M1. (a) 60% sector correct
other two sectors closer to 13:7 than 12:8 or 14:6
sectors correctly labelled (w.r.t rank order of size)
each for 1 mark

3

(b) (i) *ideas that wasted energy*
is transferred to surrounding air
pan
stove
is converted to another/correctly named energy form
any 2 for 1 mark each

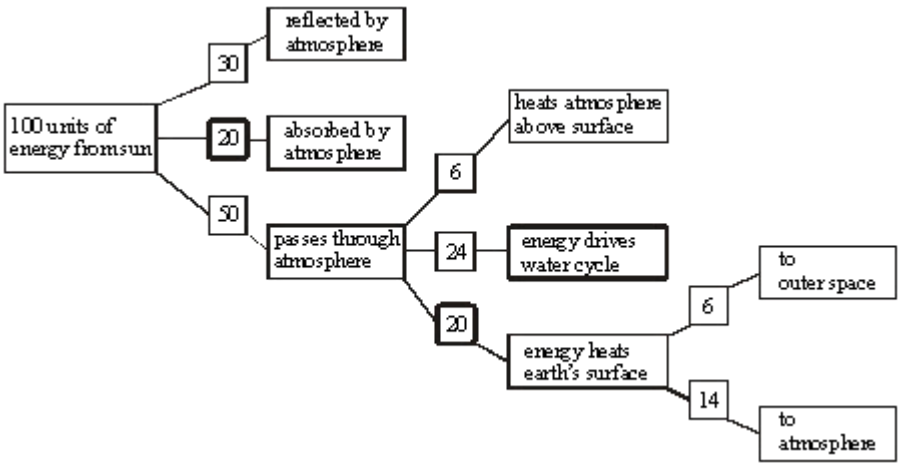
2

(ii) 40
for 1 mark

1

[6]

M2.



each for 1 mark
allow 'error carried forward' to the last box'

[3]

M3. (a) weight (lifted)

or

height (lifted)

1

(b) any **two** from:

- calculate a mean
- spot anomalies
- reduce the effect of random errors

2

(c) as speed increases, the efficiency increases

1

(but) graph tends towards a constant value

or

appears to reach a limit

accept efficiency cannot be greater than 100%

1

(d) heating the surroundings

1

(e) 0 (%)

1

[7]

M4. (a) (i) as a source of thermal <u>radiation</u>

accept heat for thermal radiation
accept to act as the Sun
*do **not** accept sunlight alone*

1

(ii) any **one** from:

- volume of water
  accept amount for volume
- distance between lamp and boiling tube
- initial / starting temperature of water
- same room temperature
  *do **not** accept time or same insulation material*

1

(iii) any **one** from:

- greater sensitivity / precision
  *do **not** accept more reliable (negates mark)*
- could link to a computer for (automatic) data analysis
- could take more frequent readings
- reduces instrument reading error
  accept more accurate
  *do **not** accept easier to use on its own*

1

(b) (i) acts as a control

accept to be able to make a comparison
accept to see the difference
*do **not** accept 'to make it a fair test' OWTTE on its own*

1

(ii) (plastic) <u>foam</u> and aluminium foil

1

(iii) (aluminium) <u>foil</u> is a <u>poor</u> absorber of thermal radiation

accept heat / infra red for thermal radiation

1

or (aluminium) <u>foil</u> is a (good) reflector of thermal radiation

*do **not** accept 'reflects sunlight' on its own*

(plastic) foam traps air which is a (good) insulator

accept (plastic) foam is a poor conductor / (good) insulator

*do **not** accept 'the material' is a good insulator / poor conductor*

1

(c) particles vibrate with a bigger / stronger amplitude / faster / with more (kinetic) energy

accept particles vibrate more

*do **not** accept start to vibrate only*

1

energy transferred by collisions with other particles

*do **not** accept answers in terms of free/mobile electrons*

1

[9]

M5. (a) (i) radiation

1

(ii) traps (small pockets of) air

*do **not** accept it's an insulator*

*do **not** accept reduces conduction and / or convection*

*do **not** allow it doesn't allow heat to escape*

1

(b) (i) bigger temperature difference (between the water and surroundings)at the start (than at the end)

*do **not** accept water is hotter*

1

(ii) starting temperature (of the water)

accept thickness of fleece

*do **not** accept same amount of fleece*

*do **not** accept thermometer / can*

*do **not** accept time is the same*

1

(iii) 18 (°C)

correct answer only

1

(iv) **M**

1

smallest temperature drop (after 20 mins)

*cannot score if **M** is not chosen*

accept it's the best insulator

accept smallest loss in heat

accept keeps heat / warmth in for longer

1

[7]