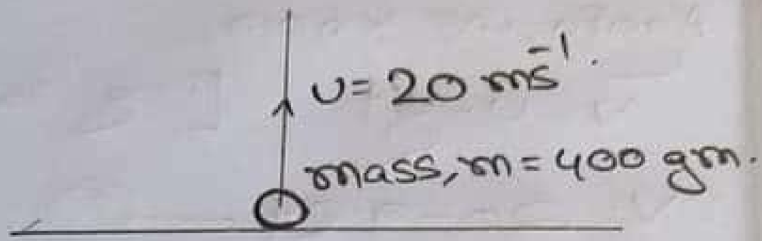
Ans: to the Q: no: 9



Given,

mass of ball, $m = 400$ gm
$= 0.4$ kg

Initial velocity of ball, $u = 20\ ms^{-1}$.

In total journey of the ball, displacement, $h = 0$

From galileo's law of freely falling bodies, we know,

$$h = uT - \frac{1}{2}gT^2. \quad [\because g \text{ is "-ve"}]$$

or, $0 = uT - \frac{1}{2}gT^2$.

or, $T\left(u - \frac{1}{2}gT\right) = 0$.

But $T \neq 0$ or, $u = \frac{1}{2}gT$

$$\therefore T = \frac{2u}{g} = \frac{2 \times 20}{9.8} = 4.08$$
$$\approx 4 \text{ secs.}$$

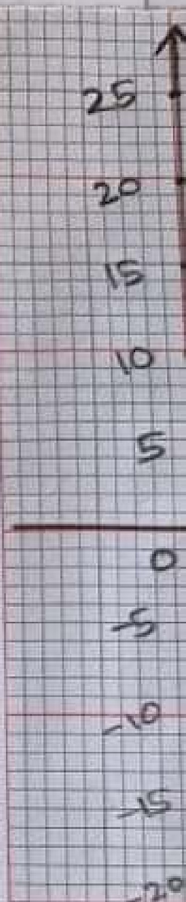
Again, we know,

$v = u - gt$ [$\because$ g is "-ve"]

$\therefore v = 20 - 9.8t$ —— (i).

Comparing eqn (i) with $y = mx + c$,
we get $m = -9.8$.

t(s)	0	0.5	1	1.5	2	2.5	3	3.5	4
v (ms^{-1})	20	15.1	10.2	5.3	0.4	-4.5	-9.4	-14.3	-19.2



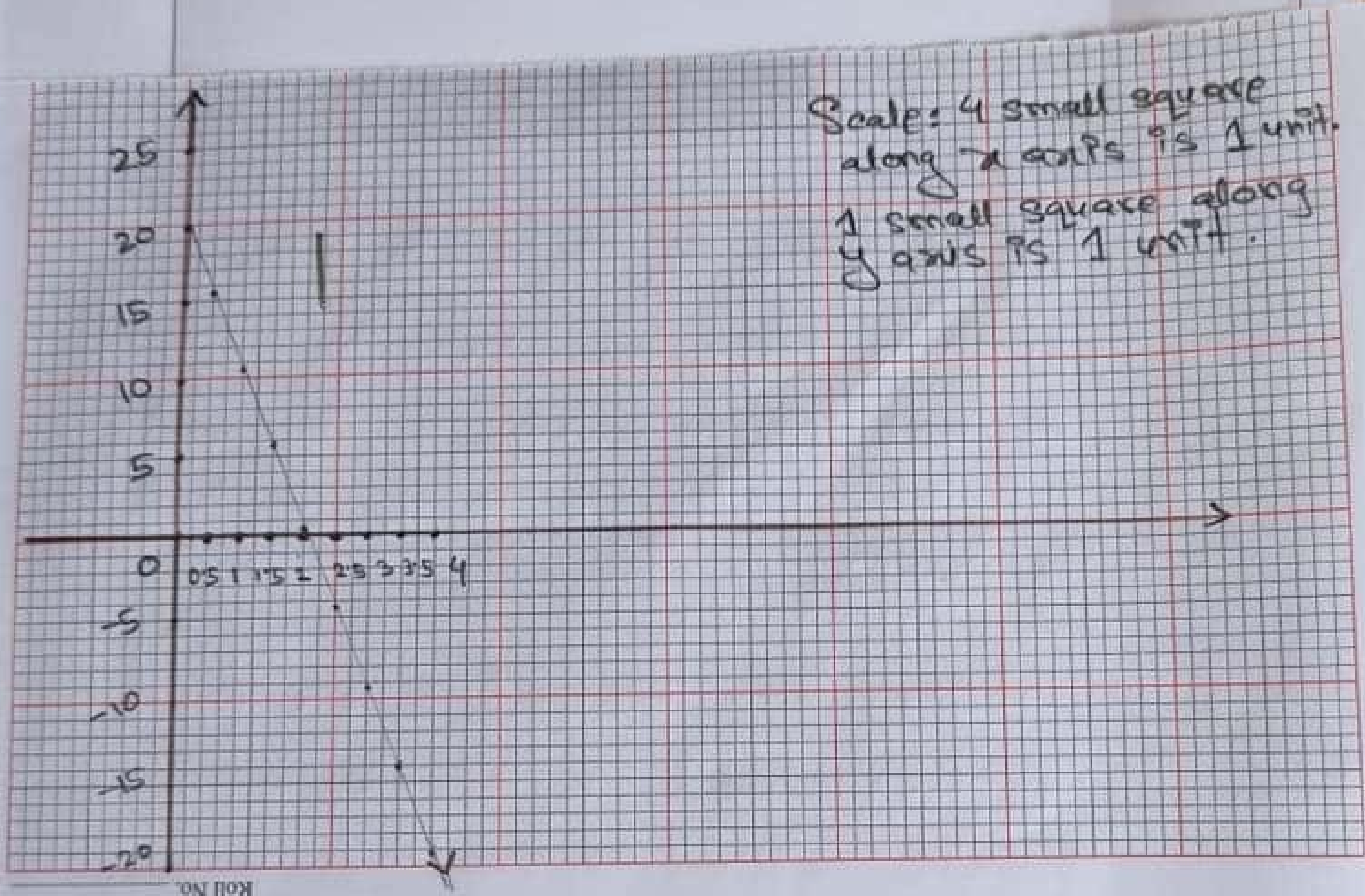


Fig: Velocity vs Time graph.

Ans: to the Q. no: (b)

At the pick of its path of motion, force of gravity will try to act downwards, so the ball will not be able to go further upwards.

When any object is projected upwards then its kinetic energy starts getting converted to potential energy. As no non-conservative force is involved, the energy remains conserved and the kinetic energy at the pick becomes minimum i.e zero.

Since kinetic energy becomes zero, then velocity at the pick point will also be zero. (Ans)

Ans: to the Q. no: (c)

At pick point, the ball starts to move downwards due to acceleration due to gravity.

Thus acceleration at that point is $a = g = 9.8\ ms^{-2}$. (Ans).

Ans: to the Q. no: (d)

At pick point, net acceleration,

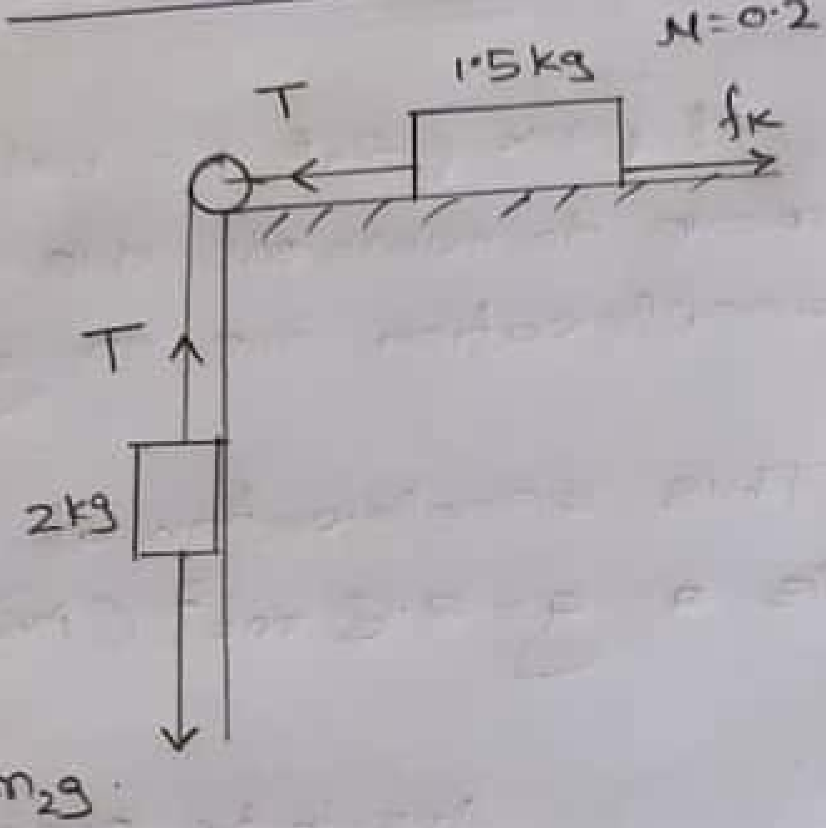
$a = g = 9.8\ ms^{-2}$.

Net force, $F_{net} = mg$

$= 0.4 \times 9.8$

$= 3.92\ N$. (Ans).

Ans: to the Q.no: (e) "1"



For 1.5 kg mass,

Reaction force, $R = m_1 g$
$= 1.5 \times 9.8$
$= 14.7$ N.

frictional force, $f_K = \mu_K R$
$= 0.2 \times 14.7$
$= 2.94$ N.

For

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Add

For 2 kg mass,

Weight downwards $= m_2 g$

$= 2 \times 9.8$

$= 19.6$ N.

Applying Newton's laws of motion for both bodies we get,

$19.6 - T = 2a$ - - - - (i).

$T - 2.94 = 1.5a$ - - - (ii)

Adding (i) and (ii) implies ⇒

$16.66 = 3.5a$.

or, $a = \frac{16.66}{3.5}$

$\therefore a = 4.76\ ms^{-2}$.

Ans: $4.76\ ms^{-2}$.

If the thread is not inextensible, the tention T will be different To determine Tension, values of extension on both sides is to be known. But sufficient data is not given in the stem to find the values of T when it is not inextensible.

Also, if thread is not inettensible then some energy will be spent in extending the thread. As a result, acceleration would be different too. (Ans)

Ans: to the Q no: (e) "2"

From 1 we got acceleration,

$a = 4.76\ ms^{-2}$,

Putting $a = 4.76\ ms^{-2}$ in (ii) we get

$T - 2.94 = 1.5 \times 4.76$

or, $T = 1.5 \times 4.76 + 2.94$.

$\therefore T = 10.08\ N$.

Tension of the thread is 10.08 N.

(Ans)

Ans: to the Q: no: (e) "3"

Let displacement be a function of time. The initial velocity of 2 kg mass is 0 ms^{-1}.

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

$$= 0 \times t + \frac{1}{2} \times 4.76t^2 \quad [\because a = 4.76 ms^{-2}$$

$$= 2.38t^2.$$

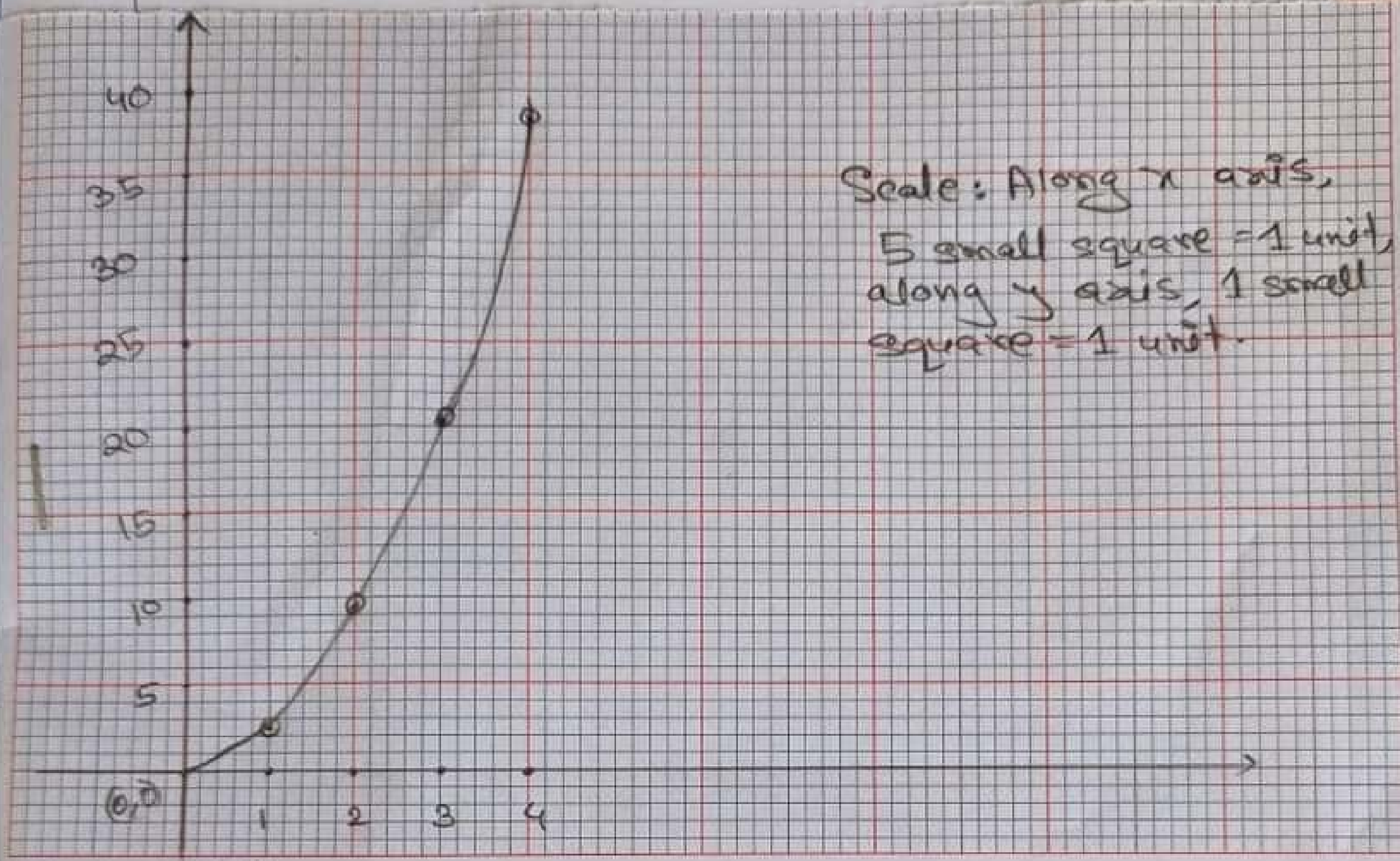
The required equation is

$$S = 2.38t^2 \text{ ——— } (i).$$

Graph of this equation represents a parabola which passes through the point (0,0)

we get some corresponding values of s by putting some values of t.

S(m)	0	2.38	9.52	21.42	38.08
t(s)	0	1	2	3	4



Roll No.

Fig: Displacement vs time graph.