

Name of the Student: \_\_\_\_\_

Max. Marks : 20 Marks

Time : 20 Minutes

Mark Schemes

### Q1.

(a) any **two** from:

- black is a good emitter of (infrared radiation)  
*accept heat for radiation*  
*ignore reference to absorbing radiation*
- large surface (area)
- matt surfaces are better emitters (than shiny surfaces)  
*accept matt surfaces are good emitters*  
*ignore reference to good conductor*

2

(b) 90% or 0.9(0)

$$\text{efficiency} = \frac{\text{useful energy out} (\times 100\%)}{\text{total energy in}}$$

*allow 1 mark for correct substitution, ie  $\frac{13.5}{15}$*   
*provided no subsequent step shown*  
*an answer of 90 scores 1 mark*  
*an answer of 90 / 0.90 with a unit scores 1 mark*

2

(c) (producing) light

*allow (producing) sound*

1

(d) any **two** from:

- wood is renewable  
*accept wood grows again / quickly*  
*accept wood can be replanted*
- (using wood) conserves fossil fuels  
*accept doesn't use fossil fuels*
- wood is carbon neutral  
*accept a description*  
*cheaper / saves money is insufficient*

2

(e)  $E = m \times c \times \theta$

2 550 000

*allow 1 mark for correct substitution  
ie  $100 \times 510 \times 50$   
provided no subsequent step shown  
answers of 1 020 000, 3 570 000 gain 1 mark*

2

joules /J

*accept kJ / MJ  
do **not** accept j  
for full credit the unit and numerical answer must be consistent*

1

[10]

## Q2.

(a) (i) conduction

1

(ii) atoms gain (kinetic) energy

*accept particles / molecules for atoms  
do **not** accept electrons for atoms*

**or**

atoms vibrate with a bigger amplitude

*accept vibrate faster / more  
do **not** accept start to vibrate*

**or**

atoms collide with neighbouring atoms

1

transferring energy to (neighbouring / other) atoms

*do **not** accept heat for energy*

**or**

making these other atoms vibrate with a bigger amplitude

*accept faster / more for bigger amplitude  
mention of (free) electrons moving and passing on energy negates this mark*

1

(b) (i) 5 (°C) to 25 (°C)

*either order*

1

(ii) a correct example of doubling temperature difference doubling heat transfer

eg going from 5 to 10 (°C) difference doubles heat transfer from 30 to 60 (J/s)

*accept for heat transfer number of joules / it  
allow 1 mark for correctly reading 1 set of data eg at 5 °C the heat transfer is 30*

**or**

*for every 5°C increase in temperature difference heat transfer increases by 30 (J/s)*

*no credit for stating they are directly proportional*

(iii) 1800

*allow 1 mark for obtaining heat transfer value = 120*

2

(c) payback time calculated as 33 years

*calculations must be correct to score the first mark point*

*explanations must relate to it not being cost effective*

1

this is greater than lifetime of windows

**or**

total savings (over 30 years) = £4800 (1)

this is less than cost of windows (1)

**or**

$$\frac{5280}{30} = 176 \text{ (1)}$$

this is more than the yearly savings (1)

1

**[10]**