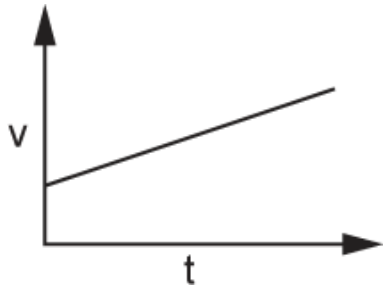
1. A car travels at a constant speed. The car travels 32 km in 20 minutes.

How long does it take the car to travel 128 km?

A 60 minutes
B 80 minutes
C 100 minutes
D 116 minutes

Your answer ☐ **[1]**

2. A teacher draws a graph showing the relationship between time, **t**, and velocity, **v**.



What information does the gradient tell us?

A Acceleration
B Distance travelled
C Final velocity
D Start velocity

Your answer ☐ **[1]**

3. A cyclist starts at an initial velocity of 0.0 m / s and accelerates at 1.4 m / s^2 for a distance of 20 m.

What is the **final velocity** of the cyclist?

Use the equation: $(\text{final velocity})^2 - (\text{initial velocity})^2 = 2 \times \text{acceleration} \times \text{distance}$

A 5.3 m / s
B 7.5 m / s
C 28 m / s
D 56 m / s

Your answer ☐ **[1]**

4. A teacher calculates the average speed of a student swimming the length of a pool.

The teacher measures:

- the distance of one length of the pool
- the time for the student to swim one length of the pool.

Which measuring instruments should the teacher use?

	Distance	Time
A	30 cm ruler	analogue clock
B	30 cm ruler	stopwatch
C	trundle wheel	analogue clock
D	trundle wheel	stopwatch

Your answer ☐ **[1]**

5. In a crash, the change in velocity of a car is 18 m / s.

The time for the crash is 0.15 s.

Calculate the deceleration of the car.

Use the equation: $\text{acceleration} = \frac{\text{change in velocity}}{\text{time}}$

Deceleration = ... m / s^2 **[2]**

6. Fig. 16.3 shows how ultrasound pulses can be used to find distances in water.

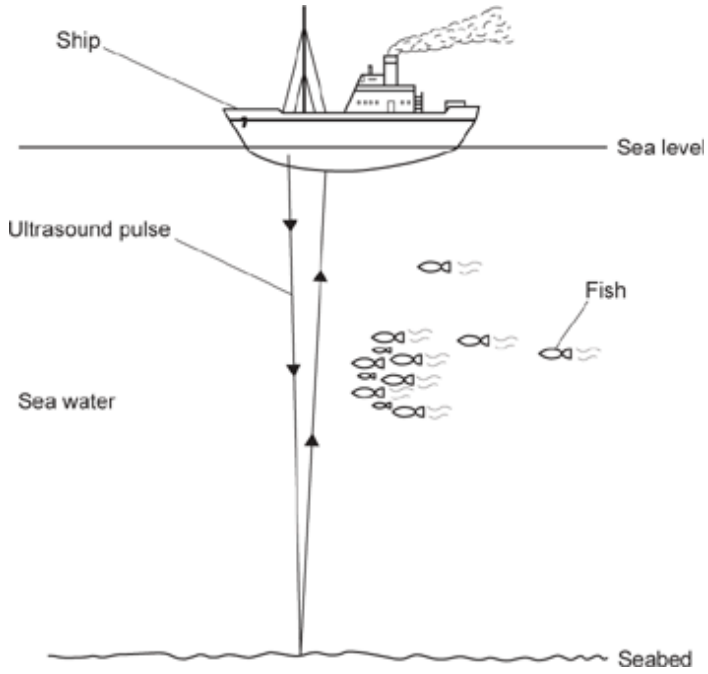


Fig. 16.3

i. Sometimes more than one echo is received by the ship from each ultrasound pulse.

Suggest why.

---

[1]

ii. An ultrasound pulse takes 0.60 s to travel to the seabed and back to the ship.

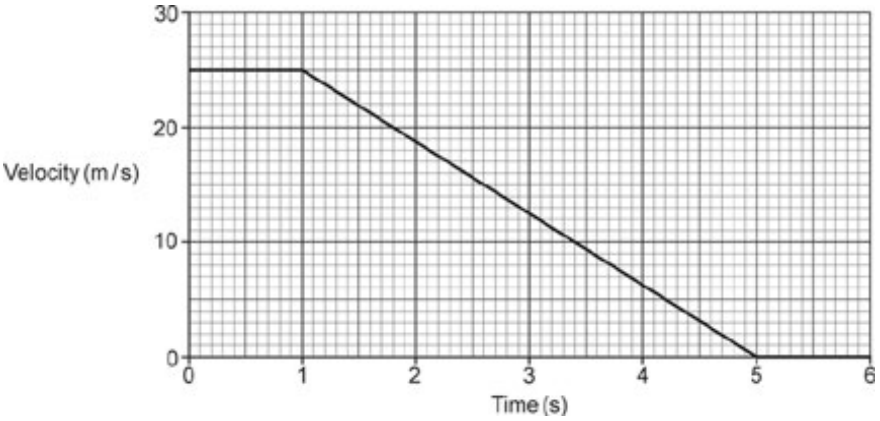
The speed of ultrasound in sea water is 1500 m / s.

Calculate the distance from the ship to the seabed.

Use the equation: distance travelled = speed × time

Distance to the seabed =.....m **[3]**

7. The graph shows how the velocity of a car changes when the driver sees a hazard in the road at time = 0 seconds.

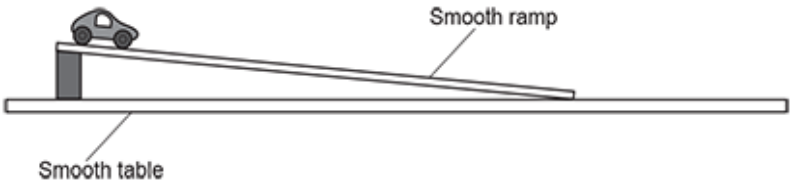


Which statement is correct?

A The driver brakes for 1 second.
B The driver brakes for 5 seconds.
C The driver takes 1 second to react.
D The driver takes 5 seconds to react.

Your answer ☐ **[1]**

8(a). The diagram shows a toy car rolling down a smooth ramp onto a smooth table where it travels at a constant velocity.



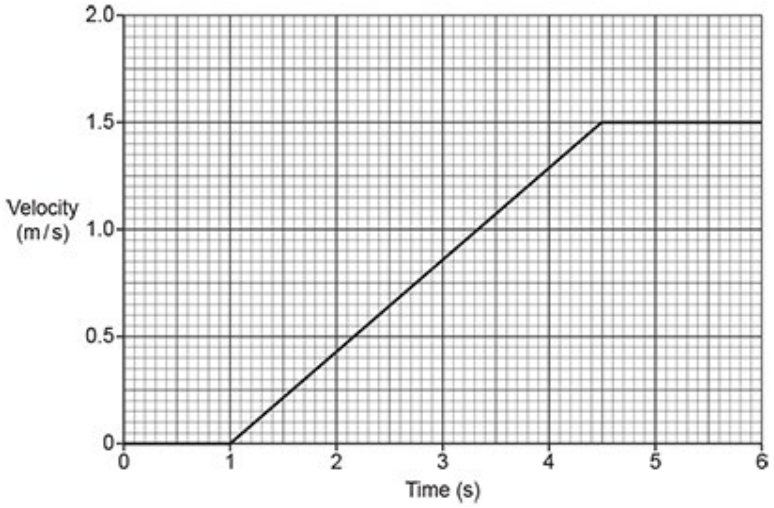
i. Suggest the equipment the student uses to measure the **distance travelled** by the car on the ramp.

---------- **[1]**

ii. Suggest the equipment the student uses to measure the **time** it takes the car to roll down the ramp.

---------- **[1]**

(b). This is the velocity–time graph for the car.



i. State the time the car starts to move.

_____ **[1]**

ii. State the time the car reaches the bottom of the ramp.

_____ **[1]**

iii. Describe how the acceleration of the car will change if the ramp is made steeper.

_____ **[1]**

iv. Draw a line on the graph to show the acceleration of the car if the ramp is made steeper.

[1]

(c). Velocity and speed are different quantities.

Complete the sentence about velocity. Use words from the list.

acceleration	**direction**	**energy**	**force**	**magnitude**

Velocity is a vector quantity because it has ..... and ..... .

[2]

9. The time taken for four students to run a race is recorded.

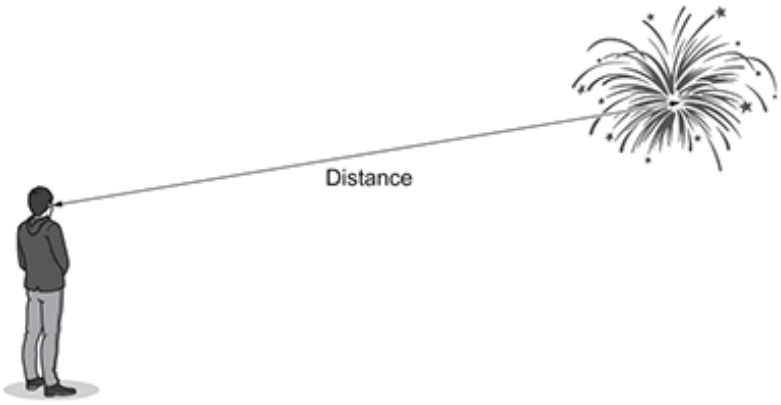
Student	Time taken (s)
1	21.5
2	21.6
3	21.0
4	21.5

What is the mean time taken by the students?

A 16.0 s
B 21.4 s
C 21.5 s
D 85.6 s

Your answer ☐ **[1]**

10(a). A child is watching a firework display.



The child measures the time between seeing and hearing the firework.

The time they measure is 0.42 s.

The speed of sound in air is 330 m / s.

Calculate the distance from the child to the firework.

Give your answer to **2** significant figures.
Use the Data sheet_J249 01/02/03/04, June 2022.

Distance = ... m **[4]**

(b). Explain why the distance calculated above is not the actual distance.

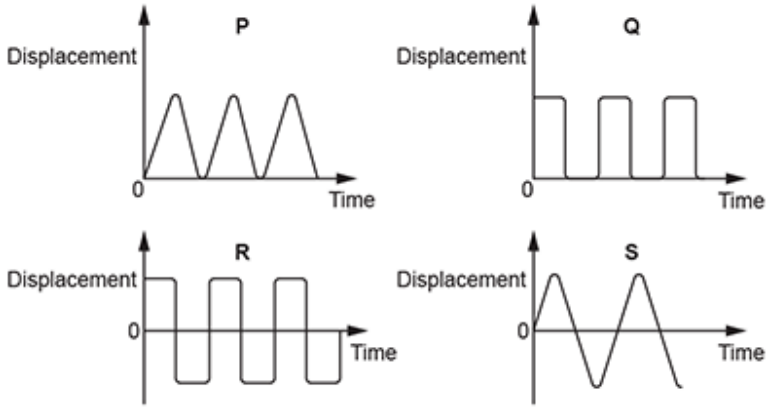
---

[2]

11. The diagram shows a swimmer in a pool.

The swimmer swims from one end of the pool to the other end at a constant speed. They then turn round and swim back at the same constant speed.

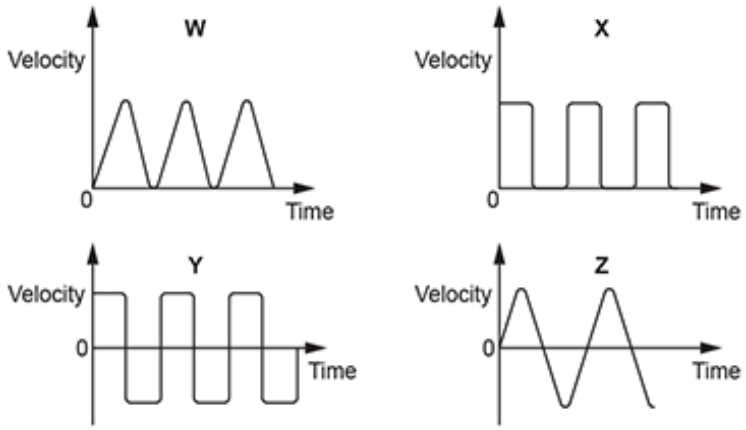
i. Here are 4 displacement–time graphs, **P**, **Q**, **R** and **S**.



Which displacement–time graph shows the swimmer swimming to the end of the pool and back several times?

_____ **[1]**

ii. Here are 4 velocity–time graphs, **W**, **X**, **Y** and **Z**.



Which velocity–time graph shows them swimming to the end of the pool and back several times?

_____ **[1]**

12. A dog has a mass of 10 kg and runs at a speed of 14 m / s.
What is the kinetic energy of the dog?

Use the equation: kinetic energy = 0.5 × mass × (speed)^2

A 70 J
B 196 J
C 980 J
D 1960 J

Your answer ☐ **[1]**

13. A bird flies at an average speed of 5.0 m / s for 240 s.
What is the distance travelled by the bird?

Use the equation: distance travelled = speed × time

A 0.8 m
B 20 m
C 48 m
D 1200 m

Your answer ☐ **[1]**

END OF QUESTION PAPER