M1. (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

        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

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Saves least energy
Least cost effective

any 2 for 1 mark each

3

[9]

M2. (a) conduction

*do **not** accept conductor*

1

(b) the freezer

both parts needed

greater <u>temperature</u> difference (between freezer and room)

*do **not** accept because it is the coldest*

1

(c) any **two** from:

- poor absorber of heat / radiation

   *accept does not absorb heat poor emitter of heat / radiation
   is neutral*

- reflects heat / radiation (from room away from fridge-freezer)

- reduces heat transfer <u>into</u> the fridge-freezer

- reduces power consumption of fridge-freezer

   *do **not** accept it is a bad conductor / good insulator*

2

[4]

M3. (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]

M4. (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]**

M5. (a) there are strong forces (of attraction) between the particles in a solid

accept molecules / atoms for particles throughout
accept bonds for forces

1

(holding) the particles close together

particles in a solid are less spread out is insufficient

1

or

(holding) the particles in a fixed pattern / positions

but in a gas the forces between the particles are negligible

accept very small / zero for negligible
accept bonds for forces

1

so the particles spread out (to fill their container)

accept particles are not close together
gas particles are not in a fixed position is insufficient

1

(b)　(i)　particles are (shown) leaving (the liquid / container)

accept molecules / atoms for particles throughout
accept particles are escapingparticles are getting further apart is insufficient

1

(ii)　*accept molecules / atoms for particles throughout*
accept speed / velocity for energy throughout

particles with most energy leave the (surface of the) liquid

accept fastest particles leave the liquid

1

so the <u>mean / average</u> energy of the remaining particles goes down

1

and the lower the average energy (of the particles) the lower the temperature (of the liquid)

1

[8]

M6. (a)   any **two** from:

- (air) particles / molecules / atoms gain energy

- (air) particles / molecules / atoms move faster
    *do **not** accept move more*
    *do **not** accept move with a bigger amplitude / vibrate more*

- (air) particles / molecules / atoms move apart

- air expands
    ignore particles expand

- air becomes less dense
    ignore particles become less dense

- warm / hot air / gases / particles rise
    *do **not** accept heat rises*
    answers in terms of heat particles negates any of the mark
    points that includes particles

    2

(b)   (i)   any **two** from

- free / mobile electrons gain (kinetic) energy
    accept free / mobile electrons move faster
    accept vibrate faster for gain energy

- free electrons collide with other (free) electrons / ions / atoms / particles

- atoms / ions / particles collide with other atoms / ions / particles
    answers in terms of heat particles negates this mark point

    2

(ii)   (faster) energy / heat transfer to room(s) / house
    accept room(s) / house gets warm(er)
    accept lounge / bedroom / loft for rooms

    1

    [5]

M7. (a) air near freezer compartment is cooled or loses energy
accept air at the top is cold

1

cool air is (more) dense or particles close(r) together (than warmer air)
*do **not** allow the particles get smaller / condense*

1

so (cooler) air falls

1

air (at bottom) is displaced / moves upwards / rises
*do **not** allow heat rises*
accept warm air (at the bottom) rises

1

(b) if volume is doubled, energy use is not doubled
or
volume ÷ energy not a constant ratio

1

correct reference to data, eg 500 is 2×250 but 630 not 2×300

1

(c) accept suitable examples, eg

advantage:

- reduces emissions into atmosphere
- lower input power or uses less energy or wastes less energy
- costs less to run
    cost of buying or installing new fridge is insufficient
    ignore reference to size of fridge

1

disadvantage:

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- land fill
- energy waste in production
- cost or difficulty of disposal
- transport costs

1

[8]

M8. (a) conduction

1

(b) 35 000

1

(c) 500

*their (b) = 2 x c x 35 correctly calculated scores **2** marks*
*allow **1** mark for correct substitution,*
ie 35000 = 2 x c x 35
or
their (b) = 2 x c x 35

2

J / kg°C

1

(d) energy lost to surroundings
or
energy needed to warm heater

accept there is no insulation (on the copper block)
*do **not** accept answers in terms of human error or poor results or defective equipment*

1

[6]

M9. (a) conduction

1

(b) (i) there is a bigger temperature difference between the water and the surrounding air
accept the water is hottest / hotter

1

so the transfer of energy (from hot water) is faster
accept heat for energy
ignore temperature falls the fastest

1

(ii) 120
*allow **1** mark for converting kJ to J correctly, ie 4 032 000*

or

correctly calculating temperature fall as 8°C

or

allow **2** marks for correct substitution, ie 4 032 000 = m × 4200 × 8

answers of 0.12, 19.2 **or** 16.6 gain **2** marks

answers of 0.019 **or** 0.017 gain **1** mark

3

(iii) water stays hot for longer

1

so heater is on for less time
accept so less energy needed to heat water

1

so cost of the jacket is soon recovered from) lower energy costs / bills
accept short payback time

1