AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



MARK SCHEME

4.1.1.1 ENERGY STORES AND SYSTEMS (PACK 1)

SCORE	PERCENTAGE
/33	%

STEMUP

These questions belong to AQA, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by AQA. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with AQA and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. AQA has not endorsed, approved or been involved in the production of it. AQA and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

AQA publishes its past papers, mark schemes and examiner reports. Always check the current specification at aqa.org.uk before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Q1.

(a) $E_p = 50 \times 9.8 \times 4.0$

1

$E_p = 1960$ (J)

allow an answer rounded to 2000 (J)

1

*allow a maximum of **1** mark if g = 10 N/kg is used*
*an answer of 1960 scores **2** marks*

(b) $E_k = 0.5 \times 50 \times 7^2$

1

$E_k = 1225$ (J)

allow 1200 or 1230 (J)

1

*an answer of 1225 scores **2** marks*

(c) some energy is wasted

1

the g.p.e of the girl is not zero

1

(d) reduces the amount of friction

*do **not** accept reference to friction between the wheels and the ramp*

1

so more energy is usefully transferred

*allow less energy is wasted **or** less heating*

1

greater kinetic energy

1

[9]

Q2.

(a) either:
7.5 (m) **and** 12.3 (m) from the graph
or
15 (m/s) × 0.32 (s) using speed

allow 7.5 (m) and between 12.2 (m) and 12.4 (m)

1

extra distance = 4.8 (m)

1

*an answer between 4.7 (m) and 4.9 (m) scores **2** marks*

(b) there is a decrease in kinetic energy of the car

allow work is done by friction (on the brakes)

STEMUP.CO.UK

1

so this (causes) the internal / thermal energy store of the brakes to increase

1

(c) $19^2 - u^2 = 2 \times 2 \times 84$

1

$u^2 = 19^2 - (2 \times 2 \times 84)$

1

u = 5 (m/s)

$$u = \sqrt{19^2 - (2 \times 2 \times 84)}$$

1

an answer of 5 (m/s) scores 3 marks

(d) **Level 3:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.

5–6

Level 2: Scientifically relevant facts, events or processes are identified and their relevance is clear. The account is not fully accurate.

3–4

Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.

1–2

No relevant content

0

Indicative content

- use of drugs, alcohol, tiredness and distractions would increase the thinking distance
- thinking distance increases with speed
- thinking distance is directly proportional to speed
- use of drugs, alcohol, tiredness and distractions would increase the gradient of thinking distance

- poor brakes, poor tyres, wet / icy roads and mass would increase the braking distance
- braking distance increases with speed
- braking distance increases at an increasing (accept greater) rate (with speed)
- poor brakes, poor tyres, wet / icy roads and mass would increase the gradient of braking distance
- braking distance is directly proportional to speed squared

- stopping distance = thinking distance + braking distance
- factors that increase thinking and / or braking distance would increase the gradient of stopping distance
- stopping distance increases at an increasing (accept greater) rate (with speed)

[13]

Q3.

STEMUP.CO.UK

(a) 600 kg = 5880 N

1

power = $\frac{5880 \times 35}{45}$

1

= 4573.3 (W)

*this step without the previous steps stated gains **3** marks*

1

% Eff. = $\frac{4573.3}{8000} \times 100$

1

= 57.17 (%)

*allow 57.17 with no working shown for **5** marks*

1

(b) gpe = 600 × 9.8 × 35

1

= 205 800

1

gpe = KE = ½ m v^2

1

$v = \sqrt{\frac{2 \times kE}{m}}$

1

$= \sqrt{\frac{411\,600}{600}}$

1

= 26.2 (m / s)

*allow 26.2 with no working shown for **6** marks*

1

[11]

STEMUP.CO.UK

Q1.

(a) A straightforward calculation with a given equation. Students needed to use the height from the diagram and some did not do this and so only managed to calculate the weight but 83% of students scored both marks.

(b) A slightly more difficult calculation but with a given equation, this question caused a few more problems with the squaring of the speed tripping up a few students but 76% were able to score both marks. A significant number made no attempt.

(c) This multiple choice question about energy transfer proved difficult. A third of students gained both marks and just over a half scored one mark.

(d) This question required an explanation in terms of the forces and the energy transferred. 57% of students scored zero and only a tenth scored more than 1 mark. The concept of energy was not well understood. There were frequent references to generating more energy or increasing gravitational potential energy. Even when the students recognised that the lubrication would reduce friction, they failed to understand what effect this would have.

Q2.

(a) About 30% gained both marks, with fewer than 1% gaining just one mark. There was widespread misreading of the graph, in some cases misreading the scale but in a very large proportion there was little attempt to read between the grid lines.

Those who were successful adopted one of three routes: reading the distance off the graph between the given times; finding the time interval from the data given and reading that off the graph from the origin; using the data from the graph along with distance = speed x time to find the extra distance.

(b) This was not answered well, with many students simply talking about heat energy, and many of those who referred to kinetic energy talking about kinetic energy in the brakes.

Many students overcomplicated their responses to this question. Over three quarters of students gained no marks.

(c) This calculation was fairly well done with just over 42% gaining full marks. There were not many able to score compensation marks and so 40% scored zero.

The major problem was the inability to rearrange the equation, and substitution marks were rare as students were trying to substitute into an incorrect equation. A significant minority divided rather than subtracted when moving v^2 from one side of the equation to the other.

(d) Many students did not grasp that a specific requirement of the question was to include factors that would affect the gradient and only a minority talked about the gradient being altered by factors rather than simply describing the graphs presented.

Lower attaining students described the graphs, often saying that “everyone has stopped by 112 km/h” as this was seen as an end point. Many mentioned factors that would affect each of the distances but the factors were not always attributed to the correct distance. A significant number of students cited factors that affected the

STEMUP.CO.UK

stopping distance in their own right.

Fewer than 6% of responses achieved level three.