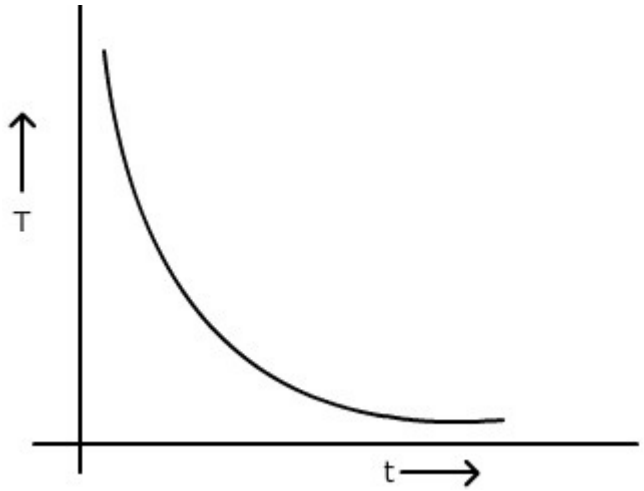
Sample Paper Class 11 Physics 2020-21

Q. No	Marks
Ans1.(i) [ML2T-2]	1/2
(ii) Dimensionless	1/2
Ans2.Reaction is the force applied by the block on the Earth.	1
Ans3.Two advantages of 'I' shape of iron beams are	
(i)minimizes sagging	1/2
(ii)minimizes buckling	1/2
Ans4.Wire B.	1
Ans5.Natural Convection: Trade winds/Land and sea breeze	1/2
Forced Convection: Human circulatory system.	1/2
Ans6. 	1
Ans7.Because of a very small coefficient of linear expansion.	1

Ans8.The frequency of free oscillations of a vibrating system.

1

Ans9.Absolute error is the magnitude of difference between the value of individualmeasurement and the true value of the quantity.

1

$\Delta t = t_2 - t_1$

$= (50 \pm 0.5) - (20 \pm 0.5)$

$= 30°C \pm 1°C$

1/2

1/2

Ans10.(i) Velocity is negative as the slope of x-t graph is negative.

1

(ii)Acceleration is negative. The increasing slope indicates speeding up, hence the sign of acceleration and velocity are same.

1

Ans11. $T = \frac{2u\sin\theta}{g}$ 1/2

$u\sin\theta = \frac{gT}{2}$

Max. Height $H = \frac{u^2 \sin^2\theta}{2g}$ 1/2

$= \frac{(u\sin\theta)^2}{2g}$

$= \frac{gT^2}{2^2 \times 2g}$

$= \frac{gT}{8}$ 1/2

Ans12.(i) Because no reaction from any surface underneath is available which can make thehorse move forward.

1

(ii)Due to inertia of motion, the upper part of the body continues to move along thetangent to the circular path of the bus. 1

Ans13.Concurrent forces are the forces whose lines of action intersect at a common point. 1

Conditions:

1. $\sum F = 0$
2. $\sum \tau = 0$

1/2

1/2

Ans14. Because thegravitational force between the satellite and the earth provides thenecessary centripetal force required to keep it in its orbit. 1

No, because New Delhi is not on the equatorial plane. 1

1

Ans15.(a) All have same average K.E. as Kavdepends only on temperature. 1

(b)C, B and A as $v_{rms} \propto \frac{1}{\sqrt{m}}$

OR

(i) $P = \frac{1}{3} mn v_{rms}^2$ 1/2

1/2

$\frac{P_i}{P_f} = \frac{1}{2}$ 1/2

(ii) $P = \frac{2}{3} E$ 1/2

$E = \frac{3}{2} P = \frac{3}{2} \times 10^5$ J/m3

Ans16. (i) $\frac{Q_1}{Q_2} = \frac{T_1}{T_2}$ 1/2

$T_2 = 320$ K 1/2

(ii) $\eta = 1 - \frac{T_2}{T_1}$ 1/2

$\eta = 0.2$ 1/2

Ans17. Motion in which the restoring force is always proportional to the displacement from themean position and is directed against it. 1

When angular displacement is very small. 1

Ans18. $\text{Fraction} = \frac{KE}{TE} = \frac{\frac{1}{2} m\omega^2 (A^2 - y^2)}{\frac{1}{2} m\omega^2 A^2}$ 1

$= 1 - \frac{1}{4} = \frac{3}{4}$ 1

Ans19. $x(t) = \int\int dt \int\int (-12t - 12) dt$ 1/2

$= \frac{-12t^2}{2} - 12t + c$

$= -6t^2 + 12t + c$ ½

Since, at t = 0, x(0) = 5, therefore, c = 5

1/2

Therefore, x(t) =-6t2+ 12t + 5 m

1/2

Also, a $= \frac{dv}{dt}$ 1/2

$= 12 m/s^2$

1/2

Ans20. $\vec{F}_1 = 2\hat{j} N$

$\vec{F}_2 = 2\cos 60^0 \hat{i} - 2\sin 60^0 \hat{j}$

1/2

$= \hat{i} - \sqrt{3}\hat{j} N$

1/2

1/2

$\vec{F}_3 = -1\sin 60^0 \hat{i} - 1\cos 60^0 \hat{j}$ 1/2

$= -\frac{\sqrt{3}}{2}\hat{i} - \frac{1}{2}\hat{j} N$

$\vec{F} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 = 2\hat{j} + (\hat{i} - \sqrt{3}\hat{j}) + (-\frac{\sqrt{3}}{2}\hat{i} - \frac{1}{2}\hat{j})$

$= \frac{3}{2}\hat{j} N$

$= \frac{3}{2} N$ 1/2

Ans21.(i) Conservative: spring force, gravitational force

1

Non-conservative: Human push, viscous drag

1

(ii)$F = -\frac{dU}{dr}$ 1

Ans22.Definition: Ratio of relative speed of separation to relative speed of approach. 1

No, not for each body separately. Total energyand total momentum of the whole isolatedsystem will be conserved.

Because collision between fast neutron and near stationary deutrons in heavy waterresults in maximum exchange of kinetic energy as their masses are comparable. 1

1

Ans23. (a) $\vec{F} = 7\hat{i} - 3\hat{j} - 5\hat{k}, \vec{r} = \hat{i} - \hat{j} - \hat{k}$

$\vec{\tau} = \vec{r} \times \vec{F}$

$= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -1 & -1 \\ 7 & -3 & -5 \end{vmatrix}$ 1/2

$= (5 - 3)\hat{i} - (5 - 7)\hat{j} + (3 - 7)\hat{k}$ 1

□ □2i^ □12j^ □10k^ 1/2

(b)Curl the fingers of right hand along the direction of rotation, the out stretched thumbpoints along the direction of angular velocity.

1

Ans24.If we define perpendicular axes*X*,*Y*, and*Z*(which meet at origin *O*)so that the body lies in the*XY*plane, and the*Z*axis is perpendicular to the plane ofthe body and

- *IX*be the moment of inertia of the body about the*X*axis;
- *IY*be the moment of inertia of the body about the*Y*axis; and
- *IZ*be the moment of inertia of the body about the*Z*axis.

The perpendicular axis theorem states that

IZ=*IX*+*IY*

1

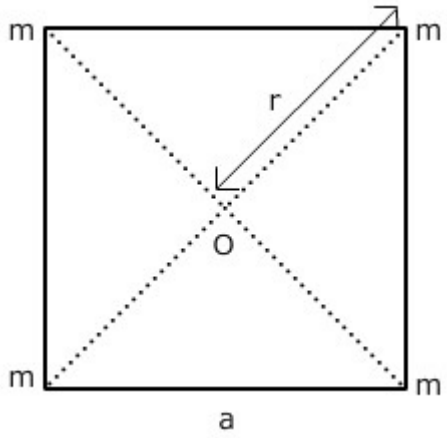
I = MR2 1/2
1/2
1/2

= 2 × (.50)2= 0.5 kg m2

I' = MR2+ MR2

= 2MR2= 2 × 0.5
= 1kg m2

Ans25.



U(r) = $\frac{Gm\square 1m2}{r_{12}}$

Therefore, total U =□ $\frac{4Gm^2}{a}$ □$\frac{2Gm^2}{a\sqrt{2}}$

1

□ □$\frac{2Gm2\ \square}{a}$ □ 2 □$\frac{1}{\sqrt{2}}$ □ □

½

$$\square \square 5.41\frac{Gm^2}{a}$$

1/2

Potential V(r) = $\frac{Gm_1}{r_1}$

1/2

TotalV = $\frac{4Gm}{\sqrt{a^2}} \square \square \sqrt{\frac{42Gm}{a}}$ 1/2

Ans26.Main featuresof kinetic theory of an ideal gasareabout

(i) Molecules
(ii) Motion (iii) Collisions (iv) Forces (v) Time
(vi) Path

1/2 × 6

Ans27.Thefirst law of thermodynamicsis an expression of the conservation of energy.It states:

The increase in the internal energy of a system is equal to the amount of energy added by heating the system, minus the amount lost as a result of the work done by the system on its surroundings.

1/2

Derivation: 1. Expression for dU1at constant volume

1/2

2.Expression for dU2at constant pressure

1/2

1/2

3.PdV = n R dT

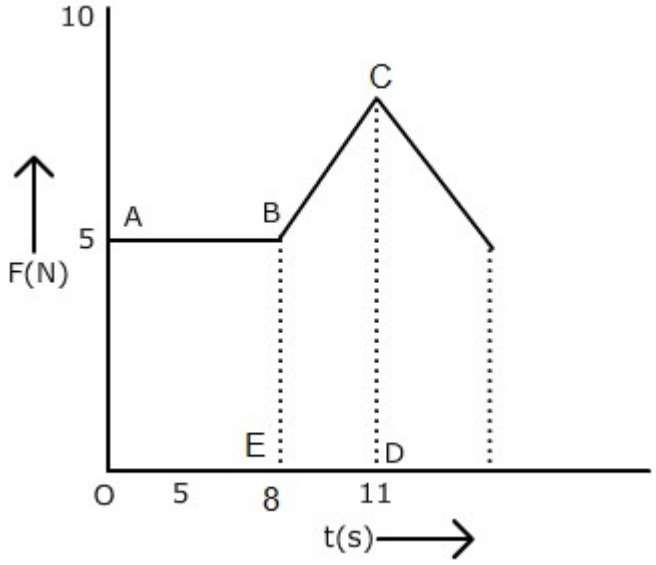
1/2

4.dU1= dU2with reason

5.Cp–Cv= R

1/2

Ans28. (a)



Impulse = Area under F(t) graph

½

= area OABE + area BCDE

$= 5 \times 8 + 1 \times 3 \times \frac{(10 + 5)}{2}$

½

$= 40 + 45$

$= 62.5$ kg m/s

1/2

$\Delta p = m(v - u)$ = Impulse

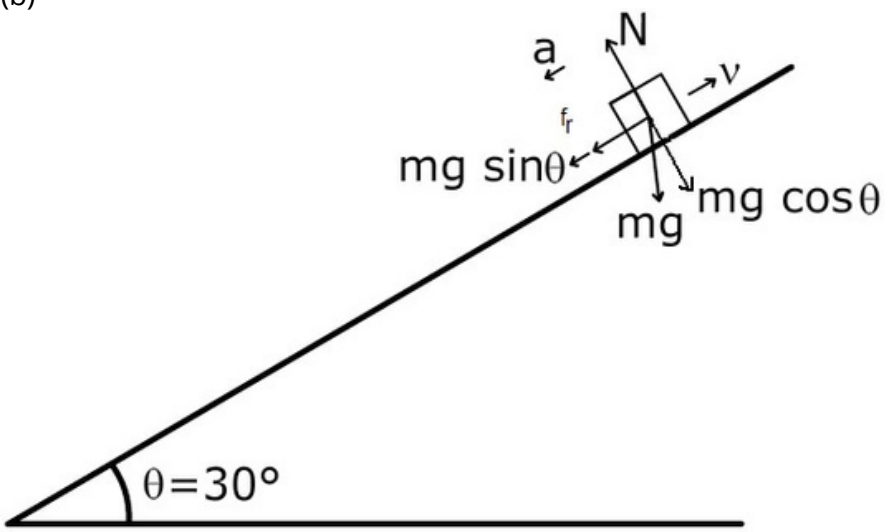
1/2

Therefore, $7(v - 0) = 62.5$

$v = \frac{62.5}{7} \approx 9$ m/s

½

(b)



1/2

ma = fr+ mg sin□ 1/2

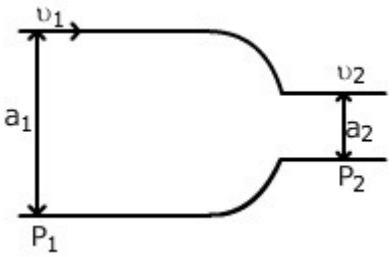
ma =□mgcos□+ mgsin□

a = (□cos□+ sin□)g = (0.1cos30° + sin30°)10 1/2

1/2

$\square \frac{\sqrt{3}}{2} \square 5 \square 5.87\ m/s2$ 1/2

Ans29.Laminar flowoccurs when a fluid flows in parallel layers, with no disruption between the layers.



2

$P_1 \square \frac{1}{2} \square \square 1 \square P2 \square \frac{1}{2} \square \square 2$ and $a_1 \square \square a2 \square 2$

Therefore, $P2 \square P1 \square \frac{2}{1} \square \square 2 \square$ 1/2

$\square P_1 \square \frac{1}{2} \square \square 12 \square \square \frac{a_1}{a_2} \square^2 \square 1 \square \square$ 1/2

$\square P_1 \square \frac{1}{2} \square \square 12 \square 1 \square \frac{a_1}{a_2} \square^2 \square \square$

□ 4□104 □ □1 □03 □4 1 4□10□ □ □4□ 1
2 □ 1 □ 104□□ □□□
1/2

□ 4□104 □0.6□104 1/2

□ 3.4□104 P a

OR

Definition:Thecontact angleis theangleat which aliquid/vapor interface meets the solid surface. The contact angle is specific for any given system and is determined by the interactions across the three interfaces.

2

For acute angle of contact.

n.4r3 R□ □ 4R3 □ r □ 1 1/2
3 3 n3

□ 4□10□3 = 4 × 10-4m
1
(1000)3 1/2

□A = n . 4□r2–4□R2

1/2

= 4□R2 □. n–4□R2□4□R2□n3□1□
2 □ □
n3 □

1/2

= 4 × 3.14 × 16 × 10-16(10–1) = 9 × 64 × 3.14 × 10-6m2

Therefore,□E =□□□A

1/2

= 0.07 × 9 × 64 × 3.14 × 10-6□1.23 × 10-2J 1/2

Ans30.(i)–z direction 1

(ii) f □ w 1/2
2□

□ 500 □ 250 Hz 1/2
2□ □

(iii)□ = 2□ 1/2
R

= 2□ □ 80□m 1/2
0.025

(iv) □□□ 1/2
R

□ 500 □ 2□104 m/s ½
0.025

(v) $\Delta p_{max} = \omega A$ 1/2

$= 0.25 \times 10^{-3} \times 500 = 0.125$ cm/s 1/2

OR

(a)Definition:TheDoppler effect isthe change infrequencyand wavelengthof awavefor an observer moving relative to the source of the waves. 1

(i)For the listener standing outside the circle, the whistle moves towardshim as well as away from him. Therefore, the frequency will appear to increase as well as decrease. 2

(ii)For the listener at the centre, the distance between him and the whistle remains constant. So, there will be no change in frequency. 1

(b)Beat frequency = 5 Hz 1

application = tuning of musical instruments. 1