

- M1.** (a) It will have a constant speed. 1
- (b) distance travelled = speed × 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 × acceleration 1
- (e) $F = (1120 + 80) \times 1.5$ 1
- $F = 1800 \text{ (N)}$
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]

M2. (a) (i) kinetic (energy)
allow gravitational potential (energy) / gpe
movement is insufficient 1

(ii) dissipates into the surroundings
allow warms up the surroundings / air / motor
accept lost to the surroundings
accept lost as heat
ignore reference to sound
it is lost is insufficient 1

(b) energy (required) increases with load
accept positive correlation
*do **not** accept (directly) proportional* 1

further amplification eg increases slowly at first (or up to 4 / 5 N), then increases rapidly
simply quoting figures is insufficient
an answer that only describes the shape of the line gains no marks 1

(c) (i) $E = P \times t$
2880
*accept £28.80 for all **3** marks*
*an answer £2880 gains **2** marks*
*allow **1** mark for obtaining 48 h **or** converting to kW*
*allow **2** marks for correct substitution*
ie $4 \times 48 \times 15$
note: this substitution may be shown as two steps
*an answer 2 880 000 gains **2** marks*
*an answer £4.80 / 480 gains **2** marks*
*an answer of 192 (ie calculation of energy without subsequent calculation of cost) gains **1** mark)* 3

- (ii) any sensible suggestion eg
 - conserves fossil fuels
 - less (fossil) fuels burned
 - less pollutant gas (produced)
 - accept a named pollutant gas*
 - less greenhouse gas (produced)
 - saves energy is insufficient*

1

[8]