SOLUTIONS

PROGRESS TEST-VI

MGZ-1901,1902,1903

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. **(4)**

Because the lift is falling freely, the effective weight and hence the normal reaction on the block is zero. Therefore, the force of friction is also zero

2. **(1)**

Force of friction, $F = \mu R = \mu mg$

Retardation due to friction, $|a| = \frac{F}{m} = \frac{\mu mg}{m} = \mu g$

Now, $u = 10\,ms^{-1}$, $s = 50\,m$, $\nu = 0$

$a = -\mu g$, $g = 10ms^{-2}$

Now, $\nu^2 = u^2 + 2as$

$(0)^2 = (10)^2 + 2(-10\mu)(50)$

$\therefore \quad \mu = 0.1$

3. **(2)**

R + P sin 60º = Mg

$\therefore$ R = Mg – P sin 60º

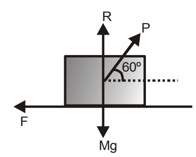
Frictional force,

$F = \mu R = \mu[Mg - P\sin 60^\circ]$

The body just moves when P cos 60º = F

$= \mu[Mg - P\sin 60^\circ]$

Here, $\mu = 0.5$, $M = 1kg$



g = 10 ms^{-2}

$\therefore \frac{P}{2} = \frac{1}{2}\left[1 \times 10 - \frac{P\sqrt{3}}{2}\right]$ or $P = 10 - \frac{P\sqrt{3}}{2}$

or, $P + P\frac{\sqrt{3}}{2} = 10$ or $P = 5.36N$

4. **(2)**

Suppose due to a force R on B, both blocks A and B move together, in this case

F = $(m_A + m_B)$ a = (2 + 5) a or a = F/7

Now, force on A = ma = (2F/7)

For no relative motion between A and B, 2F/7 must not exceed the limiting force of friction between A and B. The limiting force of friction between A and B is given by

$\mu m_A g = 0.6 \times 2 \times g$

$\therefore \frac{2F}{7} = 0.6 \times 2 \times 6$ or $F = 4.2gN = 4 = 4.2kgf$

5. **(1)**

During downward motion :

$F = mg\sin\theta - \mu mg\cos\theta$

During upward motion :

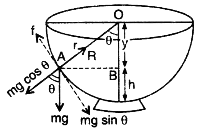
$2F = mg\sin\theta + \mu mg\cos\theta$

Solving above two equation, we get

$\mu = \frac{1}{3}\tan\theta$

6. **(2)**

7. **(2)**



Insect will crawl up the bowl till the component of its weight along the bowl is balanced by the limiting frictional force. So, resolving weight perpendicular and along the bowl, we get

$R = mg\cos\theta$ ......(i)

$f_L = mg\sin\theta$ ....(ii)

Dividing equation (ii) by equation (i)

$\tan\theta = (f_L / r)$ or $\tan\theta = \mu$ $[\because f_L = \mu R]$

$\frac{\sqrt{r^2 - y^2}}{y} = \mu$ or $y = \frac{r}{\sqrt{1+\mu^2}}$

So, $h = r - y = r\left[1 - \frac{1}{\sqrt{1+\mu^2}}\right]$

8. **(1)**

Let l be the desired length. The chain starts moving when net pulling force = maximum force of friction

or $g\frac{m}{L}l = \mu.\frac{m}{L}(L - l)g$

$l = \left(\frac{\mu}{\mu + 1}\right)L$

9. **(2)**

Till sliding starts, i.e., $\theta < \tan^{-1}\mu$, contact force (F_C) and force of gravity (mg) are equal and opposite.

Once the body starts sliding,

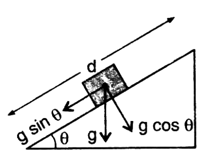
i.e., $\theta > \tan^{-1}\mu$, net contact force becomes

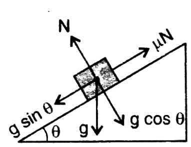
$F_c = \sqrt{(mg\cos\theta)^2 + (\mu mg\cos\theta)^2}$

$= mg\cos\theta\sqrt{1+\mu^2}$

Hence, the contact force starts decreasing and finally it becomes zero at $\theta = 90^o$

10. **(1)**





When the body moves on frictionless surface, then

$d = \frac{1}{2}g\sin\theta t^2$

When the body moves on roguh inclined surface. $d = \frac{1}{2}g(\sin\theta \mu\cos\theta)(2t)^2$

$\therefore \frac{1}{2}g\sin\theta t^2 = \frac{1}{2}g(\sin\theta - \mu\cos\theta)(2t)^2$

or $\sin\theta = 4(\sin\theta - \mu\cos\theta)$ or $\frac{\sin\theta}{4} = \sin\theta - \mu\cos\theta$

or $\mu\cos\theta = \frac{3}{4}\sin\theta$ or $\mu = \frac{3}{4}\tan\theta$

11. (1)

$$\frac{v^2}{Rg}=\left(\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}\right)\Rightarrow v=\sqrt{Rg\left[\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}\right]}$$

12. (4) 13. (1)

14. (3)

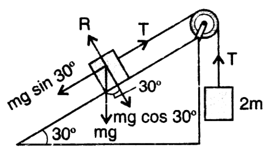
$$T_1=\frac{(m_2+m_3+m_4)F}{m_1+m_2+m_3+m_4}$$

$$\therefore\ T_1=\frac{3}{4}F$$

Similarly, $T_2=\frac{(m_3+m_4)F}{m_1+m_2+m_3+m_4}$ or $T_2=\frac{1}{2}F$

$T_3=\frac{(m_4)F}{m_1+m_2+m_3+m_4}$ or $T_3=\frac{1}{4}F$

15. (3)



2mg – T = 2ma ......(i)

T – mg sin 30º = ma ......(ii)

On adding euation (i) and (ii), we get

$$2mg-\frac{mg}{2}=3ma$$

or $a=\frac{g}{2}$

16. (2)

From the graph, it is a straight line so, uniform motion. Because of impulse direction of velocity as can be seen from the slope of the graph

Initial velocity $=\frac{2}{2}=1\ m/s$

Final velocity $=-\frac{2}{2}=-1\ m/s$

$$\vec{P}_1=0.4N-s$$

$$\vec{P}_f=-0.4N-s$$

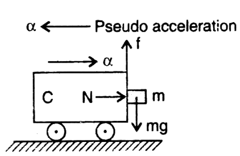
$$\vec{j}=\vec{P}_f-\vec{P}_i$$

$=-0.4-0.4=-0.8N-s$ ($\vec{j}=$ impulse)

$$|\vec{f}|=0.8N-s$$

17. (3)

Pseudo force of fictitious force, F_{fic} = $m\alpha$



Force of friction, $f=\mu N=\mu m\alpha$

The block of mass m will not fall as long as

$f \geq mg$

$\mu m\alpha \geq mg$

$\alpha \geq \frac{g}{\mu}$

18. (1)

19. (4)

Given that $U = \frac{A}{r^2} - \frac{B}{r}$

For stable equlibrium, $F = -\frac{dU}{dr} = 0$

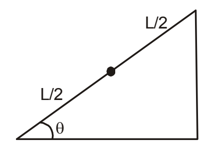
or $-\frac{2A}{r^3} + \frac{B}{r} = 0$ or $\frac{2A}{r^3} = \frac{B}{r}$ or $r = \frac{2A}{B}$

20. (3)

21. (3)

As block starts from rest and comes to rest Hence, $\Delta KE = 0$

So, $mg\sin\theta L = \mu mg\cos\theta \frac{L}{2}$



$\Rightarrow \mu = \frac{2\sin\theta}{\cos\theta} = 2\tan\theta$

22. (3)

Centripetal acceleration, $a_c = \frac{v^2}{r} = k^2rt^2$

$\Rightarrow v^2 = k^2r^2t^2$

According to work energy theorem, change in kinetic energy equal to work done.

$\therefore W = \frac{1}{2}mk^2r^2t^2$

Thus, power delivered to the particle

$P = \frac{dW}{dt} = mk^2r^2t$

23. (2)

$V = \sqrt{\mu rg} = \sqrt{0.6 \times 150 \times 10} = 30 \text{ m/s}$

24. (3)

Working from gramophone frame, a coin place at distance r remains at rest till

$F_s(\text{maxi}) \geq F_{\text{centrefugal force}}$

$F_{\text{frictional}} \geq F_{\text{centripetal}}$

$\mu mg \geq m\omega^2 r$

$\frac{\mu g}{r} \geq \omega^2$

25. (2) **26.** (1) **27.** (3) **28.** (2) **29.** (2) **30.** (4) **31.** (3) **32.** (2)

33. (2) **34.** (2) **35.** (1) **36.** (4) **37.** (1) **38.** (2) **39.** (4)

40. (2)

Suppose F = upthrust due to buoyancy

Then while descending, we find :

$Mg - F = M\alpha$ ......(i)

$F-(M-m)g=(M-m)\alpha$ ......(ii)

from (i) & (ii)

$m=\left[\dfrac{2\alpha}{\alpha+g}\right]M$

41. **(1)**

Let T be the tension in the string C. Hence,

T cos 45º = Mg

T sin 45º = tension in B

Hence, tension in B = Mg = 100 gN.

42. **(1)**

43. **(3)**

44. **(2)**

No doubt friction opposes the motion of a moving body but in many cases it is also the cause of motion. For example.

(a) In moving, a person or vehicle pushes the ground backwards (action) and the rough surface of ground reacts and exerts a forward force due to friction which casues the motion. If there has been no friction there had been no friction there will be slipping and no motion.

(b) If a body is placed in a vehicle which is accelerating the force of friction is the cause of motion of the body along with the vehicle (i.e., the body will remain at rest in the accelerating vehicle unit $mg<\mu_s mg$). If there had been no friction between the body and the vehicle, the body will not move along with the vehicle.

45. **(4)**

CHEMISTRY

46.	**(1)**	**47.**	**(1)**	**48.**	**(3)**	**49.**	**(1)**
50.	**(3)**	**51.**	**(1)**	**52.**	**(2)**	**53.**	**(1)**
54.	**(1)**	**55.**	**(2)**	**56.**	**(4)**	**57.**	**(2)**
58.	**(4)**	**59.**	**(4)**	**60.**	**(3)**		

61. **(2)**

For an isothermal process $\Delta E=0$

62. **(3)**

$W=-P\Delta V=-10^5(1\times10^{-2}-1\times10^{-3})=-900\text{ J}$

63. **(2)**

Given $C+O_2\rightarrow CO_2,\quad \Delta H^\circ=-x\text{ kJ}$ ...(i)

$2CO_2+O_2\rightarrow 2CO_2,\quad \Delta H^\circ=+y\text{ kJ}$ ...(ii)

or $CO_2\rightarrow CO+\frac{1}{2}O_2,\quad \Delta H^\circ=\frac{y}{2}\text{ kJ}$ ...(iii)

By adding no. (i) and (ii) eq.

$$C+O_2+CO_2\longrightarrow CO_2+CO+\frac{1}{2}O_2$$

$$C+\frac{1}{2}O_2\longrightarrow CO,\quad \Delta H^\circ=\frac{y}{2}-x=\frac{y-2x}{2}\text{kJ}$$

64. **(1)**

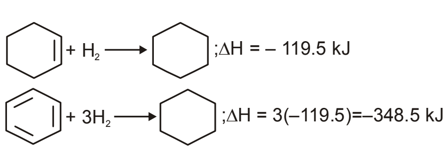
$$2H_2O_2(l)\longrightarrow 2H_2O(l)+O_2(g)\ \Delta H=?$$

$\Delta H=[2\times\Delta H_f\text{ of }H_2O(l)+(\Delta H_f\text{ of }O_2)-(2\times\Delta H_f\text{ of }H_2O_2(l))]$

$=[(2\times-286)+(0)-(2\times-188)]$

$=[-572+376]=-196\text{ kJ mole}$

65. **(1)**



The resonance energy privides extra stability to the benzene molecule so it has to be overcome for hydronation to take place.

So $\Delta H = -358.5-(-150.4) = -208.1$ kJ

66. (2)

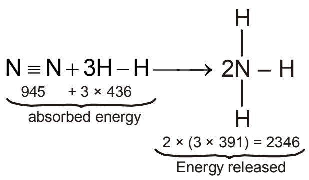
$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$. Change in enthalpy,

$\Delta H = \Delta H_{products} - \Delta H_{reactans}$

$= 2\times(-394)+2\times(-286)-(52+0)$

-1412 kJ / mol.

67. (1)



$\Delta H = 2253 - 2346 = -93$ kJ

68. (4)

For isothermal reversible expansion

$$w = q = nRT \times 2.303 \log\frac{V_2}{V_1}$$

$$= 2RT \times 2.303 \log\frac{20}{2}$$

=2×2×T×2.303 ×1=9.2 T

Entropy change, $\Delta S = \dfrac{q}{T} = \dfrac{9.2T}{T} = 9.2$ cal.

69. (2)

For combustion reaction, ΔH is negative,

$\Delta n = (16+18)-(25-2) = +7$, so ΔS is +ve, reaction is spontaneous, hence ΔG is $-$ve.

70. (4)

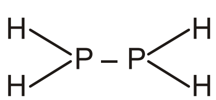
By 2×(ii) –(i)+(iii)

$H_2(g) + 2C(s) \rightarrow C_2H_2(g)$, $\Delta G^\circ = 209$ kJ

71. (2)

Bond dissociation energy of $PH_3(g)$=228 kcal mol^{-1}

P – H bond energy $= \dfrac{228}{3} = 76$ kcal mol^{-1}



Bond energy of 4 (P – H) + (P – P)=355 kcal mol^{-1}

or 4×76+(P–P)=355 kcal mol^{-1}

P – P bond energy = 51 kcal mol^{-1}

72. (1)

$Fe_2O_3(s) + 3CO(g) \longrightarrow 2Fe(s) + 3CO_2(g)$; $\Delta H = -26.8$ kJ ...(i) $FeO(s) + CO(g) \longrightarrow Fe(s) + CO_2(g)$; $\Delta H = -16.5$ kJ ...(ii)

eq. (i) –2×(eq). (ii), we get

$Fe_2O_3(s) + CO(g) \longrightarrow 2FeO(s) + CO_2(g)$

$\Delta H = -26.8 + 330. = +6.2\ kJ$

73. (4)

$X_2 + Y_2 \longrightarrow 2XY, \quad \Delta H = 2(-200)\ kJ\ mol^{-1}$

Let x be the bond dissociation energy of X_2. Then

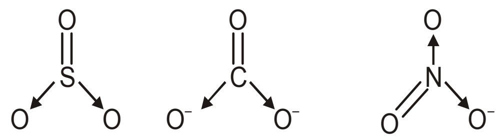
$\Delta H = -400 = \Sigma_{x-x} + \Sigma_{y-y} - 2\Sigma_{x-y}$

$= x + 0.5x - 2x = -0.5x$

or $x = \frac{400}{0.5} = 800\ kJ\ mol^{-1}$

74.	**(2)**	**75.**	**(2)**	**76.**	**(3)**	**77.**	**(3)**	**78.**	**(3)**	**79.**	**(1)**	**80.**	**(4)**	**81.**	**(4)**
82.	**(1)**	**83.**	**(3)**	**84.**	**(1)**	**85.**	**(2)**	**86.**	**(3)**	**87.**	**(3)**				

88. (2)



SO_3 CO_3^{2-} NO_3^-

89. (2)

90. (1)

BOTANY

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

ZOOLOGY

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