GCSE Physics A (Gateway)

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

Question Set 7

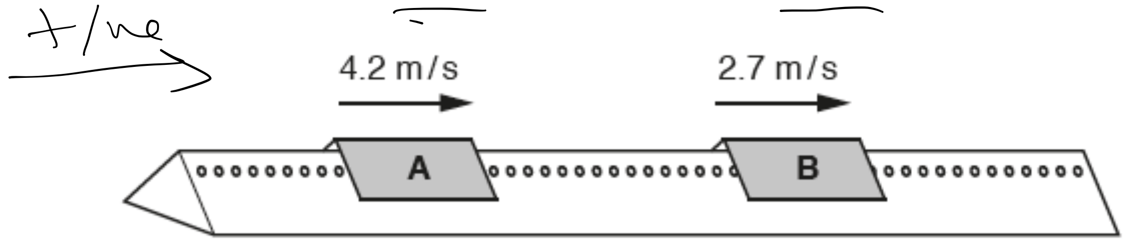
1 A student investigates collisions of trolleys on a horizontal air track.

(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.

momentum = mass × velocity

TROLLEY A:
momentum = 2 × 4.2 = 8.4

TROLLEY B:
momentum = 2.5 × 2.7 = 6.75 ≈ 6.8 (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.

Total mass = 2 + 2.5 = 4.5
momentum after = 8.4 + 6.75 = 15.15

15.15 = 4.5V

V = 3.3̇6 ≈ 3.4 (2sf)

Answer = 3.4 m/s

[3]

Total Marks for Question Set 7: 8

Equations in physics

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

change in thermal energy = mass × specific heat capacity × change in temperature

thermal energy for a change in state = mass × specific latent heat

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

potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil

Higher tier only –

force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × length