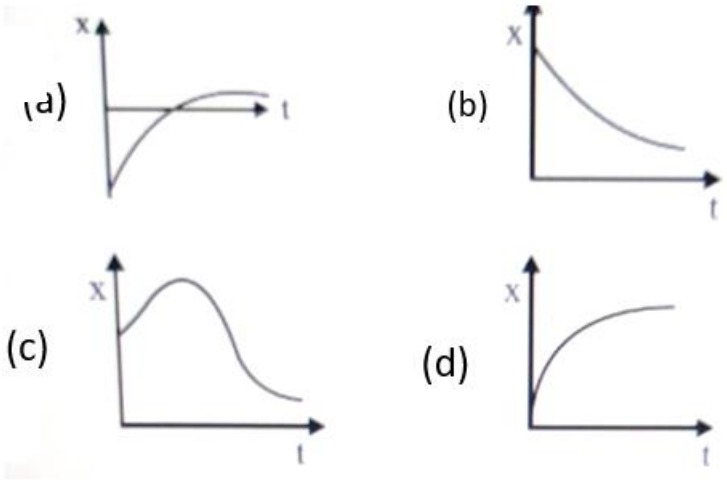
	INDIAN SCHOOL AL WADI AL KABIR	
Class: XI	**Department: SCIENCE 2026 – 27** **SUBJECT: PHYSICS**	**Date:17/04/2026**
Worksheet No: 1 **WITH ANSWERS**	**CHAPTER: 2; MOTION IN A STRAIGHT LINE**	**Note:** **A4 FILE FORMAT**
NAME OF THE STUDENT	**CLASS & SEC:**	**ROLL NO.**

OBJECTIVE TYPE QUESTIONS

1. Among the four graphs, there is only one graph for which average velocity over the time interval(0,T) can vanish for a suitably chosen T. Which one is it?



2. A body is thrown upward and after some time the body reaches its maximum height, at maximum height:

(a)Its velocity and acceleration both are zero.

(b) Its velocity is zero and acceleration is maximum.

(c) Its velocity is maximum and acceleration is minimum.

(d) Its velocity is zero and acceleration is equal to acceleration due to gravity (g).

3. If the displacement of a body is proportional to square of time then:

(a) The body moves with uniform velocity.

(b) The body moves with uniform acceleration.

(c) The body moves with increasing acceleration.

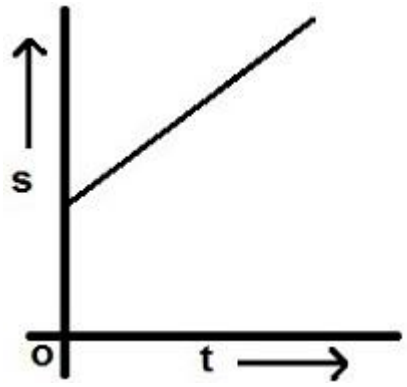
(d) The body moves with decreasing acceleration.

4. A particle covers half of its total distance with speed v1 and the rest half with speed v2. Its average speed during the complete journey is

(a) $\frac{v_1+v_2}{2}$ (b) $\frac{v_1 v_2}{v_1+v_2}$

(c) $\frac{2v_1 v_2}{v_1+v_2}$ (d) $\frac{v_1^2 v_2^2}{v_1^2+v_2^2}$

5. The displacement-time curve of a body is shown in following figure, then:



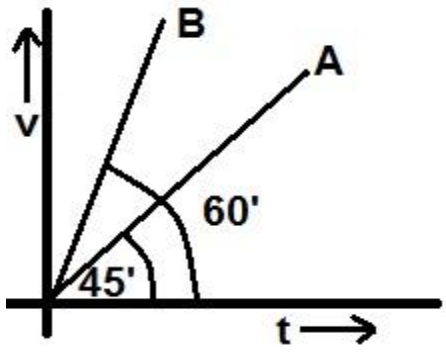
(a) The body is moving with uniform velocity with zero initial velocity.

(b) The body is moving with uniform velocity, with finite initial velocity.

(c) The body is moving with constant acceleration with zero initial velocity.

(d) The body is moving with constant acceleration with finite initial velocity.

6. The velocity-time graph of two bodies A and B are shown in figure, the ratio of their acceleration is:



(a) $1:\sqrt{3}$ (b) $1:3$ (c) $\sqrt{3}:1$ (d) $\sqrt{3}:\sqrt{2}$

7. The graph of displacement verses time of a body is a straight line making positive angle with the x-axis. Then the instantaneous velocity of the body at any point is

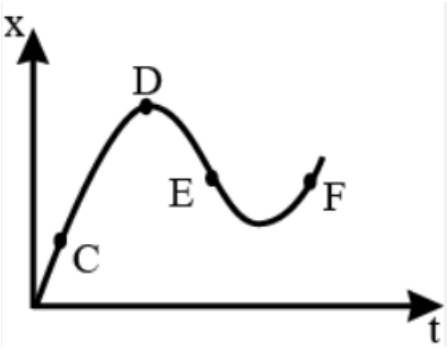
(a) Equal to the average velocity of the body.

(b) Lesser than or equal to the average velocity of the body.

(c) Greater than or equal to the average velocity of the body.

(d) Always greater than the average velocity of the body.

8. The displacement-time graph of a moving body is shown. The instantaneous velocity is negative at point



(a) C

(b) D

(c) E

(d) F

9. The acceleration of a moving body can be found from

(a) Area under distance – time graph

(b) Area under velocity – time graph

(c) Slope of the velocity – time graph

(d) Slope of the distance – time graph

10. The distance of a body depends on time according to the equation

$S = 20 + 0.1\ t^2$. The body is undergoing

(a) Uniform retardation

(b) Non uniform acceleration

(c) Zero acceleration

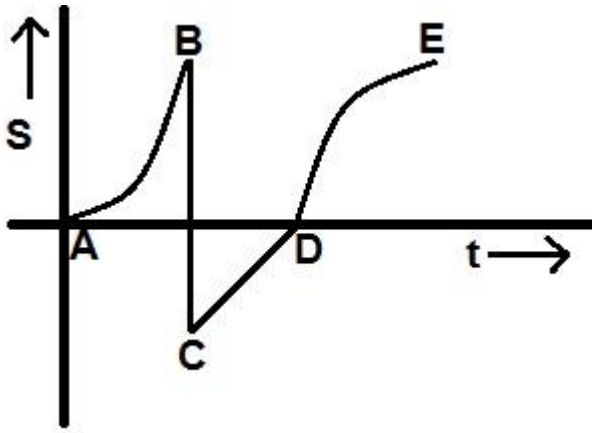
(d) Uniform acceleration

SHORT ANSWER QUESTIONS (2 MARKS)

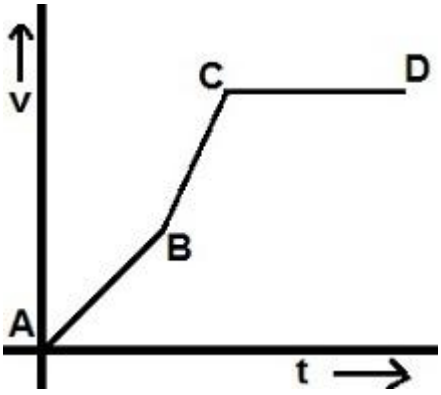
11.When is average velocity equal to average speed? On a track of length 100 km, a train covers the first 30 km with a constant speed of 30 km/h. What should be the speed of the train for the next 70 km so that the average speed for the entire trip is 50 km/h?

12. Give an example of a body having zero velocity but non-zero acceleration. What will be the Acceleration of a car if it slows from 90 km/h to a stop in 10 sec?

13. The displacement-time (s-t) graph of a body is shown in following figure. The path showing accelerated motion is



14. The velocity-time graph of a moving particle is shown in figure; the acceleration is maximum for which part and why?



15.) A body is thrown with speed 20m/s vertically upward, it will return to thrower's hand after a time of:(assume g=10m/s^2)

16.[i] A stone is thrown vertically upwards. Draw the[i] velocity-time graph[ii]speed-time for the complete journey of the body.

17. If the displacement of a body is zero, is the distance covered by it necessary zero? comment with illustration.

18.Can a body have a constant speed but a varying velocity? Explain your answer with an example.

19. Can a body have a constant velocity but a varying speed? Explain your answer.

20. What do you mean by instantaneous velocity. How can we find it graphically?

SHORT ANSWER QUESTIONS (3 MARKS)

21. A car moves a distance of 200 km. It covers the first half of the distance at a speed of 40km/h and the second half of the distance at speed v. If the average speed is 48km/h, then find the value of v.

22. Draw the nature of a position –time graph for a motion of a particle moving with[i] positive acceleration [ii] zero acceleration [iii] negative uniform velocity.

23. A train takes 1 hr. to go from one station to another. It travels at a speed of 30km/h for first half hour and at a speed of 50km/h for the next half hour. Find the average speed of the train?

24. If a body travels 1/3 distance with a velocity 2m/s next 1/3 distance with a velocity of 4m/s and the remaining 1/3 distance with a velocity of 6m/s. Find the average velocity of the body?

25. A ball thrown vertically upwards with a speed of 20m/s from the top of a tower and returns to the ground level in 6 s. Find the height of the tower

[g= 10m/s^2] (Ans. 60m)

26. From the top of a tower 30m high, a stone is dropped. At the same instant another stone is projected vertically upwards from the ground with a speed of 30m/s. After how much time and at what height from the ground will the stones crosses each other [g= 10m/s^2]

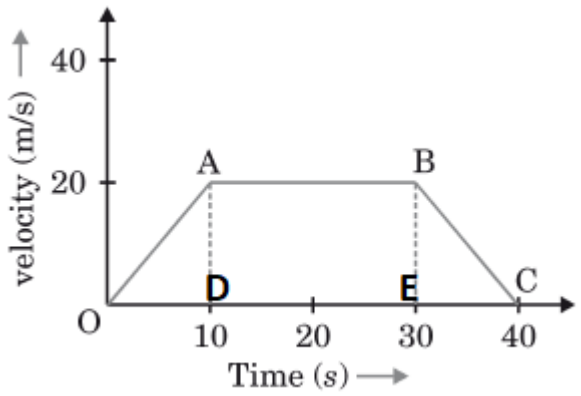
27. A stone is dropped from a balloon moving upwards with a velocity of 4.5m/s. The stone reaches the ground in 5s. Calculate the height of the balloon when the stone was dropped [g = 9.8m/s^2]

LONG ANSWER QUESTIONS (5 MARKS)

28. a) Derive all the 3 equations of uniformly accelerated motion graphically.

b) A particle moving with a uniform acceleration travels 24 m and 64 m in the first two consecutive intervals of 4 sec each. What is its initial velocity?

29. The velocity time graph of a body is shown in the following figure. Answer the following questions:



(a) State the kind of motion represented by OA, AB and BC

(b) What is the velocity of the body after 10 s and after 40 s?

(c) Find the value of acceleration between 0 to 10 s and 30 s to 40 s.

(d) Find the distance travelled by the body during the time interval between 10s and 30s.

ASSERTION REASONING QUESTIONS

Two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below.

a) If both Assertion and Reason are true and Reason is correct explanation of Assertion.

b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

c) If Assertion is true but Reason is false.

d) If both Assertion and Reason are false.

1) **Assertion:** A body may be accelerated even when it is moving uniformly.
   Reason: When direction of motion of the body is changing, the body must have acceleration.
2) **Assertion:** Displacement of a body may be zero when distance travelled by it is not zero.
   Reason: The displacement is the longest distance between initial and final position.
3) **Assertion:** Velocity-time graph for an object in uniform motion along a straight path is a straight line parallel to the time axis.
   Reason: In uniform motion of an object velocity increases as the square of time elapsed.
4) **Assertion:** For one dimensional motion the angle between acceleration and velocity must be zero.
   Reason: One dimensional motion is not always on a straight line.

CASE BASED STUDY QUESTIONS

1) Average Speed and Average Velocity

When an object is in motion, its position changes with time. So, the quantity that describes how fast is the position changing w.r.t. time and in what direction is given by average velocity. It is defined as the change in position or displacement (Δx) divided by the time interval (Δt) in which that displacement occurs. However, the quantity used to describe the rate of motion over the actual path, is average speed. It defined as the total distance travelled by the object divided by the total time taken.

(i) A 250 m long train is moving with a uniform velocity of 45 km/h. The time taken by the train to cross a bridge of length 750 m is

(a) 56 s
(b) 68 s
(c) 80 s
(d) 92 s

(ii) A truck requires 3 hr to complete a journey of 150 km. What is average speed?

(a) 50 km/h
(b) 25 km/h
(c) 15 km/h
(d) 10 km/h

(iii) Average speed of a car between points A and B is 20 m/s, between B and C is 15 m/s and between C and D is 10 m/s. What is the average speed between A and D, if the time taken in the mentioned sections is 20s, 10s and 5s, respectively?

(a) 17.14 m/s
(b) 15 m/s
(c) 10 m/s
(d) 45 m/s

(iv) A cyclist is moving on a circular track of radius 40 m completes half a revolution in 40 s. Its average velocity (in m/s) is

(a) zero
(b) 2
(c) 4π
(d) 8π

OR

A train traveling at a uniform speed, clears a platform 240 meters long in 10 seconds and passes a telegraph post in 6 seconds. find the length of the train and its speed.

(a) 300 m, 180 km/h (b) 300 m, 150 km/h
(b) 300 m, 150 km/h
(c) 200 m, 50 km/h
(d) 360 m, 216 km/h

2) An object released near the surface of the Earth is accelerated downward under the influence of the force of gravity. The magnitude of acceleration due to gravity is represented by g. If air resistance is neglected, the object is said to be in free fall. If the height through which the object falls is small compared to the earth's radius, g can be taken to be constant, equal to 9.8 m/s^2. Free

fall is thus a case of motion with uniform acceleration. We assume that the motion is in y-direction, more correctly in -y-direction because we choose upward direction as positive. Since the acceleration due to gravity is always downward, it is in the negative direction and we have a = - g = 9.8 ms^2. The object is released from rest at y = 0. Therefore, vo = 0 and the equations of motion become

$$v = 0 - gt = -9.8\ t\ ms^{-1}$$

$$y = 0 - \frac{1}{2}\ gt^2 = -4.9\ t^2\ m$$

$$v^2 = 0 - 2\ gy = -19.6\ y\ m^2s^{-2}$$

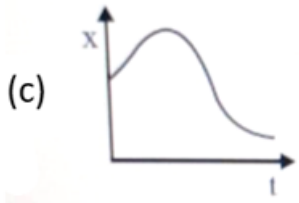
These equations give the velocity and the distance travelled as a function of time and also the variation of velocity with distance.

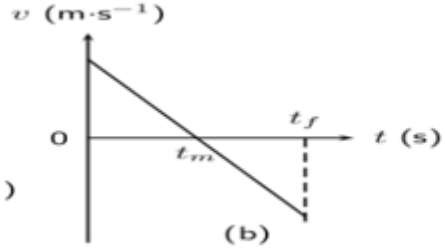
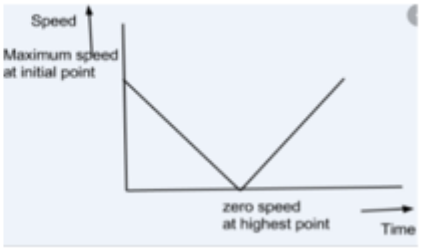
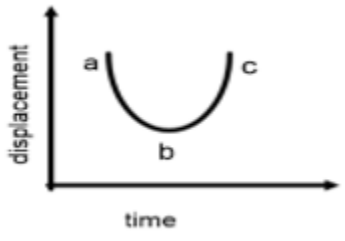
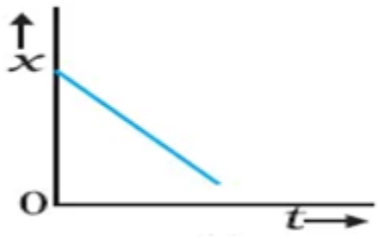
(A) Suppose you hold a book in one hand and a flat sheet of paper in another hand. You drop them both, and they fall to the ground. The falling book is a good example of free fall, but the paper is not because:
(a) The book is significantly affected by the air.
(b) The paper is relatively more affected by gravity.
(c) Free fall is the motion of an object when gravity is the only significant force on it. The paper is significantly affected by the air, but the book is not.
(d) None of the above.

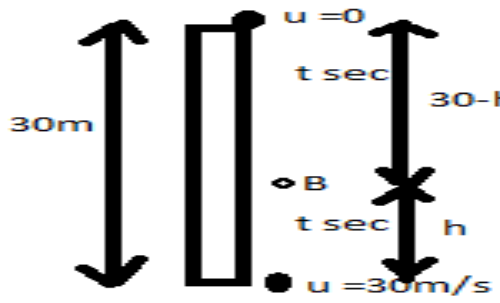
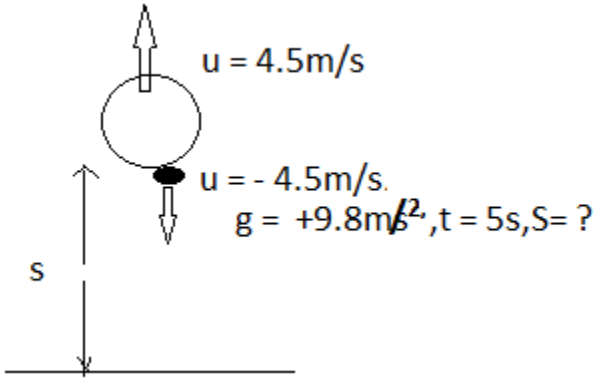
(B) Suppose you throw a ball straight up into the air. The correct option is:
(a) Velocity is reduced at a constant rate as the ball travels upward.
(b) At its highest point, velocity is zero.
(c) As the ball begins to drop, the velocity begins to increase in the negative direction.
(d) All of the above

(C) A stone that starts at rest is in free fall for 8.0 s. The stone's velocity after 8.0 s will be:
(a) 78.4 m/s downward
(b) 108 m/s downward
(c) 118 m/s downward
(d) 97 m/s downward

(D) A stone that starts at rest is in free fall for 8.0 s. The stone's displacement during this time will be:
(a) 510 m downward
(b) 800 m downward
(c) 100 m downward
(d) 310 m downward

Q. No.	ANSWERS
1.	(c) 
2.	(d) Its velocity is zero and acceleration is equal to acceleration due to gravity (g).
3.	(b) The body moves with uniform acceleration.
4.	(c) $\frac{2v_1v_2}{v_1+v_2}$
5.	(a) The body is moving with uniform velocity with zero initial velocity.
6.	(a) $1:\sqrt{3}$ acceleration = slope = tanθ)
7.	(a) Equal to the average velocity of the body.
8.	(c) E
9	(c) Slope of the velocity – time graph
10.	(d) Uniform acceleration
	SHORT ASWER QUESTIONS (2MARKS)
11.	When a body moves along a straight line. $v_{avg} = \frac{D_{total}}{T_{total}} \quad T_{total} = \frac{100\text{ km}}{50\text{ km/h}} = 2\text{ hours}$ The train covers the first 30 km at 30 km/h. Using the formula $t = \frac{d}{v}$: $t_1 = \frac{30\text{ km}}{30\text{ km/h}} = 1\text{ hour}$ The train has already used 1 hour of the total 2 hours allowed. • **Remaining Time (t_2):** 2 hours − 1 hour = 1 hour • **Remaining Distance (d_2):** 100 km − 30 km = 70 km **4. Calculate Required Speed** To cover the remaining 70 km in the remaining 1 hour: $v_2 = \frac{d_2}{t_2} = \frac{70\text{ km}}{1\text{ hour}} = 70\text{ km/h}$
12	A body which is thrown up and at the maximum height it has zero velocity but non-zero acceleration. Here, u = 90 km/h = 90×5/18=25m/s because initially it was moving at a speed of 90 kmph then reached zero.

	Final Velocity 'v' = 0 km/h, and t = 10 seconds Now, applying the formula here: $a=(0-25)10=-2.5 m/s^2$
13	AB as the slope is increasing with time.
14	BC as the slope of velocity -time graph gives acceleration and slope is maximum for BC.
15	V =0, u =20m/s, a = -10m/s^2 v=u + at, Time to go up = 2 s Time of ascent = time of descent Total time = 2 + 2 = 4 s
16	 
17	Explanation with example
18	yes, for a body executing uniform circular motion
19	No, speed gives the magnitude of velocity. So, if speed changes velocity also will change.
20	Definition. Slope of the displacement -time graph.
	3 MARKS QUESTIONS
21	Average speed $=\frac{s_1+s_2}{(s_1/v_1+s_2/v_2)}=\frac{200}{\frac{100}{40}+\frac{100}{v}}=48$ On solving v = 60km/h
22	  
23	average speed $=\frac{total\ distance}{total\ time}=\frac{d1+d2}{t1+t2}=\frac{s1\ x\ t1\ +s2\ x\ t2}{t1+t2}$
24	Average velocity $=\frac{total\ displacement}{total\ time}=\frac{3d}{t1+t2+t3}=\frac{3d}{\frac{d1}{v1}+\frac{d2}{v2}+\frac{d3}{v3}}=\frac{3d}{\frac{d}{2}+\frac{d}{4}+\frac{d}{6}}=\frac{36}{11}$m/s

25.	Ans.60m
26.	 At 'B' both the stones meet each other For stone S1: $30-h = 1/2 \times 10t^2$ --[1] For stone s2: $h = 30 \times t - 1/2\ 10xt^2$ --[2] [1] + [2] , gives , t = 1s {1}gives , h = 25m
27.	 $S = ut + \frac{1}{2} gt^2 = - 4.5 \times 5 + \frac{1}{2} \times 9.8 \times [5]^2 = 100m$
	5 MARKS QUESTIONS
28.	Derive the equations of motion graphically. (Ans. Assume that in first interval of 4s the distance covered is 24m and in next 4s it covers distance of 64 m. Let a be uniform acceleration and u be initial velocity. From equation of motion s= $ut + \frac{1}{2}at^2$, we have for first interval, 24=4u+8a or 6=u+2a…….(1) For next interval, initial velocity is u+4a. Therefore, 64=(u+4a)4+8a or 64=4u+24a or 16=u+6a……..(2) Solving equations (1) and (2), u=1m/s.)

29.	(Ans. (a) OA - Uniform acceleration, AB - Zero acceleration / constant velocity and BC - uniform deceleration. (b) After 10s velocity= 20m/s and after 40s velocity is zero / body comes to rest (c) Acceleration = 20-0/10 -0 = $2m/s^2$ Retardation = (0 - 20) / (40 - 30) = -2 ms^2 (d) Distance between 10th and 30th second = area of the rectangle ABED = length X breadth = (30 - 10) s × 20 m/s = 400 m
	ASSERTION REASON TYPE QUESTIONS
1	Answer: a
2	Answer: c
3	Answer: c
4.	Answer: (d) One dimensional motion is always along straight line. But acceleration may be opposite of velocity and so angle between them will be 180°.
	CASE BASED STUDY QUESTIONS
1.	i) c

Length of train = 250 meters.

Speed of train = 45 kmph

$= \frac{45 \times 1000}{3600}\ m/s$

= 12.5 m/s

As the train crosses the tunnel the total distance covered by train is equal to the sum of the lengths of the tunnel and that of the train.

∴ Total distance covered by train while crossing tunnel = 250 + 750 meters = 1000 meters.

Time taken by train to cover 1000 meters = $\frac{distance\ covered}{speed\ of\ train}$

Time taken by train to cover 1000 meters = $\frac{1000}{12.5}$

Then, the time taken by train to cover 1000 meters = 80 seconds.

(ii) a

(iii) a

The distance covered between points **A** and **B** is $d_{AB} = v_{AB}t_{AB} = 20 \times 20 = 400m$

The distance covered between points **B** and **C** is

$d_{BC} = v_{BC}t_{BC} = 15 \times 10 = 150m$

The distance covered between points **C** and **D** is

$d_{CD} = v_{CD}t_{CD} = 10 \times 5 = 50m$

Now the average speed for the entire journey is the ratio of total distance to the total time taken.

Therefore,

$V_{avg} = \frac{400+150+50}{20+10+5} = \frac{600m}{35s} = 17.14m/s$

Therefore, the average speed of the car between **A** and **D** is **17.14m/s**

(iv) b

- The cyclist starts at point A and ends at point B after half a revolution.
- The displacement is the straight-line distance from point A to point B, which is the diameter of the circle.

D=2R

D=2×40m=80m

	V_{avg}=Total Displacement/Total Time - We know the total displacement is 80 meters (diameter) and the total time taken is 40 seconds. Plugging in these values: V_{avg}=80/40=2m/s OR When passing the platform, distance = L + 240 m Time = 10 s Speed v = L + 240/10 When passing the telegraph post Distance = L m and time – 6s V = L/6 Equating L + 240/10 = L/6 L = 360 m Speed v = L/6 = 360/6 = 60 m/s = 60 x 18/5 = 216km/h
2.	(A) (c) Free fall is the motion of an object when gravity is the only significant force on it. The paper is significantly affected by the air, but the book is not.
	(B) (d) All of the above
	(C) **(C)** (a) 78.4 m/s downward **Explanation:** Given: Initial velocity, u = 0 m/s (since, the stone starts at rest) Time, t = 8 seconds Acceleration due to gravity, a = 9.8 m/s². Mathematically, the first equation of motion is given by the formula; v = u + at v = 0 + 9.8 x 8 Velocitv. v 78.4 m/s

	(D) (d) 310 m downward **Explanation:** Given: Initial velocity, 0 m/s (since, the stone starts at rest) Time, t = 8 seconds Acceleration due to gravity, a = 9.8 meter per seconds square of motion; $S = ut + \frac{1}{2}at^2$ $S = 0(8) + \frac{1}{2}(9.8)(8)^2$ $S = 0 + \frac{1}{2}(9.8)(64)$ $S = 4.9 \times 64$ Displacement, S = 313.6 meters

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