

1.1 Motion Past Paper Questions

1. A cyclist rides along a road. Describe a method by which the average speed of the cyclist could be measured.

Your description must include the following:

- Measurements made
 - Equipment used
 - Any necessary calculations
- (3)

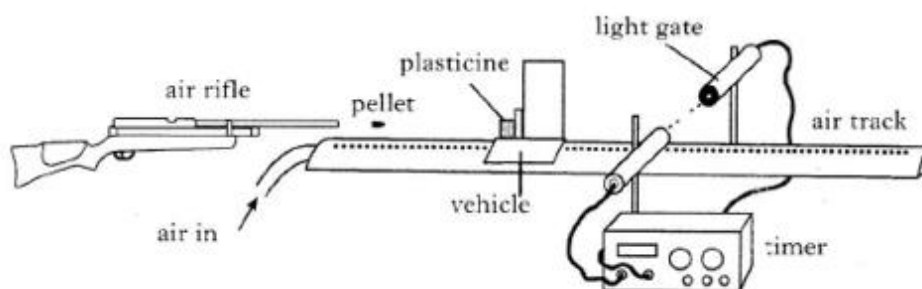
2. Cameras placed at 5km intervals along a stretch of road are used to record the average speed of a car.

The car is travelling on a road which has a speed limit of 100 km/h. The car travels a distance of 5 km in 2.5 minutes.

(a) Does the average speed of the car stay within the speed limit? You must justify your answer with a calculation. (3)

(b) At one point in the journey, the car speedometer records 90 km/h. Explain why the average speed for the entire journey is not always the same as the speed recorded on the car speedometer. (2)

3. The following apparatus is used to determine the speed of a pellet as it leaves an air rifle. The air rifle fires a pellet into the plasticine, causing the vehicle to move.



Describe how the apparatus is used to determine the speed of the vehicle.

Your description must include:

- The measurements made
- Any necessary calculations.

(3)

4. A walker wears a pedometer. A pedometer is an instrument that measures the distance walked by counting the number of steps taken. The walker measures the distance of one step as 0.8m and enters it into the pedometer.



- (a) The walker completes 9000 steps during a walk. Calculate the distance travelled. (1)
- (b) The walker completes this walk in 80 minutes. What is the average speed of the walker in ms^{-1} ? (3)
- (c) Give one reason why the distance measured by the pedometer may not be accurate. (1)

5. A cyclist approaches traffic lights at a speed of 8 ms^{-1} . He sees the traffic lights turn red and 3 s later he applies the brakes. He comes to rest in a further 2.5 s.

(a) Calculate the acceleration of the cyclist whilst braking.

(3)

(b) Sketch a speed time graph showing the motion of the cyclist from the moment the lights turn red until he stops at the traffic lights. Numerical values **must** be included.

(3)

(c) Calculate the total distance the cyclist travels from the moment the lights turn red until he stops at the traffic lights.

(3)

6. A scientist studies a flea while it jumps.

Starting from rest, the flea accelerates to 1.2 metres per second in a time of 0.001 seconds.

The flea has a mass of 0.0001 kilograms.

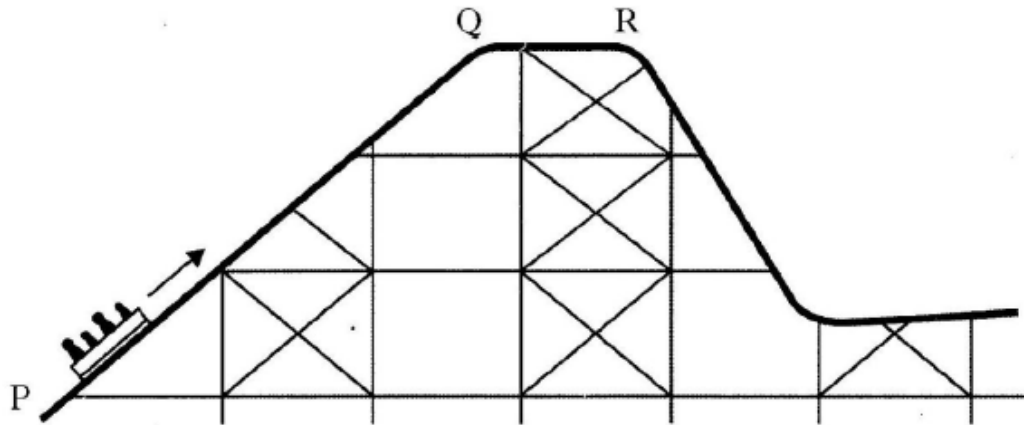
(a) State the meaning of the term "acceleration".

(1)

(b) Calculate the acceleration of the flea.

(3)

7. A carriage on a roller coaster is pulled up the first slope.



- (a) The carriage is released from rest at R. After a time of 2.5 seconds the carriage has reached a speed of 14 metres per second.
Calculate the acceleration of the carriage. (3)
- (b) The carriage travels a total distance of 720 metres in a time of 100 seconds.
Calculate the average speed of the carriage. (3)

8. During training an athlete sprints 30m East and the 40m West. Which row shows the distance travelled and the displacement from the starting point?

	Distance travelled	Displacement
A	10 m	10 m East
B	10 m	10 m West
C	10 m	70 m East
D	70 m	10 m West
E	70 m	10 m East

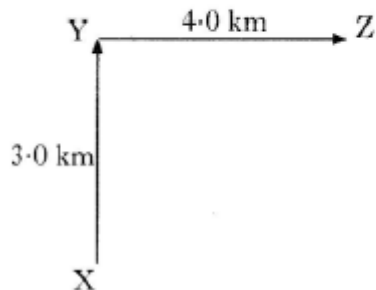
9. Which of the following is a scalar quantity?

- A Force
B Acceleration
C Momentum
D Velocity
E Energy

(1)

(1)

10. A student walks from X to Y and then from Y to Z.



The complete walk takes 2 hours.

Which row in the table shows the average speed and the average velocity for the complete walk? (1)

	Average Speed	Average velocity
A	2.5 kmh^{-1}	2.5 kmh^{-1} at 053
B	2.5 kmh^{-1} at 053	2.5 kmh^{-1}
C	3.5 kmh^{-1}	2.5 kmh^{-1} at 053
D	3.5 kmh^{-1} at 053	3.5 kmh^{-1}
E	3.5 kmh^{-1}	3.5 kmh^{-1} at 053

11. The speed of a kart and driver is recorded from the start of a race.

The kart starts from rest and accelerates uniformly until it reaches checkpoint X. Its speed at X is 12 ms^{-1} . The time taken to reach X is 4s.

- (a) Draw a speed time graph for the motion of the kart from the start until it reaches checkpoint X.

Units and numerical values must be shown on both axes.

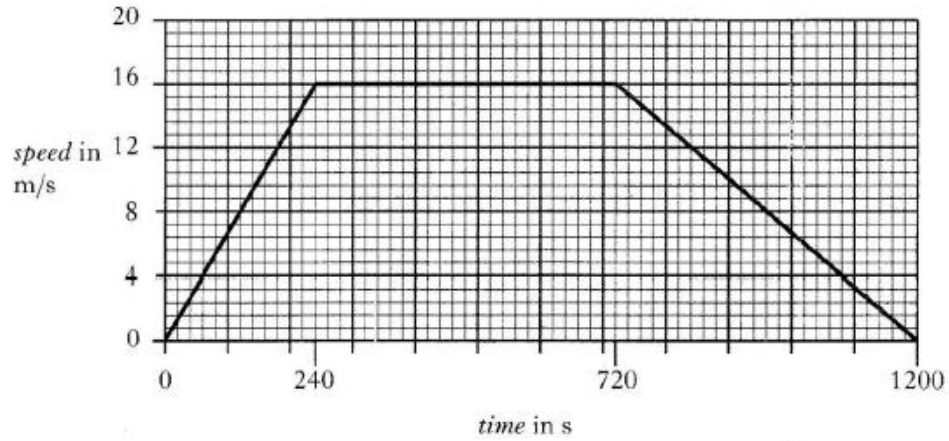
(3)

- (b) Calculate the acceleration of the kart between the start and checkpoint X.

(3)

12. A hovercraft was trialled on the Firth of Forth from Kirkcaldy to Leith.

The graph shows how the speed of the hovercraft varies with time for one journey from Kirkcaldy to Leith.



- (a) Calculate the total distance travelled during the journey.
- (b) Calculate the average speed for the whole journey.

(3)

(3)

Total Marks 50