Changes in Energy

Mark Scheme

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.1 Energy
Sub-Topic	Changes in Energy
Difficulty Level	Silver Level
Booklet	Mark Scheme

Time Allowed: **20 minutes**

Score: **/19**

Percentage: **/100**

Grade Boundaries:

M1.(a) the store of chemical energy (in the battery) decreases

1

the internal energy of the surrounding air increases.

1

*accept description of energy becoming less usefully stored for **2** marks*

(b) kinetic energy = ½ mass × velocity^2

1

(c) $E_K = ½ \times 0.8 \times 12^2$

1

$E_K = 57.6$ (J)

1

*allow 57.6 (J) without working shown for **2** marks*

(d) lower proportion of wasted energy

accept less energy is wasted

1

higher proportion of energy is converted into kinetic energy

accept more kinetic energy

1

(e) **Level 2 (3–4 marks):**
A relevant and coherent argument which demonstrates processing and numerical analysis of the information presented and draw a conclusion which is logically consistent with the reasoning and refers to payback time for the vehicles.

Level 1 (1–2 marks):
Simple comparisons are made which demonstrate a basic ability to numerically analyse

the information presented. The conclusion, if present, may not be consistent with the calculations.

0 marks:
No relevant content

Indicative content
- The electric car costs £12 000 more to buy
- Running cost of electric car = £3 000
- Running cost of petrol engine car = £24 000
- Total cost of electric car = £30 000
- Total cost of petrol engine car = £39 000
- The electric car cost £1 750 less to run each year
- The electric car will save £9 000
- Additional cost is covered in 6.9 years
- So the electric car will be cheaper over the 12 year lifetime

or

Electric
27000 / 12 = 2250
Annual cost = 2250 + 250 = 2500

Petrol
15000 / 12 = 1250
Annual cost = 1250 + 2000 = 3250

So electric is £750 cheaper per year

4

[11]

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 × 48 × 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]