - T_3 = m\omega^2 2l$

$\Rightarrow \quad T_2 = m\omega^2(5l)$

$T_1 - T_2 = m\omega^2 l$

$\Rightarrow \quad T_1 = m\omega^2(6l)$

$T_3 : T_2 : T_1 = 3 : 5 : 6$

12. (1)

$\sqrt{2gh} = \sqrt{5gR}$

$\therefore \quad R = \frac{2h}{5} = \frac{2 \times 5}{5} = 2cm$

13. **(2)**

$$e = \frac{\text{Relative velocity of separation}}{\text{Relative velocity of approach}} = \frac{5-2}{8-2} = \frac{1}{2}$$

14. **(2)**

Apply theorem of perpendicular axis.

15. **(3)**

Moment of inertia depends on the distribution of mass about the axis.

16. **(2)**

In case of pure rolling velocity of topmost point is 2 times the velocity of centre of mass.

17. **(2)**

Area of circle, $\frac{\pi}{4}a^2 = A$, area of square = $a^2 = A_2$. Since $A_2 > A_1$ centre of mass will lie inside the square plate.

18. **(1)**

19. **(2)**

$$\frac{1}{2}mv_1^2 = \frac{1}{2}\left[\frac{1}{2}\times\frac{m}{2}\times v_2^2\right]$$

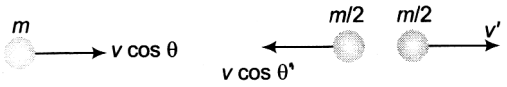
v_1 = speed of man and v_1 = speed of boy

Now, $\frac{1}{2}m(v_1+1)^2 = \frac{1}{2}\times\frac{m}{2}\times v_2^2$

Solving these two equations we get, $v_1 = (\sqrt{2}+1)\text{m/s}$ and $v_2 = 2(\sqrt{2}+1)\text{m/s}$

20. **(1)**

From conservation of linear momentum:



$$m(v\cos\theta) = \frac{m}{2}v' - \frac{m}{2}v\cos\theta$$

$$\therefore \quad v = 3v\cos\theta$$

21. **(2)**

22. **(2)**

$$\frac{1}{2}mv^2 = as^2$$

or $$F_n = \frac{mv^2}{R} = \frac{2as^2}{R} \qquad ...(i)$$

Further, $$V = \sqrt{\frac{2a}{m}}\cdot s$$

or $a_t = \frac{dv}{dt} = \sqrt{\frac{2a}{m}} \cdot \frac{ds}{dt} = \sqrt{\frac{2a}{m}} \cdot v$

$= \sqrt{\frac{2a}{m}} \cdot \sqrt{\frac{2a}{m}} \cdot s$

$= \frac{2as}{m}$

$\therefore \quad F_t = ma_t = 2as$ ...(ii)

$\therefore \quad F_{net} = \sqrt{F_n^2 + F_t^2}$

$= 2as\sqrt{1 + \frac{s^2}{R^2}}$

23. (4)

Tension at mean opsition, $mg + \frac{mv^2}{r} = 3mg$

$v = \sqrt{2gi}$ ...(i)

and if the body displace by angle θ with the vertical, then

$v = \sqrt{2gl(1-\cos\theta)}$ ...(ii)

Comparing Eqs. (i) and (ii)

$\cos\theta = 0$

$\Rightarrow \quad \theta = 90°$

24. (3)

$h = l(1-\cos 60°) = \frac{1}{2}, v^2 = 2gh = gl$

Now, $T_{max} - mg = \frac{mv^2}{l}$ (at bottommost point)

$\therefore \quad T_{max} = 2mg$

$= \mu_s(4mg)$

$\therefore \quad \mu_s = 0.5$

25. (4)

Decrease in gravitational potential energy = increase in elastic potential energy

$\therefore \quad mg(h+x) = \frac{1}{2}Kx^2$

Solving we get x = 0.1 m

26. **(2)**

$mght + \frac{1}{2}mv^2 = \text{constant} = mgh$ (H = initial height)

or $gh + \frac{v^2}{2} = \text{constant}$

27. **(4)**

From Fleming's left-hand the electron deflects, in –ve Y-direction.

28. **(1)**

29. **(2)**

30. **(4)**

31. **(2)**

32. **(2)**

33. **(3)**

In both the case (1) and (3) the induced current inthe ring will be in such a direction that it attracts the magnet.

34. **(1)**

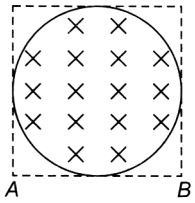
Mutual inductance between two coils depends on their degree of flux linkeage, i.e., the fraction of flux linked with one coil which is when some current passes through the other coil. In figure (A) two coils with their planes are parallel. In this situation, maximum flux passes.

35. **(1)**

$C_{net} = C/2$ (in series) and $L_{net} = 2L$ (in series)

36. **(4)**

$$V_{ba} = \int E \cdot dl = \frac{1}{4}\left(\frac{d\phi}{dt}\right)$$



$$= \frac{1}{4}\left(\pi R^2\right)\cdot\frac{dB}{dt} = \frac{\pi R^2 \alpha}{4}$$

37. **(1)**

$$V_{rms} = \sqrt{V_{av}} = \sqrt{\frac{1}{T}\int_0^T V^2 dt} = \sqrt{\frac{1}{T}\int_0^T 10^2 dt} = 10V$$

38. **(3)**

Average value of output current is given by

$$I_{av} = \frac{\int_0^{T/2} I dt}{\int_0^{T/2} dt}$$

$$= \frac{\int_0^{T/2} I_0 \sin\omega t\, dt}{T/2}$$

$$= \frac{2I_0}{T}\left[-\frac{\cos\omega t}{\omega}\right]_0^{T/2}$$

$$= \frac{2I_0}{T}\left[-\frac{\cos(\omega T/2)}{\omega} + \frac{\cos 0°}{\omega}\right]$$

$$= \frac{2I_0}{\omega T}\left[-\cos\theta + \cos 0°\right] = \frac{2I_0}{2\pi}[1+1] = \frac{2I_0}{\pi}$$

39. **(4)**

40. **(1)**

41. **(2)**

Growth of current in the circuit is given by

$$i = i_0(1 - e^{-Rt/L})$$

where, i_0 is peak value of current and

$$i_0 = \frac{5}{5} = 1A$$

$$\therefore \quad i = 1(1 - e^{-5\times 2/10})$$

$$= (1 - e^{-1})A$$

42. **(2)**

In case of growth of current in a L-R circuit, the current in the circuit grows exponentially with time 0 to the maximum value $i_0 = E/R$.

43. **(1)**

An object moving with speed υ in a circle of radius r has an acceleration twoards the centre of the circle. This acceleration of called centripetal accelerationwith is given as

$$a = \frac{V^2}{r} \text{ (towards the centre of the circle)}$$

44. **(3)**

$$\vec{r} = \cos\omega t\ \hat{x} + \sin\omega t\ \hat{y}$$

$$\vec{v} = \omega\sin\omega t\ \hat{x} + \omega\cos\omega t\ \hat{y}$$

$$\vec{a} = -\omega^2\cos\omega t\ \hat{x} + \omega\sin\omega t\ \vec{y} = -\omega^2\vec{r}$$

$\vec{r}.\vec{v} = -$ ohence $\vec{r} \perp \vec{v}$

$\vec{a}$ is directed towards the origin.

45. **(2)**

$$x_{cm} = \frac{1\times 0 + 1\times PQ + 1\times PR}{1+1+1} = \frac{PQ + PR}{3} \text{ and } y_{cn} = 0$$

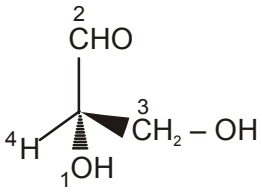
CHEMISTRY

46. **(4)**

47. **(4)**

L-glucose is minror's image of d-glucose.

48. **(2)**



Decide seniority of group after exchange of group.

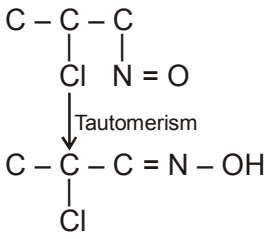
49. **(4)**

I & II are not isomer because no. of atoms are different

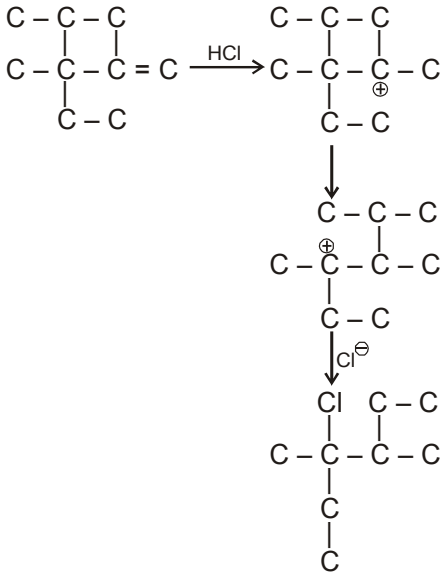
50. **(4)**

Here no. of stereogenic centre are

51. **(3)**



52. **(4)**



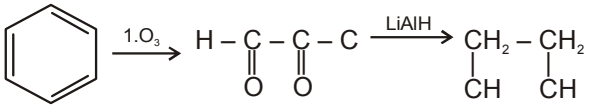
53. **(2)**

Hoff mann's rule of elimination.

54. **(4)**

55. **(3)**

56. **(2)**



57. **(4)**

58. **(3)**

59. **(2)**

60. **(2)**

61. **(4)**

62. **(4)**

63. **(3)**

$$\Delta S = nR \ln \frac{\nu_2}{\nu_1}$$

= 2.303 × 2 × 8.314 log 10

= 38.3 J/K mol

64. **(1)**

$$Fe + 2HCl \rightarrow FeCl_2 + H_2$$

$$\text{Moles of } Fe = \frac{112}{56} = 2$$

Moles of H_2 = 2

$$\text{Work} = \Delta n_g RT = 2 \times 2 \times 300 = 1200 \text{ cal}$$

65. **(2)**

66. **(4)**

67. **(1)**

The calculated Q_C for the reaction $A + B \rightleftharpoons C + D$ is $\frac{3 \times 4}{1 \times 2} = 6$.

Since Q_C is less than K_C the reaction proceed in the forward direction.

68. **(4)**

$$\underset{0.4}{\overset{1.0}{2SO_3}} \rightleftharpoons \underset{0.6}{2SO_2} + \underset{0.3}{O_2} \qquad K_C = \frac{0.6 \times 0.6 \times 0.3}{0.4 \times 0.4} = 0.675$$

69. **(1)**

For the reaction $PCl_3(g) + Cl_2(g) \rightleftharpoons PCl_5(g)$

$$K_P = K_C[RT] - 1 = \frac{26}{0.0821 \times 523} = 0.605$$

70. **(2)**

$$2NO_2(g) \rightleftharpoons 2NO(g) + O_2(g) \quad K_{C_1}$$

$$NO(g) + \frac{1}{2}O_2(g) \rightleftharpoons NO_2(g) \quad K_{C_2}$$

$$K_{C_2} = \frac{1}{\sqrt{K_{C_1}}} = \frac{1}{\sqrt{1.8 \times 10^{-6}}} = 7.5 \times 10^2$$

71. **(4)**

$$\left[H^+\right] = 0.001 \therefore pH = 3$$

72. **(1)**

1 litre contain $\frac{1000}{18} = 55.5$ moles of H_2O

Degree of ionization

$$= \frac{1 \times 10^{-7}}{55.5} \times 100 = 1.8 \times 10^{-7}$$

73. **(1)**

Whenever equal volumes of acidic solutions having different pH values are mixed the pH of the resultant solution will have 0.3 more pH and hence greater than the lower pH.

$\left[H^+\right]$ in pH = 3 solution $= 1 \times 10^{-3}$ or 0.001

$\left[H^+\right]$ in pH = 5 solution $= 1 \times 10^{-5}$ or 0.00001

$\therefore \left[H^+\right]$ in the mixture is

$$\frac{1 \times 0.001 + 1 \times 0.00001}{2} = 0.000505$$

or 5.005×10^{-4}

$$pH = 4 - \log 5.005 = 3.3$$

74. **(4)**

75. **(3)**

No of moles of $CH_3COONa = \frac{0.164}{82} = 0.002$

$$pH = PK_a + \log \frac{[Salt]}{[Acid]}$$

$$P^H = \log + 1.8 \times 10^{-5} + \log \frac{.002}{.001}$$

$$P^H = \log + 1.8 \times 10^{-5} + \log 2$$

$$P^H = 4.744 + 0.3010 = 5.0457$$

$$[H^+] = 9 \times 10^{-6}$$

76.	(3)	77.	(4)	78.	(3)	79.	(3)	80.	(2)	81.	(2)	82.	(3)	83.	(1)
84.	(2)	85.	(3)	86.	(4)	87.	(3)	88.	(1)	89.	(1)	90.	(2)		

BOTANY

91.	(4)	92.	(3)	93.	(1)	94.	(3)	95.	(3)	96.	(1)	97.	(4)	98.	(3)
99.	(2)	100.	(3)	101.	(2)	102.	(2)	103.	(1)	104.	(2)	105.	(2)	106.	(1)
107.	(2)	108.	(1)	109.	(3)	110.	(3)	111.	(2)	112.	(3)	113.	(1)	114.	(3)
115.	(4)	116.	(4)	117.	(1)	118.	(2)	119.	(3)	120.	(4)	121.	(2)	122.	(1)
123.	(3)	124.	(2)	125.	(1)	126.	(2)	127.	(1)	128.	(4)	129.	(1)	130.	(4)
131.	(2)	132.	(3)	133.	(2)	134.	(3)	135.	(4)						

ZOOLOGY

136.	(1)	137.	(2)	138.	(4)	139.	(2)	140.	(4)	141.	(3)	142.	(2)	143.	(4)
144.	(4)	145.	(4)	146.	(3)	147.	(4)	148.	(4)	149.	(3)	150.	(2)	151.	(4)
152.	(2)	153.	(1)	154.	(2)	155.	(1)	156.	(4)	157.	(1)	158.	(1)	159.	(4)
160.	(4)	161.	(2)	162.	(3)	163.	(3)	164.	(3)	165.	(4)	166.	(4)	167.	(3)
168.	(2)	169.	(3)	170.	(1)	171.	(3)	172.	(3)	173.	(4)	174.	(3)	175.	(4)
176.	(1)	177.	(2)	178.	(1)	179.	(4)	180.	(3)						