

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

Max. Marks : 22 Marks

Time : 22 Minutes

Mark Schemes

**Q1.**

(a) 78 (°C)

*allow 2 marks for correct temperature change ie 22 °C*

*allow 1 mark for correct substitution*

*ie  $46\,200 = 0.5 \times 4200 \times \theta$*

*or*

$$\frac{46200}{0.5 \times 4200} = \theta$$

3

(b) 6.4 (W)

*allow 2 marks for an answer that rounds to 6.4*

*allow 1 mark for correct substitution*

*ie  $46\,200 = P \times 7200$*

*an answer of 23 000 or 23 100 or 385 gains 1 mark*

2

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**Q2.**

- (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 apply a 'best-fit' approach to the marking.

**0 marks**

No relevant information

**Level 1 (1-2 marks)**

There is a relevant statement about an energy saving method

**Level 2 (3-4 marks)**

There is at least one clear comparison of energy saving methods and their cost effectiveness with an appropriate calculation

**Level 3 (5-6 marks)**

There is a comparison of energy saving methods and their cost effectiveness with appropriate calculations. Comparison to include further detail.

**examples of physics points made in the response**

**examples of relevant statements**

- energy efficient boiler saves the most (energy / money) per year

- loft insulation costs the least to install
- double-glazing costs the most to install

#### examples of statements that include cost effectiveness

- loft insulation is the most cost effective in the long term
- double-glazing is the least cost effective
- loft insulation has the shortest payback time
- double-glazing has the longest payback time
- payback time calculated for any method  
*payback times:*  
*energy efficient boiler: 6.25 years*  
*loft insulation: 2 years*  
*double glazing: 100 years*  
*cavity wall insulation: 2.86 years*

#### examples of further detail

- for cost effectiveness install in the following order: loft, cavity wall, boiler, double-glazing
- for reducing energy use install in the following order: boiler, loft, cavity wall, double glazing
- don't install double-glazing for insulation purposes
- double-glazing won't pay for itself in your lifetime
- justified choice of best / worst method

6

- (b) (i) how effective a material is as an insulator  
*accept 'heat' for energy*  
*accept how effective a material is at keeping energy in*  
*accept the lower the U-value the better the insulator*  
*accept the lower the U-value the lower the rate of energy transfer*

1

- (ii) (the U-value) decreases

1

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### Q3.

- (a) (i) 0.5 °C

1

- (ii) data is continuous  
**or**  
 both variables are continuous  
**or**  
 independent variable is continuous  
**or**  
 time is continuous

accept results / measurements for data  
 accept data is not categoric  
 one variable is continuous is insufficient  
 air temperature is continuous is insufficient

1

(b) (i) 20.5 (°C)

1

(ii) 60 (minutes)

accept 1 hour

1

(c) (i) so a comparison can be made

**or**

outside temperature is a control variable

accept:

(outside) temperature would affect energy required (to maintain temperature of the house)

**or**

(outside) temperature would affect internal temperature (of the house)

**or**

heat loss will be faster on a cold day

outside temperature will affect the results is insufficient

fair test is insufficient

1

(ii) the cost is equal to the number of kWh × the cost per kWh

accept (heating) bill depends on (number of) kWh used

accept energy for kWh

1

calculation  $0.8 / 8.0 = 0.1$  or 10%

allow  $7.2 / 8.0 = 0.9$  or 90%

1

(iii) heating is on for more / less time (than anticipated)

1

because some days it is cooler / warmer (than anticipated)

accept other sensible suggestions

an answer giving two sensible situations gains 2 marks

possible examples:

- some houses have different amounts of insulation

- there are different styles of house

temperature (inside / outside) is always changing is insufficient

1

[9]