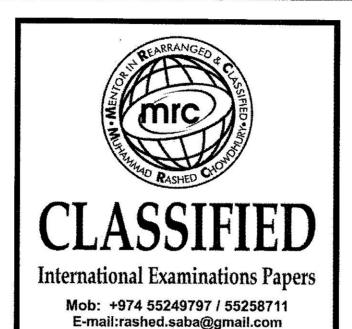
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Edexcel AS Mechanics M1

TOPIC-Kinematics of a particle moving in a straight line



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physics is fun chemistry is juicy mothematics is spicy

A stone is projected vertically upwards from a point A with speed u ms⁻¹. After projection the stone moves freely under gravity until it returns to A. The time between the instant that the stone is projected and the instant that it returns to A is $3\frac{4}{7}$ seconds

Modelling the stone as a particle,

- (a) show that $u = 17\frac{1}{2}$,
- (b) find the greatest height above A reached by the stone,

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(c) find the length of time for which the stone is at least $6\frac{3}{5}$ m above A.

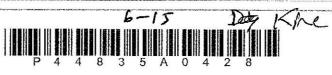
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A small stone is projected vertically upwards from a point O with a speed of 19.6	m s ⁻¹ .
Modelling the stone as a particle moving freely under gravity,	
(a) find the greatest height above O reached by the stone,	
	(2)
(b) find the length of time for which the stone is more than 14.7 m above O.	(5)
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5. A particle P is projected vertically upwards from a point A with speed u m s⁻¹. The point A is 17.5 m above horizontal ground. The particle P moves freely under gravity until it reaches the ground with speed 28 m s⁻¹.

(a) Show that u = 21

At time t seconds after projection, P is 19 m above A.

(b) Find the possible values of t.



The ground is soft and, after P reaches the ground, P sinks vertically downwards into the ground before coming to rest. The mass of P is 4 kg and the ground is assumed to exert a constant resistive force of magnitude 5000 N on P.

(c) Find the vertical distance that P sinks into the ground before coming to rest. (4)



Leave blank At time t = 0 a ball is projected vertically upwards from a point O and rises to a maximum height of 40 m above O. The ball is modelled as a particle moving freely under gravity. (a) Show that the speed of projection is 28 m s⁻¹. (b) Find the times, in seconds, when the ball is 33.6 m above O.

Leave blank 7. P(0.3 kg)O(0.5 kg)F(4N)Figure 3 Two particles P and Q, of mass 0.3 kg and 0.5 kg respectively, are joint horizontal rod. The system of the particles and the rod is at rest on a horizontal plan At time t = 0, a constant force F of magnitude 4 N is applied to Q in the direction PQ shown in Figure 3. The system moves under the action of this force until 1902 17455 17711 1753 1973 1973 the motion, the resistance to the motion of P has constant magnitude 1 N and the resistance to the motion of Q has constant magnitude 2 N. Find (a) the acceleration of the particles as the system moves under the action of F, (3) (b) the speed of the particles at t = 6 s, (2) (c) the tension in the rod as the system moves under the action of F. (3)At t = 6 s, **F** is removed and the system decelerates to rest. The resistances to motion are unchanged. Find (d) the distance moved by P as the system decelerates, (4) (e) the thrust in the rod as the system decelerates. (3)

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Leave blank A ball is projected vertically upwards with a speed of 14.7 m s⁻¹ from a point which is 49 m above horizontal ground. Modelling the ball as a particle moving freely under gravity, find (a) the greatest height, above the ground, reached by the ball, (b) the speed with which the ball first strikes the ground, (c) the total time from when the ball is projected to when it first strikes the ground. (3)



4.	A lorry is moving along a straight horizontal road with constant accelerasses a point A with speed u m s ⁻¹ , (u < 34), and 10 seconds later passes at 34 m s ⁻¹ . Given that $AB = 240$ m, find	eration. The lorry point B with speed	blar
	(a) the value of u ,	SOME THE STATE OF	
ana	(b) the time taken for the lorry to move from A to the mid-point of AB	Meb: +874 55230711 / 55246797	
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5. A racing car is moving along a straight horizontal track with constant acceleration. There are three checkpoints, P , Q and R , on the track, where $PQ = 48$ m and $QR = 200$ m. The car takes 3 s to travel from P to Q and 5 s to travel from Q to R . Find		
(i) the acceleration of the car,(ii) the speed of the car as it passes P.	THIC STATE OF THE	
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4. The points P and Q are at the same height h metres above horizontal ground. A small	blank
stone is dropped from rest from P . Half a second later a second small stone is thrown vertically downwards from Q with speed 7.35 m s ⁻¹ . Given that the stones hit the	
ground at the same time, find the value of h.	MANUSAL MANUSA MANUS
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6.	A cyclist is moving along a straight horizontal road and passes a point A . Five seconds later, at the instant when she is moving with speed 10 m s^{-1} , she passes the point B . She moves with constant acceleration from A to B .
	Given that $AB = 40 \mathrm{m}$, find
	(a) the acceleration of the cyclist as she moves from A to B . (4)
	(b) the time it takes her to travel from A to the midpoint of AB . (5)
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1.	A train moves along a straight horizontal track between two stations R and S. Initially the
	train is at rest at R. The train accelerates uniformly at $\frac{1}{2}$ m s ⁻² from rest at R until it is
	<u></u>
	moving with speed 15 m s ⁻¹ . For the next 200 seconds the train maintains a constant
	speed of 15 m s ⁻¹ . The train then decelerates uniformly at $\frac{1}{4}$ m s ⁻² until it comes to rest at S.
	Find
	(a) the time taken by the train to travel from R to S,
	(b) the distance from R to S , (4)
	(c) the average speed of the train during the journey from R to S. (2)
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1.	A truck of mass 2400 kg is pulling a trailer of mass M kg along a straight horizontal road. The tow bar, connecting the truck to the trailer, is horizontal and parallel to the direction of motion. The tow bar is modelled as being light and inextensible. The resistance	Commentment and the second commentmentmentmentmentmentmentmentmentmen
	forces acting on the truck and the trailer are constant and of magnitude 400 Namt 200 N respectively. The acceleration of the truck is 0.5 m s ⁻² and the tension in the tow bar is 600 N.	the Control of the Co
	(a) Find the magnitude of the driving force of the truck.	STATE CONTRACTOR AND
	(b) Find the value of M . Mob: *974 55259711 / 55249797 E-mail:reshed.catas@garait.com	Mathematical Spiness
	(c) Explain how you have used the fact that the tow bar is inextensible in your calculations.	ACCRECATION OF PROPERTY OF PROPERTY OF PERSONS ASSESSMENT OF PERSO
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