M1. (a) range of speeds

1

moving in different directions

accept random motion

1

(b) internal energy

1

(c) density = mass / volume

1

(d) 0.00254 / 0.0141

1

0.18

1

*accept 0.18 with no working shown for the **2** calculation marks*

kg / m^3

1

[7]

M2. (a) **B**

*no mark for **B** - marks are for the explanation*
*first two mark points can score even if **A** is chosen*

draught increases (the rate of) evaporation

accept more evaporation happens
accept draught removes (evaporated) particles faster
*do **not** accept answers in terms of particles gaining energy from the fan / draught*

1

evaporation has a cooling effect

accept (average) <u>kinetic</u> energy of (remaining) particles decreases

1

so temperature will fall faster / further

1

(b) larger surface area

1

increasing the (rate of) evaporation

accept more / faster evaporation
accept easier for particles to evaporate

or

for water to evaporate from

accept more particles can evaporate
accept water / particles which have evaporated are trapped (in the bag)
answers in terms of exposure to the Sun are insufficient

1

[5]

M3. (a) conduction

1

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

- starting temperature (of cold water)
  temperature is insufficient
- pipe length
  accept size of pipe
- pipe diameter
- pipe (wall) thickness
- volume of cold water
  accept amount for volume
- temperature of hot water (in)
- time

1

(ii) copper

1

greatest temperature change
only scores if copper chosen
accept heat for temperature
accept heated water the fastest
accept it was hottest (after 10 minutes)
accept it is the best / a good conductor

1

(c) the pipe has a larger (surface) area
accept pipe is longer

1

(so) hot / dirty water (inside pipe) is in contact with cold / clean water (outside pipe) for longer

1

[6]

M4.(a) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance.

0 marks No relevant content.

Level 1(1-2 marks) There is a basic explanation of **one** feature**or**a simple statement relating reduction in energy transfer to **one** feature.

Level 2(3-4 marks) There is a clear explanation of **one** feature**or**a simple statement relating reduction in energy transfer to **two** features.

Level 3(5-6 marks) There is a detailed explanation of at least **two** features**or**a simple statement relating reduction in energy transfer to all **four** features.

Examples of the points made in response

extra information

accept throughout:
heat for energy
loss for transfer

plastic cap:

- plastic is a poor conductor
  accept insulator for poor conductor
- stops convection currents forming at the top of the flask so stopping energy transfer by convection
- molecules / particles evaporating from the (hot) liquid cannot move into the (surrounding) air so stops energy transfer by evaporation
- plastic cap reduces / stops energy transfer by conduction / convection / evaporation

glass container:

- glass is a poor conductor so reducing energy transfer by conduction
- glass reduces / stops energy transfer by conduction

vacuum:

- both conduction and convection require a medium / particles

- so stops energy transfer between the two walls by conduction and convection
- vacuum stops energy transfer by conduction / convection

silvered surfaces:

- *silvered surfaces reflect infrared radiation*
  accept heat for infrared
- *silvered surfaces are poor emitters of infrared radiation*
- *infrared radiation (partly) reflected back (towards hot liquid)*
- *silvered surfaces reduce / stop energy transfer by radiation*

6

(b) *(the ears have a) small <u>surface</u> <u>area</u>*
ears are small is insufficient

1

so reducing energy radiated / transferred (from the fox)
accept heat lost for energy radiated
*do **not** accept stops heat loss*

1

[8]

M5. *(a) any **two** from:*

- *water evaporates*
  accept steam / water vapour for water molecules
  accept water turns to steam
- *water molecules / particles go into the air*
- *mirror (surface) is cooler than (damp) air*
  accept the mirror / surface / glass is cold
- *water molecules / particles that hit the mirror lose energy*
  accept water molecules / particles that hit the mirror cool down
- *cooler air cannot hold as many water molecules / particles*

2

(causes) condensation (on the mirror)
accept steam changes back to water (on the mirror)

or*particles move closer together*

1

(b) mirror (surface) is warm
mirror is heated is insufficient

1

(rate of) condensation reduced
accept no condensation (happens)

1

[5]

M6. *(a) conduction*

must be in correct order

1

convection

1

(b) (i) 70

accept ± half a square
(69.8 to 70.2)

1

(ii) 15

*accept 14.6 to 15.4 for **2** marks*
*allow for **1** mark 70 − 55*
ecf from (b)(i) ± half a square

2

(iii) C

1

biggest drop in temperature during a given time
accept it has the steepest gradient this is a dependent

1

(iv) starting at 70 °C and below graph for C
must be a curve up to at least 8 minutes

1

(v) because 20 °C is room temperature
accept same temperature as surroundings

1

(c) (i) 6720

*correct answer with or without working gains **3** marks*
*6 720 000 gains **2** marks*
*correct substitution of E = 0.2 × 4200 × 8 gains **2** marks*
*correct substitution of E = 200 × 4200 × 8 gains **1** mark*

3

(ii) *the fastest particles have enough energy*
accept molecules for particles

1

to escape from the surface of the water

1

therefore the mean energy of the remaining particles decreases
accept speed for energy

1

the lower the mean energy of particles the lower the temperature (of the water)
accept speed for energy

1

[16]

M7. *Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.*

0 marks
No relevant content.

Level 1 (1–2 marks)
Considers either solid or gas and describes at least one aspect of the particles.

or

Considers both solids and gases and describes an aspect of each.

Level 2 (3–4 marks)
Considers both solids and gases and describes aspects of the particles.

or

Considers one state and describes aspects of the particles and explains at least one of the properties.

or

Considers both states and describes an aspect of the particles for both and explains a property for solids or gases.

Level 3 (5–6 marks)
Considers both states of matter and describes the spacing and movement / forces between the particles. Explains a property of both solids and gases.

examples of the points made in the response
extra information

Solids

- *(particles) close together*
- *(so) no room for particles to move closer (so hard to compress)*
- *vibrate about fixed point*
- *strong forces of attraction (at a distance)*
- *the forces become repulsive if the particles get closer*
- *particles strongly held together / not free to move around (shape is fixed)*

any explanation of a property must match with the given aspect(s) of the particles.

Gases

- *(particles) far apart*
- *space between particles (so easy to compress)*
- *move randomly*
- *negligible / no forces of attraction*
- *spread out in all directions (to fill the container)*

[6]

M8. *(a) infrared / IR*

correct answer only

1

*(b) any **two** from:*

- *increase the power / watts*

  allow increase the temperature of the oven or make the oven hotter
- *decrease the speed*

  allow leave the biscuits in for longer
- *put biscuits through again*

  increase radiation is insufficient

  ignore changes to the design of the oven

2

(c) (inside) surface is a (good) reflector or poor absorber (of IR)

Ignore bounce for reflect

surface is a (good) reflector of light does not score

surface is a (good) reflector of light and infrared / heat does score

1

(and) <u>outside</u> surface is poor emitter (of IR)

1

(so) increases the energy reaching the biscuits

allow reduces energy loss or makes oven more efficient

*do **not** accept no energy losses*

keeps oven hotter is insufficient

1

[6]