Oxford Cambridge and RSA

GCSE Physics A (Gateway)

J249/04 Physics A P5-P8 and P9 (Higher Tier)

Question Set 24

$\frac{d}{s} = t$ 0.375 0.75 1.5

24 The table shows the stopping distances for a car.

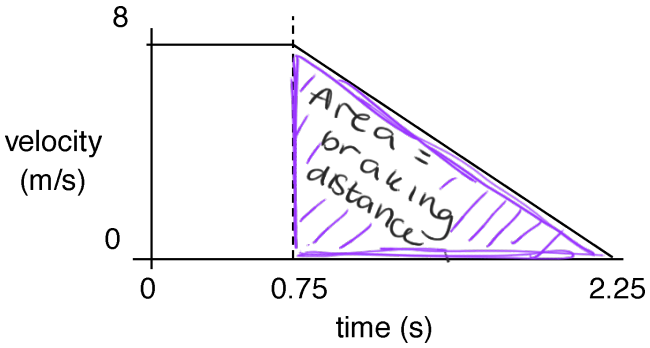
Speed of car (m / s)	Thinking distance (m)	Braking distance (m)	Stopping distance (m)
4	3	1.5	4.5
8	6	6	12
16	12	24	36
32	24	96	120

$\frac{1.5}{4} = 0.375$ ×2 $\frac{6}{8} = 0.75$ ×2 $\frac{24}{16} = 1.5$ ×2 $\frac{x}{32} = 3$

(a) Add the missing results to the table at a speed of 32 m / s. **[2]**

(b) The car takes 6 m to brake when moving at 8 m / s.

Look at the graph of the car as it starts to brake and then stop.



Use the graph to show that the braking distance is 6 m.

$(2.25 - 0.75) \times 8 \times \frac{1}{2}$

$1.5 \times 8 \times \frac{1}{2} = 6$ m

[2]

(c) The formula to work out kinetic energy is:

kinetic energy = 0.5 × mass × (velocity^2)

A car has 30 000 J of energy and a mass of 1 tonne (1 tonne = 1 000 kg).

Calculate the velocity of the car and show your working.

$KE = \frac{1}{2}mv^2$

$\sqrt{\frac{2KE}{m}} = v$

$\sqrt{\frac{2 \times 30,000}{1000}} = v = 2\sqrt{15} = 7.74596...$

$= 7.7$ m/s

Answer = 7.7 (2sf). m/s **[2]**

(d) Cars and lorries have different brakes.

- Brakes absorb the energy of the vehicle before it comes to rest.
- The brakes on lorries have larger brake discs and brake pads than cars.
- Brakes are designed to increased air flow.

Explain why increased air flow is more important for lorries than cars.

Lorries are heavier than cars ∴ have more Kinetic energy ($\frac{1}{2}mv^2$, mass is larger). This means the brakes have to absorb more of the energy of the lorry. This means the brakes need to have any increased air flow, for the lorry to have the same braking distance to a lighter car. ∴ increased air flow is more important for lorries than cars. **[4]**

Total Marks for Question Set 24: 10