Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

The table gives information about some methods of conserving energy in a house.

Conservation method	Installation cost in £	Annual saving on energy bills in £
Cavity wall insulation	500	60
Hot water tank jacket	10	15
Loft insulation	110	60
Thermostatic radiator valves	75	20

(a) Explain which of the methods in the table is the most cost effective way of saving energy over a 10 year period. To obtain full marks you must support your answer with calculations.

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_____

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_____

(3)

(b) Describe what happens to the energy which is 'wasted' in a house.

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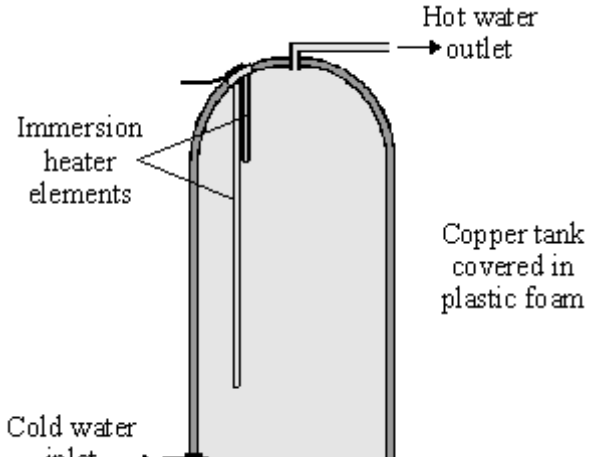
(2)

(Total 5 marks)

Q2.

The diagram shows a type of electric immersion heater in a hot water tank. These hot water tanks are normally found in airing cupboards.



Information on the immersion heater states:

230 V
10 A

(a) Immersion heaters for hot water tanks often have a switch on them labelled *bath* or *sink.* The *bath* position of the switch has **both** parts of the immersion heater elements in the circuit. The *sink* position has only the short heater element in the circuit.

(i) Explain why the hot water outlet is at the top of the tank, and the cold water inlet is at the bottom of the tank.

_____

_____

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(2)

(ii) Explain how the *sink* position for the immersion heater is able to save energy.

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_____

(2)

(b) The copper tank is surrounded by plastic foam to minimise energy loss.

Explain why a pale, shiny surface to the foam also helps to minimise energy loss.

_____

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_____

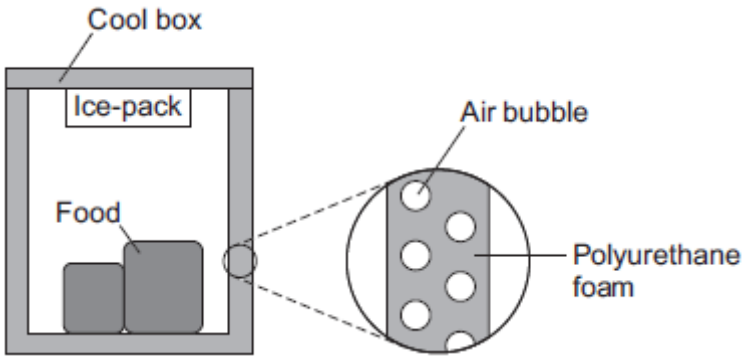
(2)

(Total 6 marks)

Q3.

The figure below shows a cool box.

A cool box is used to keep food colder than the surroundings. The cool box consists of plastic walls with a layer of polyurethane foam between them.



(a) The polyurethane foam has a low U-value.

Why does the polyurethane foam need to have a low U-value?

_____

_____

(1)

(b) The polyurethane foam contains air bubbles.

Explain how the air bubbles reduce energy transfer through the walls of the cool box.

You should refer to the processes of energy transfer in your answer.

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(3)

(c) An ice-pack can be placed inside the cool box. An ice-pack contains a material with a very high specific heat capacity. The ice-pack is frozen in a freezer and cooled to –18 °C before being put in the cool box.

The ice-pack keeps the contents of the cool box cooler than the surroundings for a long time.

Describe how.

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_____

_____

_____

_____

_____

(3)

(Total 7 marks)