B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

TERM-1 EXAMINATION (2026-27)

PHYSICS (042) SET -II

MARKING SCHEME

Class: XI **Time: 3hr**

Date: 02.09.2026 **Max Marks: 70**

Section A (16 X 1M)

1. (b) Pascal
2. (b) 3
3. (b) $[ML^2T^{-2}]$
4. (a) Zero
5. (b) Change in velocity
6. (c) 0 m/s
7. (b) Twice the magnitude of either vector
8. (b) 45°
9. (a) $\tan^{-1}(2)$
10. (a) Inertia
11. (b) 4 m/s^2
12. (d) Linear momentum
13. (a) Both A and R are true, and R is the correct explanation of A.
14. **(d) If Assertion is false but Reason is true.**
15. (a) Both A and R are true, and R is the correct explanation of A.
16. **(d) If Assertion is false but Reason is true.**

17. (a) G is $\mathbf{[M^{-1}L^3 T^{-2}]}$
    (b) coefficient of viscosity is $\mathbf{[M L^{-1} T^{-1}]}$.

18. (a) V-u=at

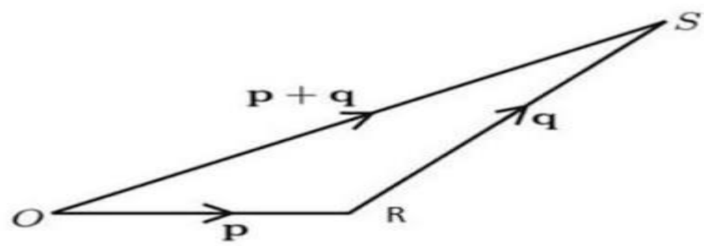
    0-20=a x 4

    a=-6.25 ms^{-2}

    (b) $S= (v^2-u^2)/2a$
    S= (0-625)/12.5
    S= -50m

19.

Triangular law



Triangle law of vector addition states that when two vectors are represented by two sides of a triangle in magnitude, and direction taken in same order then third side of that triangle represents (in magnitude and direction) the resultant of the vectors.
Thus, OR = p, RS = q, OS = r then OR + RS = OS i.e., p + q = r

OR

R= √ (P^2+2PQcosΘ +Q^2)

R=√ (5^2+0 +12^2)

R=13 Unit

20. Time period is the duration in which the body completes one complete round. Frequency is the number of complete rounds in one second.

$$\therefore \quad \text{Time period} = \frac{\text{Distance covered in one revolution}}{\text{Linear velocity}}$$

$$\therefore \quad T = \frac{2\pi r}{v}$$

But $v = r\omega$

$$\therefore \quad T = \frac{2\pi r}{r\omega}$$

$$\therefore \quad T = \frac{2\pi}{\omega}$$

21.

Newton's Third Law of Motion. ... The forces acting on you as you sit in your chair are just one **example** of **Newton's third law**, which **states** that for every action force there is an equal and opposite reaction force. In fact, all forces come in pairs. No force exists in isolation.

22.

$$\text{L.H.S.} = v^2 - u^2 = [LT^{-1}]^2 - [LT^{-1}]^2$$
$$= [L^2T^{-2}] - [L^2T^{-2}] = L^2T^{-2}$$
$$\text{R.H.S.} = 2as = [LT^{-2}]\,[L]$$

[2 has no dimension]

$$= [L^2T^{-2}]$$

23. T α $m^a k^b$

Dimension of time period T = [M^0 L^0 T^1]
 Dimension of mass m = [M^1 L^0 T^0
Dimension of force constant k = [M^1 L^1 T^ {-2}]
[L^1]} = [M^1 L^0 T^ {-2}]
Substituting dimensional formulae and using homogeneity law we get
T=√(m/k)

24.

If we draw AD parallel to OC, we observe that

BC = BD + DC = BD + OA

Substituting, BC with v and OA with u,

we get

$$v = BD + u$$

or $\quad BD = v - u \qquad ...(1)$

Thus, from the given velocity-time graph, the acceleration of the object is given by

$$a = \frac{\text{Change in velocity}}{\text{Time taken}}$$

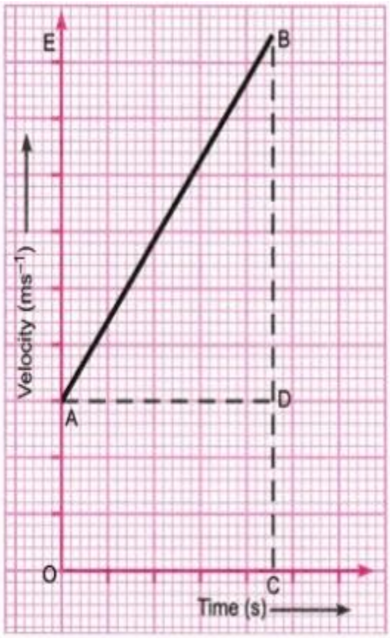
$$= \frac{BD}{AD} = \frac{BD}{OC}$$

Substituting, OC with t, we get

$$a = \frac{BD}{t} \text{ or } BD = at \qquad ...(2)$$

From equations (1) and (2), we have

$\boldsymbol{v - u = at}$ **or** $\boldsymbol{v = u + at}$



25. (i)
Time taken to reach max height= u/g
19.6/9.8= 2s

(ii) $h_{max} = u^2/2g$
$= (19.6)^2/ (2X\ 9.8)$
$=19.6$ m

(iii) Total time taken to return the ground- 4s

26. (a)

$R = u_x \cdot T$

$R = u\cos\theta \cdot (2t_A)$

$R = u\cos\theta \cdot \frac{2u\sin\theta}{g}$ ....[From (3)]

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

$R = \frac{u^2\sin 2\theta}{g}$ ....[$\because \sin 2\theta =$ $2\sin\cdot\cos\theta$]

Or

b.

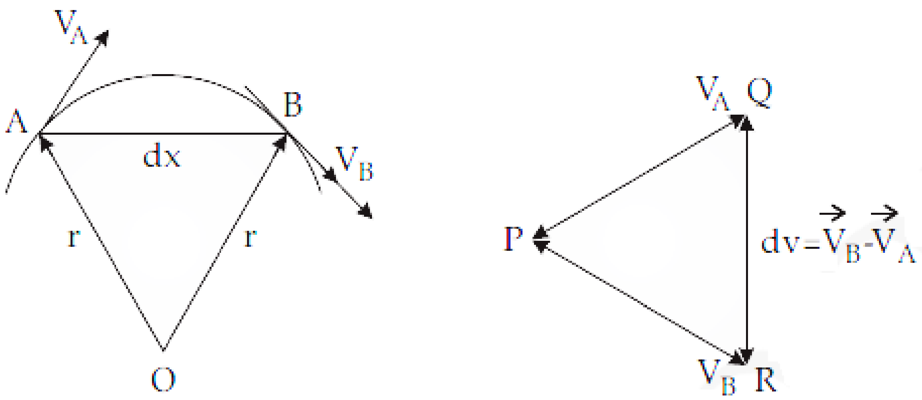
$R = \sqrt{(P^2+2PQ\cos\Theta+Q^2)}$

$10 = \sqrt{(8^2+2 \times 8 \times 6\cos\Theta+6^2)}$

$\cos\Theta=0$

$\Theta=90^o$

27.



From fig (1) $\frac{AB}{AO} = \frac{PQ}{PR}$

$$\frac{\Delta v}{v} = \frac{\Delta x}{r}$$

$$\therefore \Delta v = \frac{\Delta x v}{r}$$

$$\text{Acceleration} = \lim \Delta t \to 0 \frac{\Delta v}{\Delta t} = \frac{dv}{dt} = \frac{v}{r}\frac{dx}{dt}$$

$$= \frac{v^2}{r}$$

$$\therefore a = \frac{v^2}{r}.$$

F= ma

F= $mv^2/2$

28. **Newton's second law of motion** states that the time rate of change of linear momentum of an object is directly proportional to the applied external unbalanced force, and this change takes place in the direction of the applied force. Mathematically, it is expressed as \(F = ma\), where \(F\) represents the net force acting on the object, \(m\) represents its constant mass, and \(a\) represents the resulting acceleration

$$F \propto \frac{\text{Change in momentum}}{\text{Time}}$$

$$F \propto \frac{mv - mu}{t}$$

$$F \propto m\left(\frac{v-u}{t}\right)$$

$$\Rightarrow F \propto ma \Rightarrow F = kma \left(\because a = \frac{v-u}{t}\right)$$

$$\Rightarrow F = ma \quad (\because K = \text{constant} = 1)$$

29. (i) 24 m/s
    (ii) 96m
    (iii) 360m
    (iv) 6 m/s^2
30. (i) When the lift is **stationary**, the weighing machine reads **(686 N)** or 7**00 N** if taking g = 10 m/s^2.
    R= m(g+a)
    (ii) When accelerating upwards at **2.5 m/s^2** the machine reads 511 N or 520 N if g=10m/s^2
    (iii) Zero Newton
31. (a)

$$\Rightarrow \int_0^t adt = \int_u^v dv \Rightarrow at = v - u \Rightarrow v = u + at$$

Which gives us the first equation of motion.

Also, velocity can be written as

$$v = \frac{ds}{dt} \Rightarrow ds = vdt$$

Substituting $v = u + at$

$ds = (u + at)dt$

$ds = (udt + atdt)$.

Integrating both sides (displacement from $0\ to\ s$, time from $0\ to\ t$)

$$\int_0^s ds = \int_0^t udt + \int_0^t atdt$$

$$s = ut + \frac{1}{2}at^2$$

$a = \frac{dv}{dt}$, dv is the velocity change in time dt

Also, velocity $v = \frac{ds}{dt}$, ds indicates displacement undergone in time dt.

Dividing a by v,

$\frac{a}{v} = \frac{dv}{ds} \Rightarrow ads = vdv$;

integrating

$a\int_0^s ds = \int_u^v vdv$

$as = \frac{v^2}{2} - \frac{u^2}{2} \Rightarrow v^2 = u^2 + 2as.$

OR

$y = u_1\ t + \frac{1}{2}a_1\ t^2$

$= 0 \times t + \frac{1}{2} \times 10 \times t^2$

$y = 5\ t^2$ ______(1)

$90\text{-}y = 30t + ½\ (-10)\ t^2$

$90\text{-}y = 30t - 5t^2$ ---2

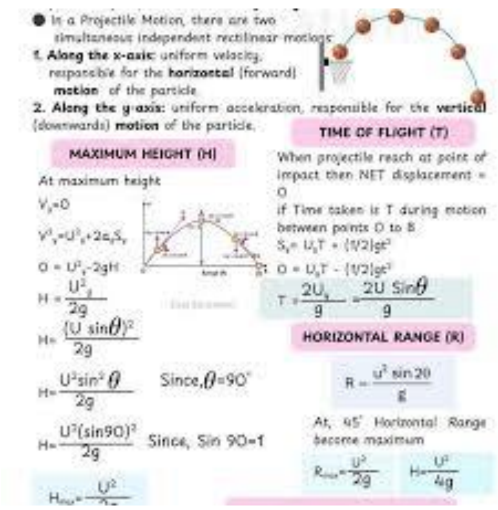
Adding 1 & 2

90=30t

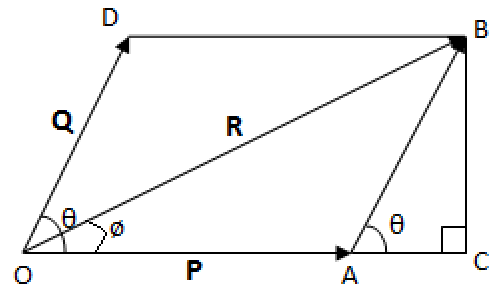
T= 3s

Y= 5 X 9= 45m

32.



OR



Let the two vectors be represented in magnitude and direction by two adjacent sides $\overrightarrow{OP}$ and $\overrightarrow{OS}$ of parallelogram OPQS, drawn from a point O.

According to the parallelogram law of vectors, thier resultant vector $\vec{R}$ will be represented by disgnol $\overrightarrow{OQ}$ of the parallelogram.

Manitude of $\vec{R}$:

Draw QN perpendicular to OP produced.

From the figure, OP = A, OS = PQ = B, OQ = R and $\angle SOP = \angle QPN = \theta$

In ΔQNP, $PN = PQ\cos\theta = B\cos\theta$

$QN = PQ\sin\theta = B\sin\theta$

In right angled triangle, ONQ, we have

$OQ^2 = ON^2 + NQ^2$

$= (OP + PN)^2 + NQ^2$

or $R^2 = (A + B\cos\theta)^2 + (B\sin\theta)^2$

or $R^2 = A^2 + 2AB\cos\theta + B^2(\cos^2\theta + \sin^2\theta)$

or $R^2 = A^2 + 2AB\cos\theta + B^2$

or $R = \sqrt{A^2 + 2AB\cos\theta + B^2}$

R= √ (P^2+2PQcosΘ + Q^2)

R=√ (10^2+2x8x6x0.5 +5^2)

R=13.15 N

33. The law of conservation of linear momentum states that the total linear momentum of an isolated system remains constant if no external force acts on it. This means the total momentum before a collision equals the total momentum after.

Change in momentum of A is: $m_1(v_1 - u_1)$

Change in momentum of B is: $m_2(v_2 - u_2)$

According to third law of motion,

$$F_{BA} = -F_{AB}$$

$$F_{BA} = m_2 \times a_2 = \frac{m_2(v_2 - u_2)}{t}$$

$$F_{AB} = m_1 \times a_1 = \frac{m_1(v_1 - u_1)}{t}$$

Here, a_1 & a_2 are the acceleration of A and B.

Therefore,

$$\frac{m_2(v_2 - u_2)}{t} = -\frac{m_1(v_1 - u_1)}{t}$$

$$m_2(v_2 - u_2) = -m_1(v_1 - u_1)$$

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

$m_1v_1+m_2v_2= (m_1+m_2)\ V$

v $= (m_1v_1+m_2v_2)/(m_1+m_2)$

= (0.015X 400)/ 3.015

= 1.99 m/s

OR

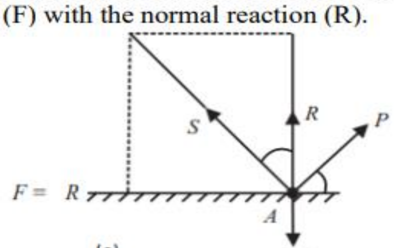
(a) Angle of Friction (θ) It is defined as the angle made by the resultant of the normal reaction (R) and the limiting force of friction (F) with the normal reaction (R).

Let, S = Resultant of the normal reaction (R) and limiting force of friction (F)

θ = Angle between S and R

Tan θ = F/R = μ

Note: The force of friction (F) is always equal to μR



(a)

b) Angle of Repose (α) It is the max angle of inclined plane on which the body tends to move down the plane due to its own weight.

Consider the equilibrium of the body when body is just on the point of slide.

Resolving all the forces parallel and perpendicular to the plane, we have:

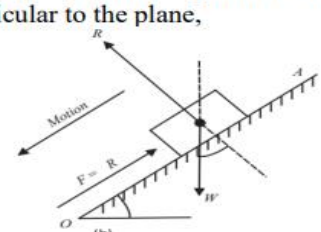
μR = W.sina

R = W.cosa

Dividing 1 by 2 we get T ana μ

But μ = tan θ, θ = Angle of friction

i.e., θ = α



(b)

The minimum force required to move the body is $F_s=\mu_s N$

F_s= 0.4 X 10 x10

F_s= 40N

_______________________________END OF MARKING KEY_________________________________