

M1. (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 3000×25 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 10.3×1200 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) 7.5×10^{-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]