AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



MARK SCHEME

4.1.1.1 ENERGY STORES AND SYSTEMS (PACK 2)

SCORE	PERCENTAGE
/67	%

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Q1.

(a) chemical

1

kinetic

1

in this order only

(b) $E_k = 0.5 \times 80 \times 12^2$

1

$E_k = 5760$ (J)

1

*an answer of 5760 (J) scores **2** marks*

(c) $E = 0.040 \times 480 \times 50$

1

$E = 960$ (J)

1

*an answer of 960 (J) scores **2** marks*

(d) increased

1

[7]

Q2.

(a) chemical

1

equal to

allow the same as

1

in this order only

(b) $\text{power} = \frac{\text{work done}}{\text{time}}$

allow $P = \frac{W}{t}$

1

(c) $200 = \frac{W}{1800}$

1

$W = 200 \times 1800$

1

$W = 360\,000$ (J)

1

*an answer of 360 000 (J) scores **3** marks*

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(d) 11 − 9.5 = 1.5 (m/s)

allow a change in speed between 1.2 and 1.5 (m/s)

1

$$\left(\frac{1.5}{9.5}\right) \times 100 = 15.8\,(\%)$$

allow an answer consistent with their change in speed
*an answer of 16 (%) scores **2** marks*

1

*an answer that rounds to 15.8 (%) scores **2** marks*

(e) maximum speed is lower

1

because maximum power output of cyclist is constant

allow maximum force on pedals is constant

1

(but) additional work is done (against gravity)

*do **not** accept additional work done against friction or air resistance*

or
gravitational potential energy (of cyclist) is increased

1

[11]

Q3.

(a) risk of electric shock (if someone touched the case)

allow risk of electrocution (if someone touched the case)

1

(b) 2530 = I × 230

this mark may be awarded if P is incorrectly / not converted

1

$$I = \frac{2530}{230}$$

this mark may be awarded if P is incorrectly / not converted

1

I = 11 (A)

this answer only
*an answer of 0.011 (A) scores **2** marks*

1

*an answer of 11 (A) scores **3** marks*

(c) E = 2530 × 14

this mark may be awarded if P is incorrectly / not converted

1

E = 35 420 (J)

this answer only

1

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35 420 = m × 4200 × 70

allow their calculated E = m × 4200 × 70

1

$$m = \frac{35\,420}{4200 \times 70}$$

allow $m = \frac{\text{their calculated } E}{4200 \times 70}$

1

m = 0.12 (kg)

allow an answer that is consistent with their calculated value of E

1

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Q4.

(a) $1.2 = \frac{m}{2.3 \times 10^4}$

1

m = 1.2 × 2.3 × 10^4

1

m = 27 600 (kg)

allow an answer of 28 000 (kg) or 2.8 × 10^4 (kg)

or

m = 2.76 × 10^4 (kg)

1

*an answer of 27 600 (kg) scores **3** marks*

(b) mass of air passing the turbine blades is halved which decreases kinetic energy by a factor of two

1

(wind speed is halved) decreasing kinetic energy by a factor of four

1

so kinetic energy decreases by a factor of eight

1

allow power output for kinetic energy throughout

(c) 388 000 = 0.5 × 13 800 × v^2

this mark may be awarded if P is incorrectly / not converted

1

$$v^2 = \frac{(2 \times 388\,000)}{13\,800}$$

this mark may be awarded if P is incorrectly / not converted

or

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$$v^2 = \frac{388\,000}{(0.5 \times 13\,800)}$$

or

$v^2 = 56.2$

1

$v = 7.50$ (m/s)

an answer that rounds to 7.50 (m/s) only

1

[9]

Q5.

(a) uniform acceleration

allow constant / steady acceleration
allow velocity / speed increasing at a constant rate
ignore reference to direction
*acceleration scores **1** mark*
or
*velocity / speed is increasing scores **1** mark*
*do **not** accept acceleration increases*

2

(b) up(wards)

1

(c) a group of objects that interact

1

(d) velocity just after bounce is less than just before bounce

allow velocity is less / decreases
velocity decreases to zero − on its own scores zero

or

the height at the top of the bounce is less than the height from which it was dropped

1

so the ball has lost energy

1

correct reference to (loss of) ke or (reduced) gpe

1

total energy of ball and Earth / ground is constant

allow 'a system' for ball and Earth
allow energy is conserved

1

[8]

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Q6.

(a) gravitational potential

1

kinetic

1

chemical

1

(b) flying drones may damage aircraft
or
falling drones may injure people
or
damage buildings / vehicles

allow any sensible suggestion of a hazard caused by a flying / falling drone

1

(c) energy transferred = power × time

allow E = Pt

1

(d) t = 25 × 60 = 1500 (s)

1

E = 65 × 1500

1

E = 97 500 (J)

an answer of 97 500 (J) scores 3 marks

allow 2 marks for an answer of 1625 (J)

1

[8]

Q7.

(a) any **two** from:

- bungee rope may snap
- rope may extend too much
- student may land in the river

2

(b) gravitational potential

correct order only

1

kinetic

1

elastic potential

1

(c) ½ × 40 × 35^2

1

24 500 (J)

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accept 25 000 (J) (2 significant figures)

1

*allow 24 500 (J) with no working shown for **2** marks*

[7]

Q8.

(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

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less pollutant gas (produced)

accept a named pollutant gas

less greenhouse gas (produced)

saves energy is insufficient

1

[8]

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