

<b>M1.</b>	(a)	(i)	Constant speed	2
		(ii)	Accelerates to higher constant speed	1
	(b)	(i)	Points correct (allow one major or two minor mistakes) Line correct (for their points)	2
		(ii)	5 m/s or 5 <i>gets 2 marks</i>  or correct unit <i>gets 1 mark mark</i>	3
	(c)	(i)	50 s or 50 <i>gets 2 marks</i>  or $t = d/v$ <i>gets 1 mark</i>	3
		(ii)	Line correct (of gradient 4 and spans 30 consecutive seconds)	1
	(d)	(i)	0.04 or 6/15 <i>gets 2 marks</i>  or $a = v/t$ <i>gets 1 mark</i>	3

**[15]**

**M2.** (a) gravitational / gravity / weight  
*do not accept gravitational potential* 1

(b) accelerating  
*accept speed / velocity increases* 1

the distance between the drops increases 1

but the time between the drops is the same  
*accept the time between drops is (always) 5 seconds*  
*accept the drops fall at the same rate* 1

(c) (i) any **one** from:  
• speed / velocity  
• (condition of) brakes / road surface / tyres  
• weather (conditions)  
*accept specific examples, eg wet / icy roads*  
*accept mass / weight of car friction is insufficient*  
*reference to any factor affecting thinking distance negates this answer* 1

(ii) 75 000  
*allow 1 mark for correct substitution, ie  $3000 \times 25$  provided no subsequent step shown*  
*or allow 1 mark for an answer 75 or allow 2 marks for 75 k(+ incorrect unit), eg 75 kN* 2

joules / J

*do **not** accept j  
an answer 75 kJ gains **3** marks  
for full marks the unit and numerical answer must be  
consistent*

1

[8]

**M3.** (a) It will have a constant speed. 1

(b) distance travelled = speed  $\times$  time 1

(c)  $a = \frac{18 - 9}{6}$  1

$a = 1.5$   
*allow 1.5 with no working shown for 2 marks* 1

(d) resultant force = mass  $\times$  acceleration 1

(e)  $F = (1120+80) \times 1.5$  1

$F = 1800$  (N)  
*allow 1800 with no working shown for 2 marks* 1

*accept their  $10.3 \times 1200$  correctly calculated for 2 marks*

(f)  $18^2 - 9^2 = 2 \times 1.5 \times s$  1

$s = 18^2 - 9^2 / 2 \times 1.5$  1

$$s = 81 \text{ (m)}$$

1

*allow 81 (m) with no working shown for 3 marks  
accept answer using their 10.3 (if not 1.5) correctly  
calculated for 3 marks*

(g) **Level 2 (3–4 marks):**

A detailed and coherent explanation is provided. The response makes logical links between clearly identified, relevant points that include references to the numerical factor.

**Level 1 (1–2 marks):**

Simple statements are made. The response may fail to make logical links between the points raised.

**0 marks:**

No relevant content.

**Indicative content**

- doubling speed increase the kinetic energy
- kinetic energy increases by a factor of 4
- work done (by brakes) to stop the car increases
- work done increases by a factor of 4
- work done is force  $\times$  distance and braking force is constant
- so if work done increases by 4 then the braking distance must increase by 4

4

[14]

M4. (a) (i) 20

1

20 000

*either order*

*accept ringed answers in box*

1

(ii) (frequency) above human range  
*accept pitch for frequency*

**or**

(frequency) above 20 000 (Hz)

*do **not** accept outside human range*

*allow ecf from incorrect value in **(a)(i)***

1

(iii) any **one** from:

- pre-natal scanning  
*accept any other appropriate scanning use*  
*do **not** accept pregnancy testing*
- removal / destruction of kidney / gall stones
- repair of damaged tissue / muscle  
*accept examples of repair, eg alleviating bruising, repair scar damage, ligament / tendon damage, joint inflammation*  
*accept physiotherapy*  
*accept curing prostate cancer or killing prostate cancer cells*
- removing plaque from teeth  
*cleaning teeth is insufficient*

1

(b)  $7.5 \times 10^{-4}$  (m)

$1.5 \times 10^3 = 2.0 \times 10^6 \times \lambda$  gains 1 mark

2

(c) for reflected waves

*must be clear whether referring to emitted or detected /  
reflected waves*

*if not specified assume it refers to reflected wave*

any **two** from:

- frequency decreased
- wavelength increased
- intensity has decreased

*allow amplitude / energy has decreased  
allow the beam is weaker*

2

[8]