AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



MARK SCHEME

4.2.4 ENERGY TRANSFERS (PACK 2)

SCORE	PERCENTAGE
/153	%

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Mark schemes

Q1.

(a) electric current
(rate of) flow of (electric) charge / electrons

accept $I = \frac{Q}{t}$

with Q and t correctly named

1

potential difference
work done / energy transferred per coulomb of charge
(that passes between two points in a circuit)

accept $V = \frac{W}{Q}$

with W and Q correctly named

1

(b) metals contain free electrons (and ions)

accept mobile for free

1

as temperature of filament increases ions vibrate faster /
with a bigger amplitude

accept atoms for ions

accept ions/atoms gain energy

accept vibrate more for vibrate faster

do not accept start to vibrate

1

electrons collide more (frequently) with the ions
or
(drift) velocity of electrons decreases

do not accept start to collide

*accept increasing the p.d. increases the temperature (**1** mark)*

and

*(and) resistance increases with temperature (**1** mark) if no other marks scored*

1

(c) 7.8

*allow **1** mark for obtaining value 1.3 from graph*

***or** allow **1** mark for a correct calculation using an incorrect current in the range 1.2-1.6 inclusive*

2

[7]

Q2.

Fan C

1

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Kettle B

1

Lamp D

1

Radio E

1

[4]

Q3.

(a) (i) 7.6

*allow **1** mark for correct substitution and / or transformation*

ie $0.95 = \frac{x}{8}$

95 × 8.0

2

(ii) 25 (hours)

*allow **1** mark for obtaining number of kWh = 200*

an answer of 26(.3) gains both marks

2

(b) any **two** from

- transferred to the surroundings / air / atmosphere
- becomes spread out
- shared between (many) molecules
- (wasted as) heat / sound

2

[6]

Q4.

(a) radio

radio must be chosen for reason to score

1

gives out sound

inclusion of other forms of energy negates mark

or

others give out heat / thermal energy

1

(b) Kettle

accept 2.5 (kW)

1

(c) 60 (p)

accept £0.6(0)

*allow **1** mark for correct substitution ie 4 × 15*

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substitution only scores if no subsequent step shown
*£60 scores **1** mark*

2

(d) (bigger volume) takes more time (to boil)
accept explanation using data from graph

1

(so) more energy transferred
*do **not** accept electricity for energy*

1

(and) this costs more money
ignore references to cost of water

1

[8]

Q5.

(a) transferred to surroundings / surrounding molecules / atmosphere
'it escapes' is insufficient
or
becomes dissipated / spread out
accept warms the surroundings
accept degraded / diluted
accept a correct description for surroundings eg to the washing machine
*do **not** accept transformed into heat on its own*

1

(b) a smaller <u>proportion / percentage</u> of the energy supplied is wasted
owtte
*accept a statement such as 'less energy is wasted' for **1** mark*
*do **not** accept costs less to run*
ignore references to uses less energy

2

(c) (i) 2.4 (p)
accept 2 p if it is clear from the working out this is rounded from 2.4 p
*allow **1** mark for correct substitution of correct values*
ie 0.2 × 12
*allow **1** mark for calculating cost at 40 °C (13.2 p)*
or
cost at 30 °C (10.8 p)

2

(ii) any **one** from:

- less electricity needed
ignore answers in terms of the washing machine releasing less energy

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an answer in terms of the washing machine releasing CO_2

negates the mark

*do **not** accept less energy is produced*

- fewer power stations needed
- less fuel is burned

  accept a correctly named fuel

  *do **not** accept less fuel is needed*

1

[6]

Q6.

(a) each hair gains the same (type of) charge

or

(each) hair is negatively charged

*do **not** accept hair becomes positively charged*

or

(each) hair gains electrons

1

similar charges repel

accept positive charges repel

providing first marking point is in terms of positive charge

or

negative charges repel

or

electrons repel

1

(b) 0.000002

*accept correct substitution and transformation for **1** mark*

or

2×10^{-6}

ie 30 / 15 or .03 / 15000 or 30 / 15000 or .03 / 15

or

2 μ C

*answers 2 and 0.002 gain **1** mark*

2

(c) current

*do **not** accept amp / amperes*

1

[5]

Q7.

(a) (i) 2(.0)

accept 2000 W or 2000 watt(s)

accept answer given in table

*do **not** accept 2000*

1

(ii) 4.5

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*allow **1** mark for correct substitution*
ie 1.5 × 3
*allow **1** mark for the answers 1.5 or 6(.0)*

2

(iii) 54
or
their (a)(ii) × 12 correctly calculated
*allow **1** mark for correct substitution*
ie 4.5 × 12
or
their (a)(ii) × 12
*allow **1** mark if correct answer is given in pounds eg £54*

2

(b) (i) 6 pm

1

temperature starts to rise faster
only scores if 6 pm given

or
graph (line) is steeper / steepest
it refers to graph gradient or temperature
accept answers in terms of relative temperature rise
eg 5 to 6 pm 2 °C rise, 6 to 7 pm 6 °C rise
accept temperature rises sharply / rapidly / quickly
*do **not** accept temperature starts to rise*

1

(ii) middle box ticked

1

[8]

Q8.

(a) electrical

1

sound
correct order only

1

(b) the energy transformed by the TV will be destroyed

1

(c) a higher efficiency than

1

[4]

Q9.

(a) 32,400,00 J
*allow **1** mark for correct substitution*
3.24 × 10^7 J

2

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(b) (3kW) fan heater

accept 3kW
accept the middle one

1

(c)

features common to more than one heater, treat as neutral

<u>oil-filled</u>

low level heat

cannot be knocked over / space saving / no trailing wires

*do **not** accept just wall-mounted*

or more control over heat output

*do **not** accept just 3 heat settings*

1

<u>fan</u>

warms (office) rapidly **or** can be used to cool air (in summer)

accept can be used as a fan
accept cool air fan (setting)
accept 'it has a cool air setting in case it gets too hot'
*do **not** accept a specific reference to cooling the heater*

1

<u>ceramic</u>

can be switched on for set periods of time

*do **not** accept just has a timer*

or can be switched on before office is used / switched off automatically at night

1

[6]

Q10.

(a) (i) France

1

(ii) any **one** from:

- different homes have different appliances(*)
- different homes have different numbers of appliances(*)
  (*) accept all homes are different
- standby power not the same for all appliances
- some people will switch appliances off
  accept named appliances
  accept people waste different amounts of energy
- homes have different numbers of residents

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- can't measure every (individual) home

accept any sensible suggestions
*do **not** accept answers in terms of accurate / precise etc*

1

(b) (i) increases amount of energy wasted

accept (encourages) people to leave appliances on (standby)
accept increases it

1

(ii) any **two** from:

- less electricity needed / generated
- fewer power stations needed
- less coal is burned

*do **not** accept coal is non-renewable / running out*
answers in terms of fuel stocks neutral

- less pollutant gases produced

accept named gases
accept harmful for pollutant
accept greenhouse gases
accept reduce / slow / stop global warming
accept reduces acid rain

2

(c) joule

1

(d) (i) 6800

*accept £68 for **3** marks an answer of 68 gains **2** marks*
*allow **2** marks for correct substitution ie 400 × 17*
*allow **1** mark for obtaining 400*
*answers of 7480, 4760, 12920, 4080 gain **2** marks*

3

(ii) a small . . . . . electricity

1

[10]

Q11.

(a) (i) 0.6

accept 60 %
*allow **1** mark for useful energy = 480*
*answer 0.6 with any unit or 60 gains **1** mark only*

2

(ii) transferred to surroundings

accept goes into the air
accept heats the surroundings up
accept gets spread out
accept transferred into heat (only)

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*do **not** accept wasted / lost unless qualified*
destroyed negates mark
transferred into light / sound negates mark

1

(b) (i) 1.75

*allow **1** mark for converting to kW*

*answers of 0.7, 0.525, 0.35, 0.875, 1.05, 5.25 gains **1** mark*
*answers of 1750 or 17.5 gains **1** mark*

2

(ii) 21p or £0.21 or their (b)(i) × 12

1

(c) any **two** from:

- (more) electricity needs to be generated
  (more) electricity is being used
- (more) power stations needed
- (more) fossil fuels burnt
  accept named fossil fuel
- (more) pollutant gases emitted
  accept named gas
  accept harmful for pollutant
  accept greenhouse gases
  accept atmospheric pollution
  accept answer in terms of any form of electricity generation and an associated environmental problem

2

[8]

Q12.

(a) electric drill **C**

1

MP3 player **E**

1

toaster **B**

1

(b) (i) 2100

no unit required / ignore units
accept 2.1 kW must have units for this

1

(ii) **Y**

1

(iii) bar drawn with any height greater than **Y**

ignore width of bar

1

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(c) (i) any **one** from:

answers must be a comparison

- holds more water
  *do **not** accept 1 litre of water on its own*
- works in other countries
  accept a named country
  accept works at 2 voltages
- boils faster
- has a more powerful element
  *do **not** accept 1 kW element on its own*
- can filter water

ignore can wash filter

1

(ii) any **one** from:

- it weighs less
- smaller to pack
- cheaper to use
  answers must be a comparison
  ***or** state why the chosen feature is an advantage*
  accept boils enough for one drink

1

[8]

Q13.

(a) £15

*allow **1** mark for use of 125 (kWh)*
*allow **1** mark for an answer 1500*
*allow **both** marks for 1500 pence / p*
*allow **1** mark for correct calculation of annual cost for either freezer (£27 and £42)*

2

(b) £45

or their (a) × 3

*allow **1** mark for correct use of 3*
*allow **1** mark for 12 – 9 = 3*

2

(c) any **two** from:

the marks are for the explanation

yes **plus** explanation

- less electricity / energy needed / used

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accept less energy wasted

- less (fossil) fuels burned

  accept a named fossil fuel
  *do **not** accept conserving (fossil) fuels*

- less polluting gases emitted

  accept a named polluting gas / greenhouse gases / carbon emissions / reduce global warming
  accept an answer in terms of nuclear fuel
  eg less nuclear fuel required (1)
  less nuclear waste (1)

2

or no **plus** explanation

- old freezer must be disposed of
- hazardous chemicals inside freezer

  accept CFC gases

- *(*lot of*)* energy used in producing new freezer

[6]

Q14.

(a) £19.20

*allow **1** mark for correct substitution*
ie 160 × 12
*allow **1** mark for an answer (£)1920*
*an answer of 1920p gains **both** marks*
*an answer of £40.80 gains **both** marks*
*allow **1** mark for 340 × 12*

2

(b) 340

*allow **1** mark for correctly using the reading 62580*
ie 62920 − 62580
*accept £40.80 for **both** marks*

2

[4]

Q15.

(a) iron

1

hairdryer

1

kettle

answers can be in any order

1

(b) sound

1

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(c) is more efficient than

1

[5]

Q16.

(a) kinetic

accept movement

1

(b) (i) 3 (kWh)

allow 1 mark for selecting the correct information

1

(ii) transfers more energy

accept transform or use for transfer

accept electricity for energy

*allow higher (average) power **and** switched on for more time*

2

(iii) any **one** from:

- use the internet
- brochures
- reading adverts
- visiting shops
- recommendation from friends / plumbers

1

[5]

Q17.

(a) (i) heat

1

(ii) temperature increases **or** (cause) convection (currents)

accept gets warmer
accept gets hotter

1

(iii) 60% **or** 0.6

60 without % scores 1 mark
0.6 with a unit scores 1 mark
60 with incorrect unit scores 1 mark

or correct substitution $\frac{120}{200}$

for 1 mark

2

(b) street

1

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more (energy transferred as) light or less (energy transferred as) heat or useful energy output the highest

can only score this mark if first mark scored

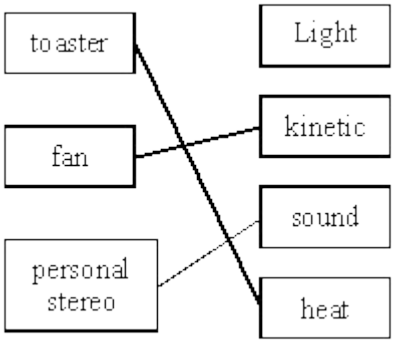
all efficiencies calculated correctly score 2nd mark point

1

[6]

Q18.

(a) each correct line scores 1 mark



if more than 3 lines are drawn mark incorrect ones first, to a maximum of 3 lines

3

(b) toaster

accept 1.2 kW

1

(c) (i) 400

1

(ii) £24 or 2400p

full credit for their (c)(i) × 6p for full credit the correct numerical answer must have the correct unit
an answer of 24 or 2400 with no unit or the incorrect unit scores 1 mark

(c)(i) × 6 incorrectly evaluated scores 1 mark

2

(d) 6

allow 6000 for 1 mark

allow 3 × 2 for 1 mark

2

[9]

Q19.

(a) (i) any **one** from:

water to the mug
water to the air
mug to the air
mug to the table

***both** required*

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direction of transfer must be correct

1

(ii) when <u>temperatures</u> are the same

accept a specific example eg when the <u>temperature</u> of the water and mug are the same

accept radiant heat transfer will never stop

1

(b) wood

1

(c) (i) conduction

accept convection if not given as 3rd answer

1

insulator

1

(ii) any **one** from:

*do **not** accept any rebuilding of house*

double glazing

loft insulation

accept roof for loft

1

carpets

(cavity) wall insulation

*do **not** accept closing doors and windows*

draft excluders

foil behind radiators

accept blocking chimney

paint inside walls white

[6]

Q20.

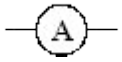
(a) (i) electrons

1

(ii) ammeter

*do **not** accept ampmeter*

1



***must** be capital A*
horizontal lines not required no e.c.f.

1

(b) light bulb

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answers in either order

1

hairdryer

1

[5]

Q21.

(a) Sun
Any valid

for 1 mark each

2

(b) From electric/pe or chemical in battery

for 1 mark

to ke, light, sound, heat

3 for 1 mark each

4

(c) Gravitational pe OR just pe
For any gravity feed
OR Elastic pe
any valid
OR Food
For maintaining body/life etc.
OR Any descriptive answer
e.g. water in a high lake used to produce hydroelectric power

2 for 1 mark each

2

[8]

Q22.

(a) (i) …….. light …… electrical

2

for 1 mark each

(ii) …….. electrical……chemical

for 1 mark each

2

(iii) …….. electrical ….. kinetic

for 1 mark each

2

(b) (i) 1500 / 10

gains 1 mark

1

but
150

gains 2 marks

1

(ii) heat (thermal) or sound

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for 1 mark

1

[9]

Q23.

(a) **Using wind (advantage)**

any **one** from

can be used in remote locations

renewable

clean

accept does not cause pollution to the air / land

1

Using wind (disadvantage)

any **one** from

does not generate much (electrical) energy
many hundreds wind turbines would be needed

*accept many hundreds wind turbines would be needed **or** too much land would be needed for wind farms **or** wind energy is 'dilute'*

the wind is unreliable

*accept the wind does not blow all of the time **or** the wind is not always strong enough*

noise / visual pollution

*do **not** accept just the word pollution*

1

Using coal (advantage)

any **one** from

can generate electricity all of the time

accept reliable electrical / energy supply

generates a lot of (electrical) energy

1

Using coal (disadvantage)

any **one** from

pollution by carbon dioxide / greenhouse gas

*accept slow start-up time **or** production of ash **or** difficult to transport (coal) **or** there's not much coal left*

non renewable

pollution by sulphur dioxide acid rain

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1

(b) all link lines correct

accept one link line correct for one mark

2

[6]

Q24.

(a) changes the sound wave(s)

to a varying **or** changing (electric) potential difference **or** p.d. **or** voltage **or** current **or** to an irregular alternating current or a.c. **or** transfers sound energy to electrical energy (1) mark is vibrations **or** pulses **or** of sound **or** in air become electrical waves

*do not credit just 'to electricity' **or** 'to a.c'*

2

(b) (i) decrease **or** reduce the amplitude

accept less amplitude nothing else added

1

(ii) increase the frequency **or** decrease wavelength

accept higher frequency nothing else added

1

[4]

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