Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

B621/02

GATEWAY SCIENCE

SCIENCE B

Unit 1 Modules B1 C1 P1 (Higher Tier)

THURSDAY 14 JANUARY 2010: Morning
DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the Question Paper
A calculator may be used for this paper

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Pencil
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (LEO/SW) MEP10248 24479/1

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully and make sure that you know what you have to do before starting your answer.**
- **Answer ALL the questions.**
- **Write your answer to each question in the space provided, however additional paper may be used if necessary.**

INFORMATION FOR CANDIDATES

- **The number of marks is given in brackets [ ] at the end of each question or part question.**
- **A list of physics equations is printed on page three.**
- **The Periodic Table is printed on the back page.**
- **The total number of marks for this paper is 60.**

EQUATIONS

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

fuel energy input = waste energy output + electrical energy output

power = voltage × current

energy supplied = power × time

energy (kilowatt hours) = power (kW) × time (h)

wave speed = frequency × wavelength

Answer ALL the questions.

SECTION A – MODULE B1

1 This question is about being healthy.

(a) A balanced diet contains all the following food types.

CARBOHYDRATE

FAT

PROTEIN

MINERALS

VITAMINS

FIBRE

WATER

The amount of each food type you should eat varies from person to person.

Mary is in a swimming club and swims every day.

Vicki is the same age and weight as Mary, but does NOT exercise as much.

How should Mary's diet be different from Vicki's?

In your answer, write about

- which food type or types she should have more or less of than Vicki
- the reason or reasons for this.

_____

_____

_____ [2]

(b) Vicki is concerned about her health.

She measures her mass and height so she can calculate her BMI (body mass index).

Vicki's mass is 60 kg.

Her height is 170 cm.

Calculate Vicki's BMI.

Use the formula

$$\text{BMI} = \frac{\text{mass in kg}}{(\text{height in m})^2}$$

answer _____ [2]

(c) Vicki's BMI shows she is not overweight.

Having a high BMI increases the risk of getting heart disease.

(i) Smoking can also increase the risk of heart disease.

Nicotine is one substance in cigarette smoke that is linked to heart disease.

Write down <u>ONE OTHER</u> substance in cigarette smoke that is linked to heart disease.

_____ [1]

(ii) Look at the list of drug types.

<u>DEPRESSANT</u>

<u>HALLUCINOGEN</u>

<u>PAINKILLER</u>

<u>PERFORMANCE ENHANCER</u>

<u>STIMULANT</u>

What type of drug is nicotine?

Choose your answer from the list.

_____ [1]

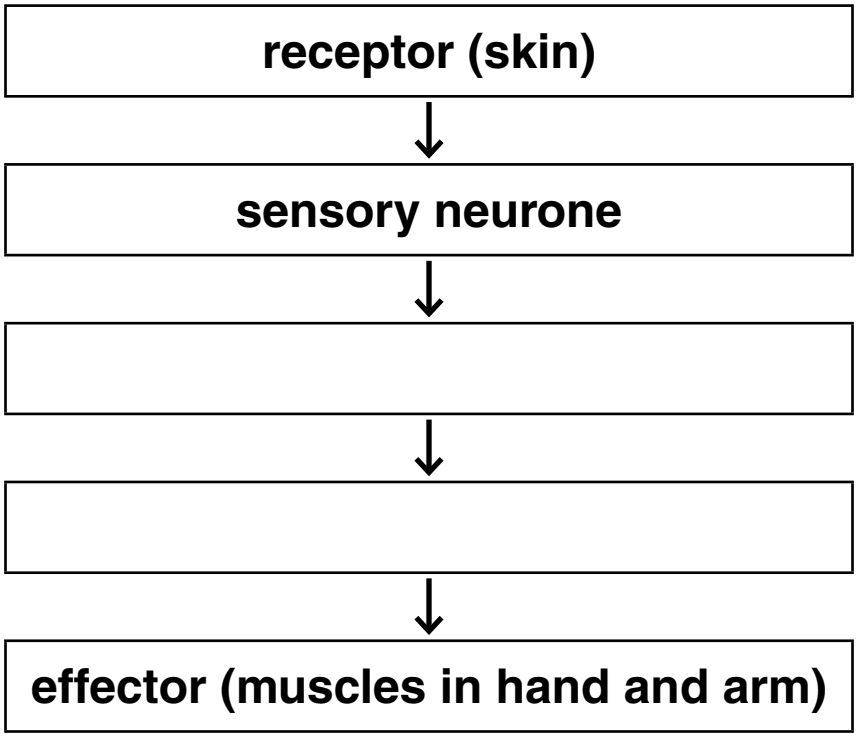
[Total: 6]

2 Lynne is going to have a bath.

She puts her hand in the water and quickly pulls it out because it is too hot.

This is an example of a SPINAL REFLEX.

(a) Complete the flow diagram to show the reflex arc involved in this reflex.



[2]

(b) If Lynne had been drinking alcohol, her reaction would have been slower.

Explain why.

_____

_____

_____ [1]

[Total: 3]

3 Some people have free earlobes.

Some people have attached earlobes.

free earlobe

attached earlobe

The allele for free earlobes (E) is dominant to the allele for attached earlobes (e).

(a) Two parents with free earlobes have a child with attached earlobes.

(i) What does this tell you about the earlobe alleles of both parents?

_____ [1]

(ii) What is the probability that their next child will also have attached earlobes?

In your answer include a fully labelled genetic diagram.

probability _____ [2]

(b) Which of the following statements is true? Put a tick (✓) in the correct box.

People who are homozygous for the e allele have free earlobes. ☐

People who are homozygous for the E allele have free earlobes. ☐

People who are heterozygous for the e allele have attached earlobes. ☐

People who are heterozygous for the E allele have attached earlobes. ☐

[1]

[Total: 4]

4 Iain has diabetes.

He has to take insulin injections to control his blood glucose levels.

(a) How does insulin control blood glucose levels?

_____

_____

_____

_____ [3]

(b) Controlling blood glucose levels is an example of <u>HOMEOSTASIS</u>.

Explain what the term homeostasis means.

_____

_____

_____ [1]

(c) The gene for making insulin is present in every body cell.

However, insulin is only made in the pancreas.

Why is insulin <u>NOT</u> made by any other body cells?

_____

_____ [1]

(d) Glucose is used in the body for respiration.

There are two types of respiration, anaerobic and aerobic.

Write down TWO ways anaerobic respiration is different from aerobic respiration.

1 _____

_____

2 _____

_____ [2]

[Total: 7]

SECTION B – MODULE C1

5 Crude oil is a fossil fuel.

Crude oil is a mixture of hydrocarbons.

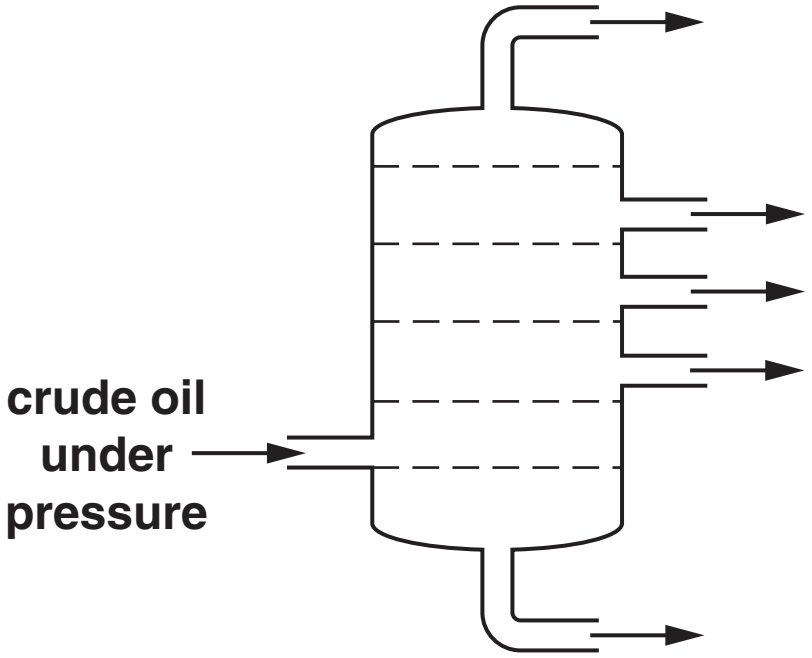
(a) What is a HYDROCARBON?

_____ [1]

(b) Crude oil can be separated into useful chemicals by FRACTIONAL DISTILLATION.

Look at the diagram.

It shows a fractionating column.



(i) ON THE DIAGRAM put the letter X in the HOTTEST part of the fractionating column. [1]

(ii) Complete the sentence about fractional distillation.

Fractional distillation separates crude oil into fractions containing many substances with similar properties such as _____ . [1]

(c) Methane, CH_4, is a hydrocarbon.

Methane burns in oxygen, O_2, to form carbon dioxide and water vapour.

Write a balanced <u>SYMBOL</u> equation for the burning of methane.

_____ [2]

(d) The reaction between methane and oxygen is <u>EXOTHERMIC</u>.

What is meant by the word exothermic?

_____ [1]

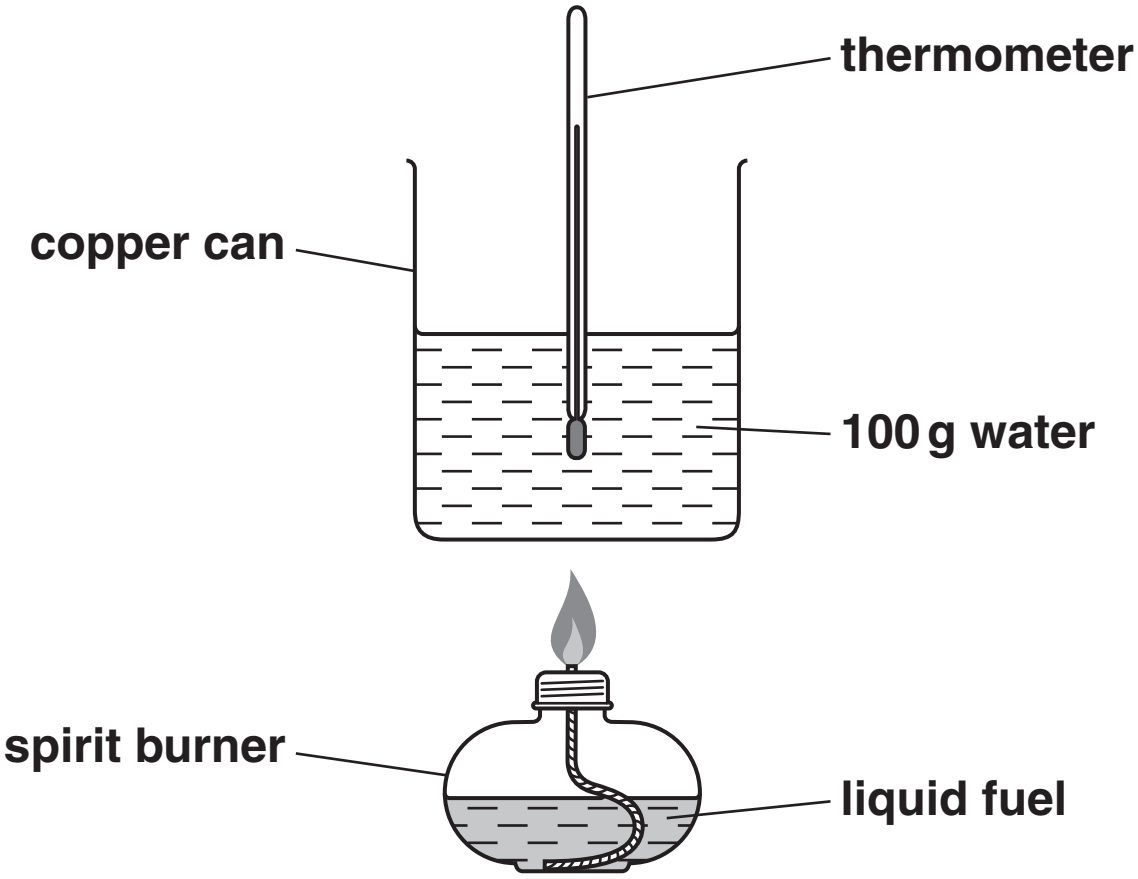
[Total: 6]

6 Steve and Sarah investigate some fuels.

They want to find out which fuel gives off most energy.

They test four liquid fuels.

Look at the diagram. It shows the apparatus they use.



They burn 1.0 g of fuel each time.

Look at the table, opposite.

The table shows their results.

FUEL	TEMPERATURE AT START IN °C	TEMPERATURE AT END IN °C
ethanol	20	37
methanol	18	28
paraffin	20	35
petroleum spirit	18	42

(a) Which fuel transfers the MOST energy to the water?

_____

Explain how you know.

_____

_____ [2]

(b) Calculate the amount of heat energy transferred by 1.0 g of paraffin to 100 g of water.

Use the equation

ENERGY = MASS × SPECIFIC HEAT CAPACITY × TEMPERATURE CHANGE

The specific heat capacity of water is 4.2 J/g °C.

_____

_____

_____

answer _____ J [2]

[Total: 4]

7 This question is about polymers.

(a) Poly(chloroethene) is a polymer.

The plastic from this polymer is used to make water pipes.

One property of poly(chloroethene) is that it is easy to shape.

Write about <u>OTHER</u> properties of poly(chloroethene) that make it suitable for making water pipes.

_____

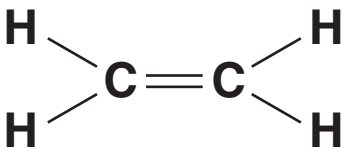
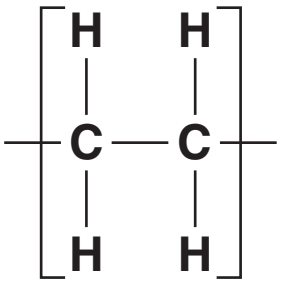
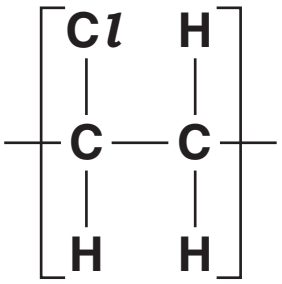
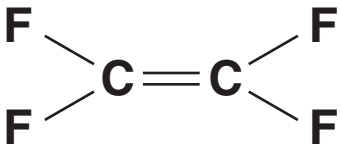
_____

_____ **[2]**

(b) Poly(chloroethene) is a polymer.

Look at the table. It shows some information about polymers.

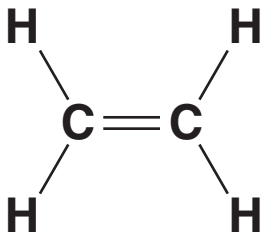
<u>COMPLETE</u> the table.

FORMULA OF MONOMER	NAME OF POLYMER	REPEAT UNIT OF POLYMER
	poly(ethene)	
	poly(chloroethene)	
	poly(tetrafluoroethene)	

[2]

(c) Poly(ethene) is made from ethene.

Look at the displayed formula of ethene.



Ethene is an <u>UNSATURATED</u> hydrocarbon.

What is meant by unsaturated?

_____ **[1]**

[Total: 5]

8 Sam has bought a new bottle of perfume.

(a) One of these chemicals gives this perfume its smell.

Which one?

Choose from the list.

ACID

ESTER

SALT

WATER

_____ [1]

(b) Draw a straight line to join each property of Sam's perfume to the reason it is important.

Draw only THREE lines.

PROPERTY OF THE PERFUME	REASON
insoluble	so Sam can put the perfume directly onto her skin
non-irritant	so the perfume cannot be washed off easily
non-toxic	so Sam is not poisoned

[2]

(c) Sam's friends are able to smell her perfume because it evaporates easily.

Write about how Sam's perfume evaporates.

Your answer should include ideas about

- **the energy of the perfume particles**
- **the forces of attraction between the particles.**

A labelled diagram may help your answer.

_____

_____

_____

_____

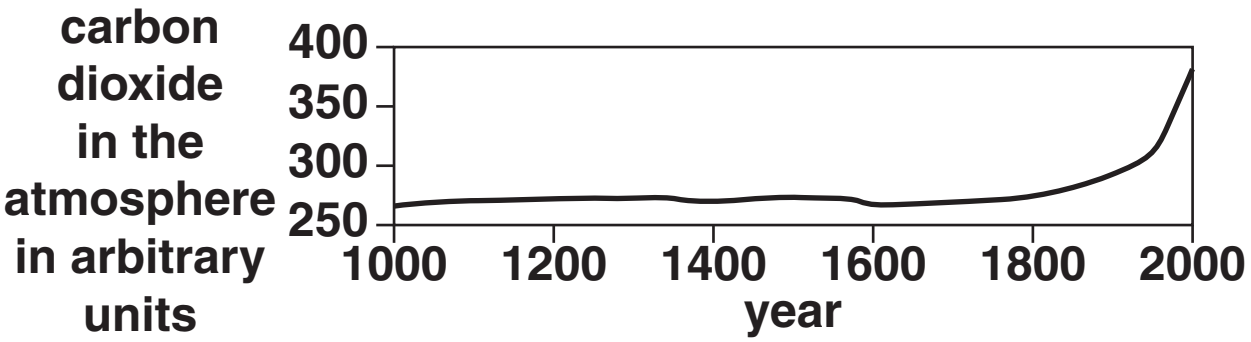
_____ **[2]**

[Total: 5]

SECTION C – MODULE P1

9 The CARBON DIOXIDE levels in the Earth's atmosphere are changing.

(a) Look at the graph showing information about carbon dioxide, CO_2, in the Earth's atmosphere.



(i) Describe what has happened to the carbon dioxide levels during the last 1000 years.

_____

_____ **[1]**

(ii) How has the change in carbon dioxide levels affected the Earth?

_____ **[1]**

(iii) What has caused the change in carbon dioxide levels?

_____ **[1]**

(b) Erupting volcanoes can cause the Earth's temperature to FALL.

Explain how.

_____

_____

_____ **[2]**

[Total: 5]

10 Many years ago it was difficult to send messages long distances.

A runner had to carry a written message.

The use of flashing light signals greatly improved this.

(a) Messages sent this way use a series of flashing lights.

This is a type of code.

What is the NAME of this code?

_____ [1]

(b) There are two types of signal.

- analogue
- digital

Analogue signals have a continuously varying value.

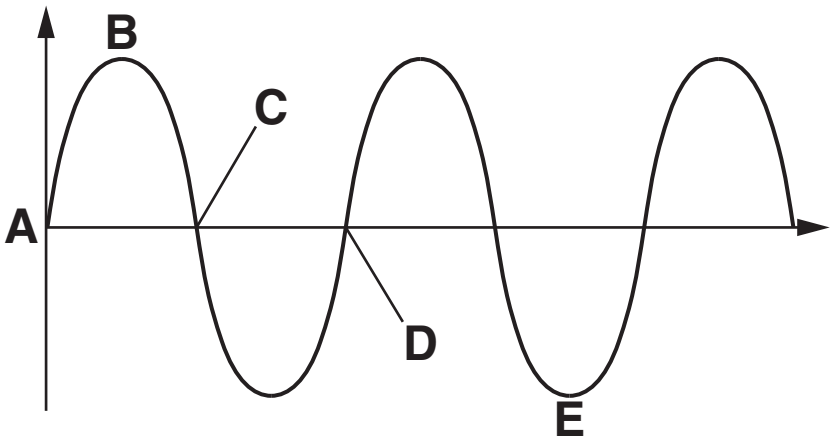
Digital signals are used in optical fibres.

Describe a digital signal.

_____ [1]

(c) A light wave is a <u>TRANSVERSE</u> wave.

Look at the diagram.



Describe what is meant by the <u>WAVELENGTH</u> of the wave.

Use the letters from the diagram in your answer.

_____

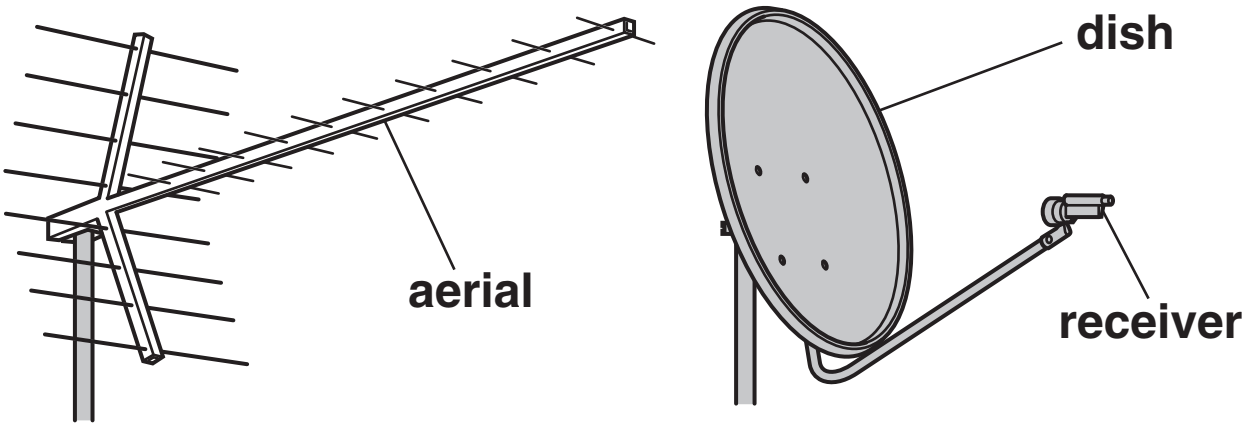
_____ **[1]**

[Total: 3]

11 The diagrams show an aerial and a satellite receiver dish.

Aerials can be used to receive long wave radio signals.

Satellite dishes are used to receive digital TV signals.



Signals are sent out into the upper atmosphere from a transmitting station.

How do the signals get <u>BACK DOWN</u> to Earth?

Complete the sentences.

Long wave radio signals get back down to an aerial by

_____ .

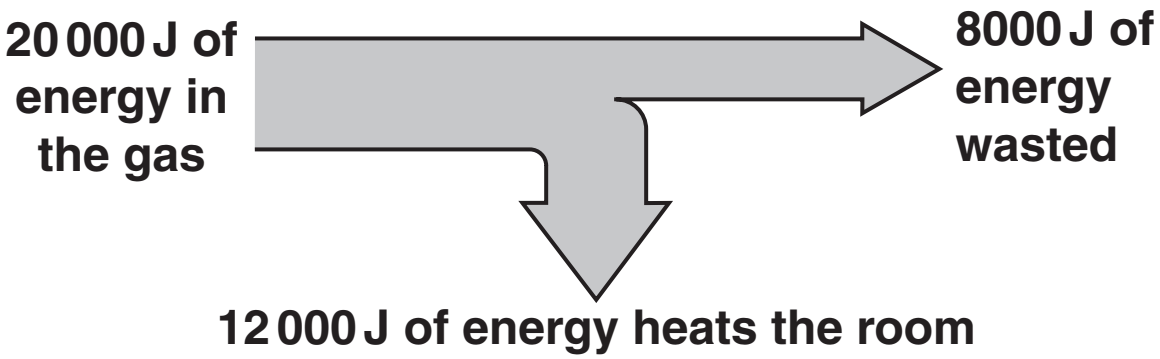
Digital TV signals get back down to a receiver dish by

_____ . [2]

[Total: 2]

12 Asif has a gas fire that heats the living room of his house.

The diagram shows how much of the energy in the gas actually heats the room.



(a) Calculate the efficiency of the gas fire.

The equations on page three may help you.

_____

_____

answer _____ [2]

(b) Asif insulates his loft. It costs £240.

This reduces his energy bill by £80 every year.

Calculate the payback time for his loft insulation.

_____

_____

answer _____ years [1]

[Total: 3]

13 Microwaves and infrared waves are used in cooking and in communications.

Some scientists think that microwaves could cause brain damage.

This could be from

- microwaves escaping from a microwave cooker
- using a mobile phone for too long.

(a) Explain how the brain absorbs the microwaves.

In your answer, write about

- what substance absorbs microwaves
- what happens to this substance.

_____

_____

_____

_____ [2]

(b) Some microwaves cause more damage than others.

What <u>TWO</u> things can make microwaves more dangerous?

1 _____

_____

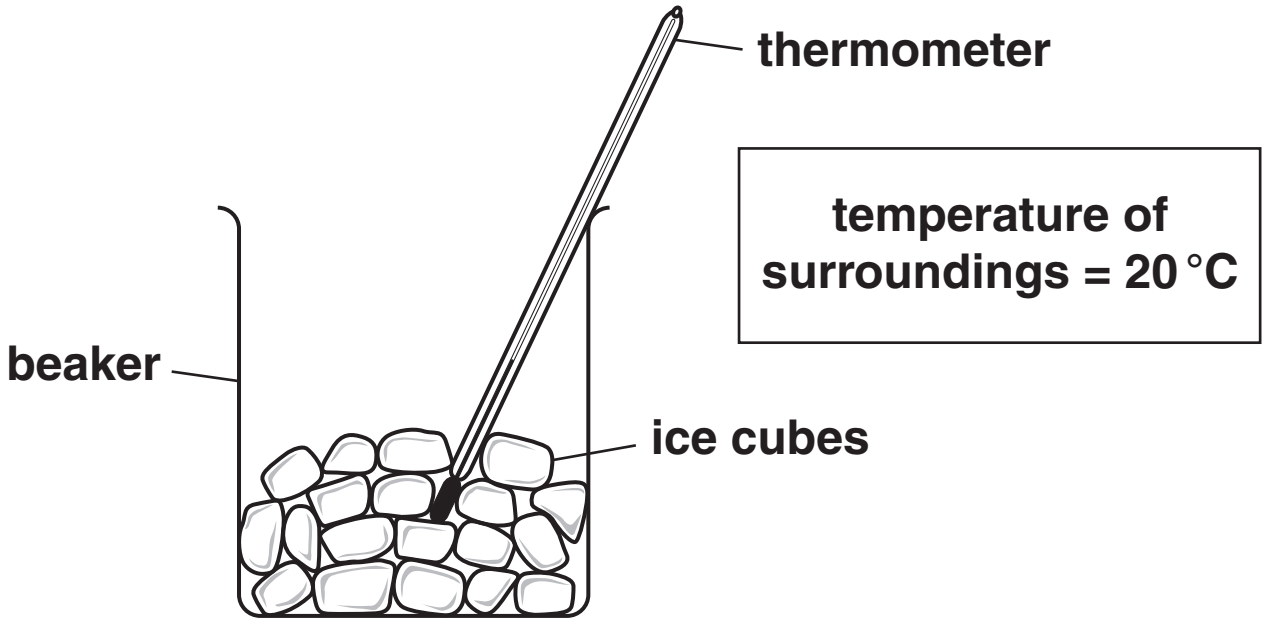
2 _____

_____ **[2]**

[Total: 4]

14 Beth is doing an experiment with ice cubes.

The temperature of the room is 20 °C.



The ice cubes are melting.

(a) Why do the ice cubes melt?

_____ [1]

(b) What happens to the temperature of the ice AS THE ICE MELTS?

_____ [1]

(c) Complete the sentence about the SPECIFIC LATENT HEAT of ice.

Choose from

BOIL

DEFROST

ENERGY

MELT

TEMPERATURE

WARM

The specific latent heat of ice is the amount of

_____ needed

to _____ 1 kg of ice. [1]

[Total: 3]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.