AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



MARK SCHEME

4.3.2.1 INTERNAL ENERGY (PACK 2)

SCORE	PERCENTAGE
/121	%

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Q1.

(a) the outside colour of the cans

1

(b) (i) 18 (°C) **or** 88 to 70

ignore negative sign

1

(ii) 8 (°C) **or** 70 to 62

ignore negative sign

1

(c) greater temperature difference between water and surroundings (at start)

must mention temperature difference
ignore just water hotter
accept energy used to heat cans initially

1

(d) black

1

temperature falls the fastest (in L)

accept (can L) loses more heat / cools quicker
accept heat for temperature

1

black is a good / the best / better emitter (of heat / radiation)

accept converse
ignore black is best absorber

1

[7]

Q2.

(a) air is (a good) insulator

1

or air is a poor conductor

accept air cavity / 'it' for air

reducing heat transfer by <u>conduction</u>

accept stops for reduces
ignore convection
*do **not** accept radiation*
*do **not** accept answers in terms of heat being trapped*

1

(b) (i) most cost effective

accept it is cheaper or low<u>est</u> cost
accept shortest payback time
accept in terms of reducing heat loss by the largest amount

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*do **not** accept it is easier*
ignore most heat is lost through the roof

1

(ii) 4

1

[4]

Q3.

(a) ions / electrons gain (kinetic) energy

accept atom / particles / molecules for ion
accept ions vibrate faster
accept ions vibrate with a bigger amplitude
accept ions vibrate more
do not accept ions move faster

1

(free) electrons transfer energy by collision with ions
or energy transferred by collisions between vibrating ions

1

(b) move faster or take up more space

*do **not** accept start to move / vibrate*

1

(warmer) water expands **or** becomes less dense (than cooler water)

*do **not** accept answers in terms of particles expanding*

1

warm water rises (through colder water) **or** colder water falls to take its place

1

(c) transfer of energy by waves / infrared (radiation)

accept rays for waves
*do **not** accept transfer of energy by electromagnetic waves*
ignore reference to heat

1

[6]

Q4.

(a) (i) vacuum

do not allow stopper

1

(ii) (absence of particles) means no (transfer of energy between) particles for conduction

*accept particles **or** atoms **or** molecules **or** electrons*

1

no movement of molecules for (transfer of energy by) convection

accept particles/atoms/electrons
if answer to (a)(i) is correct: then in (a)(ii) have stated 'conduction and convection both need a medium/particles/materials' = 2 marks

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(If medium is specified, it must be correct, conduction can be solid, liquid or gas, convection must be liquid or gas)

if answer to (a)(i) is incorrect then in (a)(ii) have stated 'conduction and convection both need a medium...'= 1 mark, unless further qualified by stating about absence of particles, in which case get a second mark.

1

(b) (i) silvered surface

accept silver surface

1

(ii) silvered is a bad emitter/radiator

1

surface reflects heat/energy/radiation (at inner and outer surface) **or** is a bad absorber (of energy)

accept bounces off

1

[6]

Q5.

(i) conduction, convection

answer can be in either order

1

(ii) traps (lots of) air

*do **not** accept heat is trapped in the fibre*

1

air is a (good) insulator **or** poor conductor

1

[3]

Q6.

(i) radiation **or** infra red

*do **not** accept rays*

*do **not** accept waves*

accept electromagnetic waves

1

(ii) good absorber (of heat) to absorb heat (**or** infrared)

*do **not** accept 'attract' **or** 'capture' **or** soak*

1

(iii) reduce heat loss (from the panel)

accept (good) (heat) insulator

*accept stop **or** reduce conduction*

*accept stop **or** reduce convection*

accept traps heat

accept keeps water hot

1

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(iv) to reflect (back into the panel) heat **or** infrared **or** Sun's energy

*do **not** accept 'bouncing'*

*do **not** accept reflect Sun*

*do **not** accept reflect sunlight **or** sun's rays*

1

radiated **or** given out by the (black) pipe

accept back to pipe
accept reduce heat loss for 1 mark
accept reduce heat loss by radiation for 2 marks
accept stop heat loss by radiation for I mark

1

[5]

Q7.

(a) (i) convection current correctly shown with arrows extending to above insulation label line

circulation must show water rising in the left half of the tank
*accept continuous **or** broken arrows **must** be at least **one** arrow up and **one** arrow down*

*allow **1** mark for correct diagram which does not extend high enough*

2

(ii) it expands or it gets less dense

*do **not** allow hot water rises*

*do **not** accept explanation in terms of molecules expanding **or** changing density*

*do **not** accept lighter **or** heavier*

1

more dense water falls

allow cold water falls if qualified with a suitable reason

1

(b) (i) reflects heat back into the room **or** where it came from

accept infrared or radiation or energy for heat

accept bounce for reflect if in correct context

1

(ii) air is a (good) insulator or poor conductor **or** air stops conduction

*do **not** accept plastic foam is a good insulator **or** bad conductor*

1

air is trapped

1

convection loss reduced or stopped

1

(c) **two** out of the following three:

any answer which gains credit must contain a comparison

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rate of evaporation decreases

*accept less sweat can evaporate **or** evaporation is more difficult*

less heat energy removed from the body

higher *humidity* the less water vapour can be absorbed (into the air)

accept sweat for water vapour

*do **not** credit description of high humidity*

accept a correct answer in terms of dynamic equilibrium

2

[10]

Q8.

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

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

***both** required*

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

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foil behind radiators

accept blocking chimney

paint inside walls white

[6]

Q9.

(a) plastic/glass walls; vacuum; insulating top

any two for 1 mark each

2

(b) silvering/shiny on either wall

for 1 mark

1

[3]

Q10.

(a) (i) Carries heat up (as convection current)

1

(ii) (1) By conduction or from molecule to molecule
(2) By radiation or as IR

2

(iii) Use shiny surface (inside or outside) or small area

1

(b) (i) Rise more quickly

1

(ii) Dull surface good absorber
(accept “attract” = “absorb” if context correct,
then penalise spg mark.

Shiny surface poor absorber

2

(c) (i) Fall more quickly

1

(ii) Dull surface good emitter
Shiny surface poor emitter

2

[10]

Q11.

(a) (i) hot water rises (not heat)

for 1 mark

due to convection currents
or water expands/becomes less dense on heating
or less dense water rises

any for 1 mark

2

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(ii) inside hotter (than outside)

for 1 mark

1

(iii) (heat transfer by) conduction

for 1 mark

1

(iv) surround/cover/insulate tank with poor conductor **or** named insulator

for 1 mark each

2

(b) (i) air is an insulator/poor conductor

for 1 mark

1

(ii) convection stopped foam is an insulator/poor conductor

for 1 mark each

2

[9]

Q12.

(i) currents of moving liquids/gases/fluids carrying/transferring energy
(can name fluid)

1

(ii) liquids/gases **expand** when their temperature rises/when they are heated

the **density** of the heated liquid/gas is then **less** than that of the colder liquid/gas which has not been heated

the warmer/less dense liquid/gas **then rises** through the colder/denser liquid/gas

the **colder/denser liquid/gas falls** to replace the liquid/gas which has risen, and in turn becomes heated

for 1 mark each

4

[5]

Q13.

(a) (i) £150

gets 2

Else 1000 – (250 + 350 + 100 + 150) or 1000 – 850

gets 1

2

(ii) (Named) floor covering
OR Insulation under floor

for 1 mark

1

(b) (i) Draught proof doors or fibre glass in loft or in cavity
For draught proofing

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gains 1 mark

Very low cost/easy to install
Repays for itself quickly/cost recuperated quickly
Reasonable energy saving

any 2 for 1 mark each

For loft insulation

Second lowest installation cost/easy to install
Reasonable large energy savings for this cost
Reasonable payback time

gains 1 mark

For foam filled cavity
Biggest energy/cash saving
Cost effective

any 2 for 1 mark each

3

(ii) **Double glazing**

gains 1 mark

Costs most
Saves least energy
Least cost effective

any 2 for 1 mark each

3

[9]

Q14.

…….. conduction
…….. convection
…….. insulation
…….. radiation

for 1 mark each

[4]

Q15.

(a) convection
air is heated by the burner / particles gain energy
air expands / particles move about more / particles move faster
air becomes less dense / particles are more spread out
air rises / particles rise - *not* heat rises
air from C moves into the heater / particles from C move into the heater to replace it / them

any four *for 1 mark each*

4

(b) (i) radiation

for one mark

1

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(ii) black surface <u>radiates / emits</u> well
(*allow* absorbs and emits well) (*allow* comparison with shiny / white surfaces)

large surface area needed
high temperature (of the lumps)
any one for 1 mark

1

[6]

Q16.

(a) (i) conduction

1

convection
they may be in either order

1

(ii) radiation

1

(iii) evaporation

1

convection
they may be in either order

1

(iv) convection

1

(v) conduction

1

(b) in the middle above halfway up (above line joining top of spacers)
below the surface of the liquid

1

(c) by particles vibrating more
*particles shake more **or** move more*
do not credit they start vibrating

1

they pass on the energy **or** vibrations
do not credit heat

1

[10]

Q17.

(a) insulation
allow example e.g fibreglass

1

double glazing
allow curtains

1

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draught excluder

allow double glazing / close fitting door

allow turning down thermostat once only / turn down the heating

1

(b) transfers more useful energy

allow converts more energy into light / less into heat / less energy wasted

1

[4]

Q18.

(a) (i) the outlet mark

hot water rises **or** floats up

do not accept heat rises

the inlet mark

1

cold water replacing any drawn off comes in at the bottom and does not mix with hot **or** cool the hot water

do not accept descriptions of a convection current

1

(ii) only heats top (of tank) **or** a small volume

credit heats less water

1

no mixing occurs with cold because hot water is less dense **or** water is a poor conductor

no mixing because cold water is more dense

1

(b) radiation (losses from tank)

do not accept reflection of heat

1

lower from light **or** white **or** shiny surfaces

credit they are poor radiators for both marks

1

[6]

Q19.

(a) radiates
absorbs / conducts
reflects

for 1 mark each

3

(b) C make sure the lamp is the same distance from both tubes
B switch on the lamp
A switch off the lamp

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E wait for the temperature to stop rising
D read the thermometers

for 1 mark each

5

[8]

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