AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



MARK SCHEME

4.1.1.4 POWER

SCORE	PERCENTAGE
/98	%

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Q1.

(a) higher

1

(b) low(er)

1

hot(ter)

allow warm(er)

1

(c) advantage:

- water heated continuously (by the Sun)

1

one disadvantage from:

- temperature of water is lower (for most of the time than water heated by immersion heater)
- water may not be hot enough

allow less control over water temperature

- it takes longer to heat the water

1

(d) $\frac{4\,030\,000}{4\,070\,000}$

1

0.99

*an answer of 99% scores **2** marks*
*an answer of 99 or 0.99% scores **1** mark*

1

*an answer of 0.99 scores **2** marks*
*allow an answer that rounds to 0.99 for **2** marks*

(e) power = energy transferred / time

allow P = E / t

1

(f) $5000 = \frac{4\,070\,000}{t}$

1

$t = \frac{4\,070\,000}{5000}$

1

t = 814

1

seconds

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other units of time must be consistent with numerical value

1

*an answer of 814 seconds scores **4** marks*
*an answer of 13.57 minutes scores **4** marks*

[12]

Q2.

(a) $P = \frac{120\,000}{8.0}$

1

P = 15 000 (W)

1

*an answer of 15 000 (W) scores **2** marks*

(b) energy is transferred in heating the surroundings

1

friction causes energy to be transferred in non-useful ways

1

(c) the switches are in parallel

1

(so) closing either switch completes the circuit

1

(d) gravitational potential energy = mass × gravitational field strength × height
allow $E_p = m\ g\ h$

1

(e) $E_p = 280 \times 9.8 \times 14$

1

$E_p = 38\,416$ (J)

1

$E_p = 38\,000$ (J)
*an answer that rounds to 38 000 scores **2** marks*

1

*an answer of 38 000 scores **3** marks*

[10]

Q3.

(a) chemical

1

equal to
allow the same as

1

in this order only

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

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

1

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

1

W = 200 × 1800

1

W = 360 000 (J)

1

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

(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

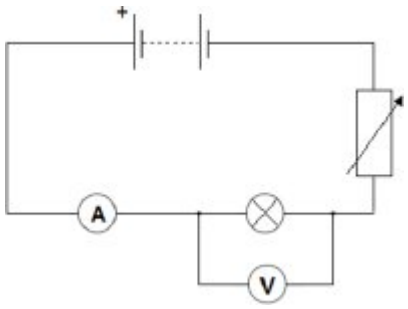
1

[11]

Q4.

(a)

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battery in series with bulb and ammeter

1

voltmeter in parallel with bulb

1

variable resistor
or
variable power pack
or
potentiometer

1

(b) A is brighter because it has a higher current (than lamp B at any p.d.)

1

(therefore A has a) higher power output (than bulb B)
accept higher energy output per second

1

(c) lower current (than lamp A) for the same potential difference
accept answer in terms of $R = V / I$

1

lower gradient (than lamp A)

1

(d) 0 – 2 Volts
allow a range from 0 V up to any value between 1 and 2 V.

1

(for an ohmic conductor) current is directly proportional to potential difference
allow lines (of best fit) are straight and pass through the origin

1

(so) resistance is constant

1

[10]

Q5.

(a) (i) high levels of infrared radiation (from the Sun)
allow lots of (solar) energy (available)
*do **not** accept 'heat' for infrared*
'it is hot' is insufficient
'lots of sunlight' is insufficient

1

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(ii) reflected

1

(iii) boiler

correct order only

1

turbine

1

transformer

1

(b) 2 100 000 (kWh)

*allow **1** mark for correct substitution i.e. 140 000 × 15 provided no subsequent step*

2

(c) (i) only 1 wind turbine was considered

accept only one location is considered

1

or

other wind turbines may have generated more electricity

accept insufficient sample size

only 1 week's weather was reported on

or

wind speed varies from one week to another

'wind speed varies' is insufficient

1

(ii) any **one** from:

- wind speed is too high / low

  allow no wind

  allow too windy
- wind is unreliable.

  allow wind is variable

1

(iii) any **one** from:

- wind is a renewable energy source
- do not use fuel
- energy source is free
- do not release carbon dioxide
- do not release greenhouse gases
- do not release sulfur dioxide
- do not cause acid rain
- do not cause climate change
- do not cause global warming
- do not cause global dimming.

answer must be an advantage of wind, converse answers in terms of fossil fuels are insufficient

accept do not release pollutant gases

'no pollution' is insufficient

1

[11]

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Q6.

(a) (i) infrared (radiation)

accept IR (radiation)

1

(ii) (heated) water turns to steam

ignore reference to fossil fuels

*do **not** accept water evaporates to steam*

1

steam turns a turbine

1

turbine turns a generator

accept turbine connected to a generator

1

(b) (i) (so the molten salts) can store large amounts of energy

accept there is a small temperature change for a large energy transfer

accept heat for energy

1

(ii) 16 (hours)

*an answer that rounds to 16 gains **2** marks eg 15.71*

*allow **1** mark for a correct substitution ie 2 200 000 = 140 000 × t*

3

(iii) the number of daylight hours varies

less sunlight is insufficient

1

the (mean) power (received from the Sun per square metre) varies

*accept an answer in terms of maximum possible electrical output only possible during Summer for **1** mark*

1

(c) (i) non-renewable power stations have higher Capacity Factors than renewable power stations

1

fuel (for non-renewable power stations) is always available

reference to non-renewable power stations operating all the time is insufficient

non-renewable energy sources are reliable is insufficient

1

(most) renewable energy sources are unpredictable / unreliable

accept (most) renewable energy sources depend on the weather

1

(ii) the (proportion of) time that solar storage power stations can generate electricity is greater (than for other renewable energy sources)

1

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[14]

Q7.

(a) (i) 150

1

(ii) transferred to the surroundings by heating

reference to sound negates mark

1

(iii) 0.75

*450 / 600 gains **1** mark*
*accept 75% for **2** marks*
*maximum of **1** mark awarded if a unit is given*

2

(iv) 20 (s)

*correct answer with or without working gains **2** marks*
*correct substitution of 600 / 30 gains **1** mark*

2

(b) (i) to avoid bias

1

(ii) use less power and last longer

1

1 LED costs £16, 40 filament bulbs cost £80

or

filament costs (5 times) more in energy consumption

1

(iii) any **one** from:

- availability of bulbs
- colour output
- temperature of bulb surface

1

[10]

Q8.

(a) potential

1

(b) (i) 13 200

*allow **1** mark for correct substitution, ie 660 × 20 provided no subsequent step shown*

2

(ii) 16.5

allow 1 mark for correct

or

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$\frac{\text{their (b)(i)}}{800}$ correctly calculated

substitution, ie $\frac{13\,200}{800}$ ***or*** $\frac{\text{their (b)(i)}}{800}$

provided no subsequent step shown

2

[5]

Q9.

(a) (i) 24

*allow **1** mark for converting time to 600 seconds*

***or** showing method ie 14400/10*

$\frac{14400}{10 \times 60}$

***or** provided no further steps shown*

2

(ii) 24

ignore any unit

or

their (a)(i)

1

(b) (i) 20 45

***both** required – either order*

1

(ii) the block transfers energy to the surroundings

1

[5]

Q10.

(a) (i) 720

*allow **1** mark for correct substitution,*

ie 72 × 10 provided no subsequent step shown

2

(ii) 720

or

their (a)(i)

1

(b) (i) gravitational potential

allow gravitational

allow potential

1

(ii) 432

*allow **1** mark for correct substitution, ie* $\frac{21600}{50}$ *provided no subsequent step shown*

2

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watt / W

1

[7]

Q11.

(a) 1 080 000

*allow **1** mark for correct substitution*
ie ½ × 15 000 × 12 × 12

2

(b) any **one** from:

- KE (of wind) more than doubles
- mass of air (hitting blades) more than doubles
- area swept out by blades more than doubles
  *do **not** accept blades are larger / have a bigger area*
- area swept out by blades increases × 4

1

[3]

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