UNIT TEST-02

Subject : Physics
Class : XI

Q.1 (3)	**Q.2** (1)	**Q.3** (3)	**Q. 4** (1)	**Q.5** (2)	**Q.6** (2)	**Q.7** (3)	**Q.8** (4)	**Q.9** (4)	**Q.10** (1)
Q.11 (3)	**Q.12** (4)	**Q.13** (1)	**Q.14** (1)	**Q.15** (3)	**Q.16** (2)	**Q.17** (3)	**Q.18** (4)	**Q.19** (1)	**Q.20** (3)
Q.21 (3)	**Q.22** (3)	**Q.23** (1)	**Q.24** (3)	**Q.25** (4)	**Q.26** (3)	**Q.27** (1)	**Q.28** (2)	**Q.29** (2)	**Q.30** (1)
Q.31 (1)	**Q.32** (2)	**Q.33** (3)	**Q.34** (2)	**Q.35** (1)	**Q.36** (1)	**Q.37** (2)	**Q.38** (2)	**Q.39** (3)	**Q.40** (1)
Q.41 (1)	**Q.42** (3)	**Q.43** (4)	**Q.44** (2)	**Q.45** (1)	**Q.46** (3)	**Q.47** (4)	**Q.48** (4)	**Q.49** (3)	**Q.50** (2)

Q.1 (3)
Concept of Inertia.

Q.2 (1)
The compartments have a spring system between them. Firstly, the engine comes to rest ; then the compartment attached to it will come to rest.

Q.3 (3)

$$F = ma = m\left[\frac{V^2 - U^2}{2s}\right]$$

$$F = 20\left[\frac{(5)^2 - (20)^2}{2\times 100}\right] = -37.5\text{ N}$$

Q. 4 (1)
Here,

$$\frac{dm}{dt} = \frac{8}{5.6}\text{ g/sec}$$

$u_{rel} = 7$ cm/s

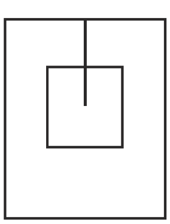
$$F_{thrust} = u_{rel}\frac{dm}{dt}$$

$$= 7 \times \frac{8}{5.6} = 10\text{ dyne} = 10 \times 10^{-5}\text{ N}$$

$F = 10^{-4}$ N

Q.5 (2)

Q.6 (2
T = m(g + a)
= 6 (10 + 1)
= 66 N



Q.7 $T = \frac{75}{100}mg$

$= \frac{3}{4}$ mg

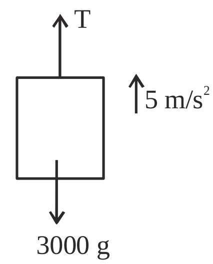
$F_{net} = mg$

$mg - \frac{3}{4}mg = ma$

$\frac{mg}{4} = ma$

a = g/4

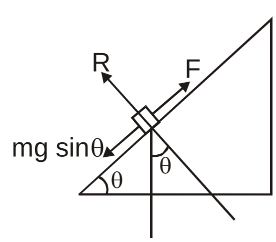
Q.8 (4)



T – 3000 g = 3000 × 5
T = 45000 N

Q.9 (4)
A physical beam balance measures normal reaction which will be greater than the weight of body when elevator accelerating upwards.

Q.10 (1)
F = mg sinθ = 2 x 9.8 x sin45° = 19.6 sin45°



Hence the correct choice is (1)

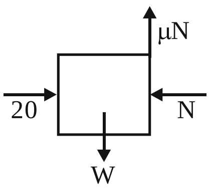
Q.11 (3)

$$a = \frac{(m_2 - m_1)g}{m_1 + m_2} = \frac{4g}{16} = 2.5 m/s^2$$

Q.12 (4)

Q.13 (1)

Q.14 (1)

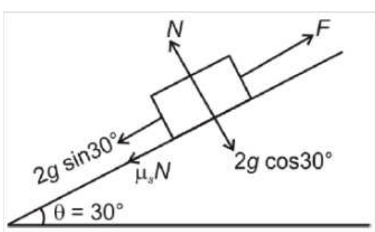


Here, $W = \mu N$
$= 0.4 \times 20$
$= 8N$

Q.15 (3)

Q.16 (2)
Theory

Q.17 (3)
From FBD of body
To just move up
$F = (2g\sin 30° + \mu_s N); N = (2g\cos 30°)$



$$F_{min} = \left(2 \times 9.8 \times \frac{1}{2}\right) + \left(\frac{3}{10} \times 2 \times 9.8 \times \frac{\sqrt{3}}{2}\right)$$

$= 9.8 + 5.09 = 14.89 N$

Q.18 (4)

$$a_{common} = \frac{100}{40 + 60} = 1 m/s^2$$

$f_{s, max} = \mu_s N_{12} = 0.2 \times 400 = 80 N$
$f_{required} = ma = 60 \times 1 = 60 N$
$\because f_{required} < f_s$, max $\Rightarrow$ blocks move together and
$f = f_{required} = 60 N$

Q.19 (1)
Loss in PE of m_2 = gain in KE of (m_1, m_2) + loss in friction

$$m_2 g(2) = \frac{1}{2} m_1 v^2 + \frac{1}{2} m_2 v^2 + \mu m_1 g(2)$$

$4 \times 10 \times 2$

$$= \frac{1}{2} \times 6 \times v^2 + \frac{1}{2} \times 4 \times v^2 + (0.5 \times 6 \times 10 \times 2)$$

v = 2 m/s

Q.20 (3)

$$\frac{v_1^2}{r_1} = \frac{v_2^2}{r_2} \;\Rightarrow \frac{v_1}{v_2} = \sqrt{\frac{r_1}{r_2}} = \frac{1}{\sqrt{2}}$$

Q.21 (3)

Q.22 (3)
$W = Fd\cos\theta$
$25 = 5 \times 10 \cos\theta$
$\theta = 60°$

Q.23 (1)

$\vec{s} = 3\hat{j} + 4\hat{k}$

$\vec{F} = -\hat{i} + 2\hat{j} + 3\hat{k}$

$w = \vec{F}.\vec{S}$
$= -6 + 12 = 18J$

Q.24 (3)
Work done
$w = \Delta KE$

(a) $w = \frac{1}{2}(2)(2)^2 - \frac{1}{2}(2)\cdot(4)^2 = -12 J$

(b) $w = \frac{1}{2}(1)[(6)^2 - (4)^2] = 10J$

(c) $w = \frac{1}{2}(2)[(3)^2 - (0)^2] = 9J$

(d) $w = \frac{1}{2} \times 5[4 - 1] = 7.5 J$

Q.25 (4)

$$W = \frac{MgL}{2n^2}$$

here n = 3

$$W = \frac{MgL}{18}$$

Q.26 (3)

$$5 \times 10^4 \times 3 = \frac{1}{2} \times 3 \times 10^7 \times V^2$$

$10 \times 10^{-3} = v^2$
$V = 0.1 m/s$

Q.27 (1)

Let spring compresses by x

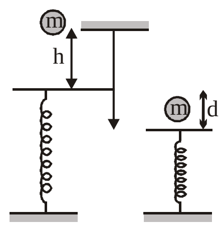
By COME

$$\frac{1}{2}mv^2 = \frac{1}{2}kx^2 + f.x$$

$\Rightarrow$ x = 5.5 cm

Q.28 (2)

Situation is shown in figure. When mass m falls vertically on spring, then spring is compressed by distance d.



Hence, net work done in the process is

W = potential energy stored in the spring + loss of potential energy of mass

$$= mg\ (h + d) - \frac{1}{2}kd^2$$

Q.29 (2)

Q.30 (1)

$$m\frac{dv}{dt}\ v = p$$

$$\int_0^u v\ dv = \int_0^t \frac{p}{m}\ dt$$

$$\frac{v^2}{2} = \frac{p}{m}t$$

$$v = \sqrt{\frac{2pt}{m}}$$

Q.31 (1)

$$P = \frac{w}{f} = \frac{(M+m)gh}{t}$$

$$= \frac{800\times 20\times .2}{10} = 320w$$

Q.32 (2)

$$F = -\frac{dU}{dx}$$

Between B and C

$$\text{Slope} = \frac{dU}{dx} = +\text{ve}$$

So F = –ve i.e. attractive

Q.33 (3)

For water not to spill out of the bucket,

$$v_{min} = \sqrt{5gR}$$

$$= \sqrt{5\times 10\times 0.5}$$

$= 5\ ms^{-1}$

Q.34 (2)

For light rod

$v_{top} = 0$

Using energy conservation

$$\frac{1}{2}mv^2 + 0 = 0 + mg\ell$$

$$v = \sqrt{2g\ell}$$

Q.35 (1)

Let the velocity is v. The particle will not slide, if centripetal force is not there or the centripetal force is balanced by the weight of the particle.

$$\text{So,} \frac{mv^2}{R} = mg$$

$$\therefore v = \sqrt{Rg} = \sqrt{20\times 10^{-2}\times 9.8}$$

$$= \sqrt{196\times 10^{-2}} = 1.4ms^{-1}$$

Q.36 (1)

Q.37 (2)

Here the tension in the cord is given by

T = mg + ma

(Here : upwards acceleration = a, mass of sphere = m, T = 4 mg)

So 4 mg = mg + ma

3 mg = ma

$$g = \frac{a}{3}$$

or a = 3g

Q.38 (2)

The reading on the scale is a measure of the force on the floor by the person. by the Newton's third law this is equal and opposite to the normal force N on the person by the floor.

$\therefore$ When the lift is ascending upwards with a acceleration of 9 ms^{-2}, then

N – 50 × 10 = 50 × 4 or N = 50 × 10 + 50 × 4

= 50 (10+4)= 700 N

$\therefore$ The reading of weighing machine is 70 kg.

Q.39 (3)

$$a = \frac{F_{net}}{\text{Total mass}}$$

$$a = \frac{(5-2)g}{7} = \frac{3g}{7}$$

2 kg up and 5 kg down .

$a \rightarrow$ (iii)

$b \rightarrow$ (ii)

$$c \rightarrow \text{(i) } T = \frac{2m_1m_2}{m_1+m_2}g$$

$$= \frac{2\times5\times2\times g}{7} = \frac{20}{7}g$$

$$d \rightarrow \text{ (iv) } T^1 = 2T = \frac{40}{7}g$$

Q.40 (1)

Q.41 (1)

Q.42 (3)

As initially, the acceleration of aeroplane is in upward direction then it decrease.

Q.43 (4)

Net downward force = Weight – Friction

$\therefore$ ma = 25 × 9.8 – 2

$\Rightarrow a = 9.72$ m/s^2

Q.44 (2)

Q.45 (1)

$$F_C = \frac{mv^2}{r} = \frac{mr^2\omega^2}{r} = mr\omega^2 \qquad T_{max} = 10 \text{ N}$$

$T_{max} = F_{cp} \Rightarrow 10 = mr\omega^2$

$\Rightarrow \omega^2 = 400$

$\Rightarrow \omega = 20$ rad/sec.

Q.46 (3)

$$\text{Workdone} = \int_0^1 F dy = \int_0^1 20 dy + \int_0^1 \log dy$$

$$\Rightarrow \text{workdone} = 20(1-0) + \left(\frac{10y^2}{2}\right)_0^1$$

$= 20 + 5(1-0) = 25$ J

Q.47 (4)

$x = 3t^2 + 5$

$\Rightarrow v = 6t \Rightarrow \Delta W = \Delta k$

$$= \frac{1}{2}(2)(30)^2 - \frac{1}{2}2(0)^2 = 900 \text{ J}$$

Q.48 (4)

$$\text{Average power} = \frac{\text{Total work done}}{\text{Total time taken}}$$

Mass = 90 tonne = 90 × 1000 kg

Height = 200 m

Time taken = 1 hour = 3600 s

$$\Rightarrow \langle P_{avg} \rangle = \frac{mgh}{\Delta t} = \frac{90\times1000\times9.8\times200}{3600}$$

= 49000 W

= 49 kW

Q.49 (3)

$$a = 0 \qquad \Rightarrow F = 0, \qquad \Rightarrow \frac{dU}{dx} = 0\ ]$$

Q.50 (2)