

Name of the Student: _____

Max. Marks : 18 Marks

Time : 18 Minutes

Q1.

- (a) A company is developing a system which can heat up and melt ice on roads in the winter. This system is called 'energy storage'.

During the summer, the black surface of the road will heat up in the sunshine.

This energy will be stored in a large amount of soil deep under the road surface. Pipes will run through the soil. In winter, cold water entering the pipes will be warmed and brought to the surface to melt ice.

The system could work well because the road surface is black.

Suggest why.

(1)

- (b) (i) What is meant by specific latent heat of fusion?

(2)

- (ii) Calculate the amount of energy required to melt 15 kg of ice at 0 °C.

Specific latent heat of fusion of ice = 3.4×10^5 J/kg.

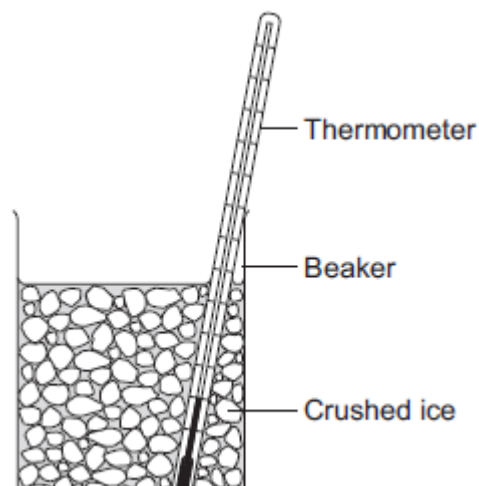
Energy = _____ J

(2)

- (c) Another way to keep roads clear of ice is to spread salt on them. When salt is added to ice, the melting point of the ice changes.

A student investigated how the melting point of ice varies with the mass of salt added.

The figure below shows the equipment that she used.



The student added salt to crushed ice and measured the temperature at which the ice melted.

- (i) State **one** variable that the student should have controlled.

(1)

- (ii) During the investigation the student stirred the crushed ice.

Suggest **two** reasons why.

Tick (✓) **two** boxes.

	Tick (✓)
To raise the melting point of the ice	
To lower the melting point of the ice	
To distribute the salt throughout the ice	
To keep all the ice at the same temperature	
To reduce energy transfer from the surroundings to the ice	

(2)

- (iii) The table below shows the data that the student obtained.

Mass of salt added in grams	0	10	20
Melting point of ice in °C	0	-6	-16

Describe the pattern shown in the table.

(1)

- (d) Undersoil electrical heating systems are used in greenhouses. This system could also be used under a road.

A cable just below the ground carries an electric current. One greenhouse system has a power output of 0.50 kW.

Calculate the energy transferred in 2 minutes.

Energy transferred = _____ J

(3)

- (e) In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

A local council wants to keep a particular section of a road clear of ice in the winter.

Describe the advantages and disadvantages of keeping the road clear of ice using:

- energy storage
- salt
- undersoil electrical heating.

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Extra space _____

(6)
(Total 18 marks)