

GCSE Physics A (Gateway)

J249/03 Physics A P1-P4 and P9 (Higher Tier)

Question Set 7

1

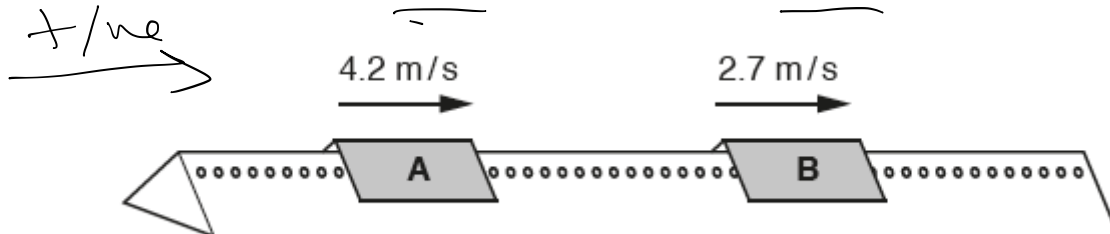
A student investigates collisions of trolleys on a horizontal air track.

- (a) Write down the **two** quantities involved with motion which are conserved during an elastic collision.

1. momentum
2. kinetic energy

[2]

- (b) Trolley **A** has a mass of 2 kg. Trolley **B** has a mass of 2.5 kg.



- (i) Calculate the **momentum** of each trolley.

$$\text{momentum} = \text{mass} \times \text{velocity}$$

Trolley A:

$$\text{momentum} = 2 \times 4.2 = 8.4$$

Trolley B:

$$\text{momentum} = 2.5 \times 2.7 = 6.75 \approx 6.8 \text{ (2sf)}$$

Trolley **A** = 8.4 kg m/s

Trolley **B** = 6.8 kg m/s

[3]

- (ii) The two trolleys collide and stick together after the collision. Use your answers to (b)(i) to calculate the **speed** of the combined trolleys after the collision.

Record your answer to 2 significant figures.

$$\text{Total mass} = 2 + 2.5 = 4.5$$

$$\text{momentum after} = 8.4 + 6.75 = 15.15$$

$$15.15 = 4.5v$$

$$v = 3.36 \approx 3.4 \text{ (2sf)}$$

Answer = 3.4 m/s

[3]

Total Marks for Question Set 7: 8

Equations in physics

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

$$\text{change in thermal energy} = \text{mass} \times \text{specific heat capacity} \times \text{change in temperature}$$

$$\text{thermal energy for a change in state} = \text{mass} \times \text{specific latent heat}$$

$$\text{energy transferred in stretching} = 0.5 \times \text{spring constant} \times (\text{extension})^2$$

$$\text{potential difference across primary coil} \times \text{current in primary coil} = \text{potential difference across secondary coil} \times \text{current in secondary coil}$$

Higher tier only –

$$\text{force on a conductor (at right angles to a magnetic field) carrying a current} = \text{magnetic flux density} \times \text{current} \times \text{length}$$

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