Specimen Paper

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

General Certificate of Secondary Education
Higher Tier
Specimen Paper

Science B (Science in Context)

H

Unit 2 My Family and Home

Higher Tier

For this paper you must have:
- a ruler
- the Equations Sheet (enclosed).

You may use a calculator.

Time allowed
- 60 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 5(b) should be answered in continuous prose. In this question you will be marked on your ability to:
  - –use good English
  - –organise information clearly
  - –use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

Answer **all** questions in the spaces provided.

1 We use many different types of electromagnetic waves in our homes.

1 (a) Which type of electromagnetic wave is used in:

1 (a) (i) TV remote controls .....

(1 mark)

1 (a) (ii) Fibre optic cables ..... .

(1 mark)

1 (b) What is the correct term for the number of electromagnetic waves that a source produces every second?

.....

(1 mark)

1 (c) The table shows the sequence of some of the electromagnetic waves in the electromagnetic spectrum.

Complete the table to show the correct sequence of the electromagnetic spectrum.

Radio waves
Microwaves
…….
……..
…….
…….
Gamma rays

(4 marks)

7

Turn over ▶

2 Chemists who work in a hospital may monitor samples of stomach acid from patients with very bad heartburn.

2 (a) The diagram shows some hazard warning symbols.

Which **two** symbols could be used to label a sample of stomach acid?

Tick (✓) **two** boxes.

(1 mark)

2 (b) Hospital chemists need to protect themselves from coming into contact with acids.

Suggest **two** safety precautions that a hospital chemist should take when working with stomach acids.

1 .....

2 .....

(2 marks)

2 (c) People with heartburn can take antacids to relieve their symptoms.

2 (c) (i) Why does the stomach work better if the contents are acidic?

.....

.....

(1 mark)

2 (c) (ii) Antacids work because they neutralise excess acid.

Complete the word equation for a neutralisation reaction.

acid + alkali ⟶ ..... + ...

(2 marks)

2 (d) A hospital chemist neutralises a stomach acid sample using a known alkali.

She uses a pH meter to find out when neutralisation is complete.

2 (d) (i) Describe how the hospital chemist could use the pH meter to decide when a sample of acid had been neutralised.

.....

.....

.....

.....

(2 marks)

2 (d) (ii) Which ion in stomach acid makes it acidic?

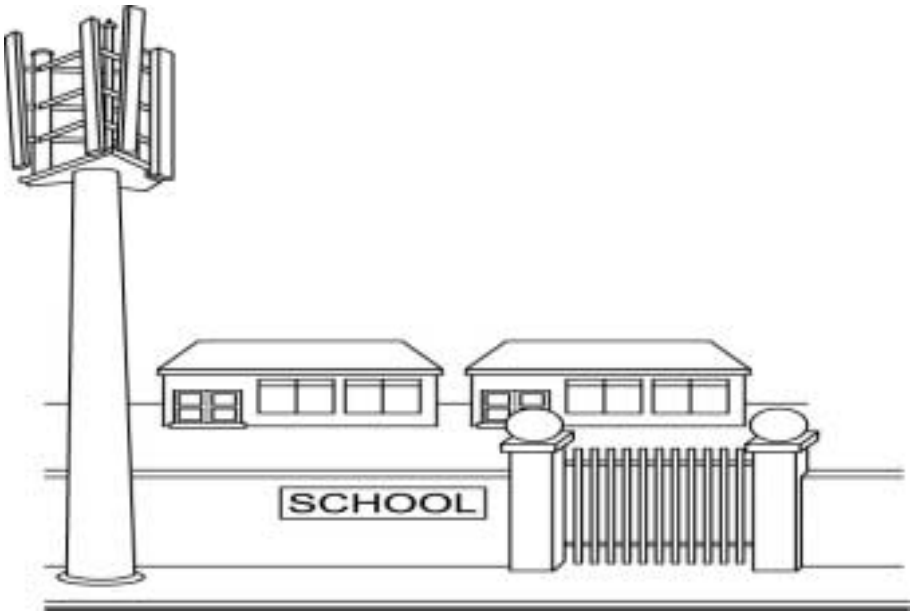
.....

(1 mark)

9

Turn over for the next question

3 Read the article below and answer the questions that follow.



Parents protest against mobile phone mast

Angry parents met yesterday to protest against a 3G (third generation) mobile phone mast being built next to their children's primary school.

Third generation phones require many more base stations to operate effectively. These transmit electromagnetic radiation at a higher frequency than for 2G (second generation) phones, with the highest concentrations within 400 m of the mast. One survey found that one-third of Britain's schools now have a mobile phone mast 200 m away or less.

3 (a) Why might the electromagnetic radiation that comes from 3G masts be more dangerous than the radiation from 2G masts?

.....

.....

(2 marks)

3 (b) At present, there is no scientific evidence that electromagnetic radiation from mobile phone masts is dangerous to health. Suggest why the parents are protesting.

Give **three** reasons.

1 .....

.....

2 .....

.....

3 .....

.....

(3 marks)

3 (c) The mobile phone company is concerned about the parents' protest, because it wants to attract more customers to buy 3G phones.

Suggest actions the mobile phone company should take to persuade the parents to stop their protest.

.....

.....

.....

.....

(2 marks)

7

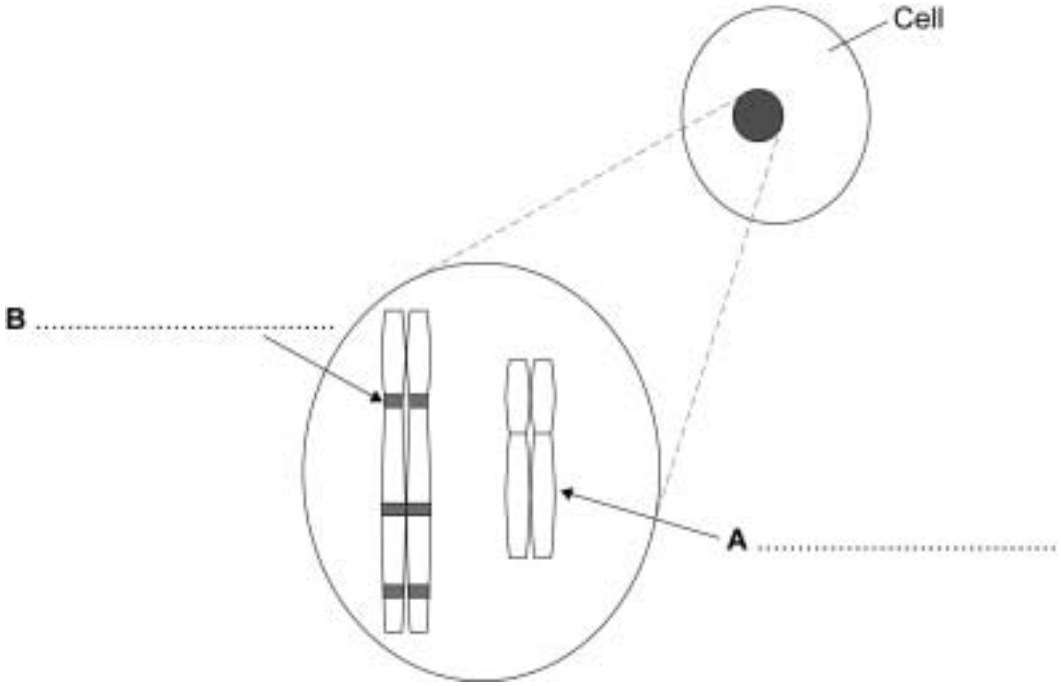
Turn over for the next question

4 Geneticists study how we inherit features from our parents.

Geneticists need to know about our cell structure.

4 (a) The diagram shows some structures within a cell.

Label the structures **A** and **B** shown on the diagram.



(2 marks)

4 (b) Some inherited diseases are caused by recessive alleles.

4 (b) (i) Genetic scientists can use a Punnett square to work out the probability of a child inheriting a disease.

The mother has one dominant and one recessive allele (**Aa**).

The father has one dominant and one recessive allele (**Aa**).

Draw a Punnet square to show how a child would inherit the disease.

Clearly indicate with an arrow the child that would inherit the disease.

(4 marks)

4 (b) (ii) What is the probability of the child inheriting the disease?

.....

(1 mark)

7

Turn over for the next question

5 Doctors help people with diabetes to keep their blood glucose at safe levels by managing their hormone levels.

5 (a) How does the body respond when blood glucose levels get too high?

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(5 marks)

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

A high body temperature is often a symptom of illness.

Use the idea of negative feedback to explain how the body keeps a constant temperature.

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(6 marks)

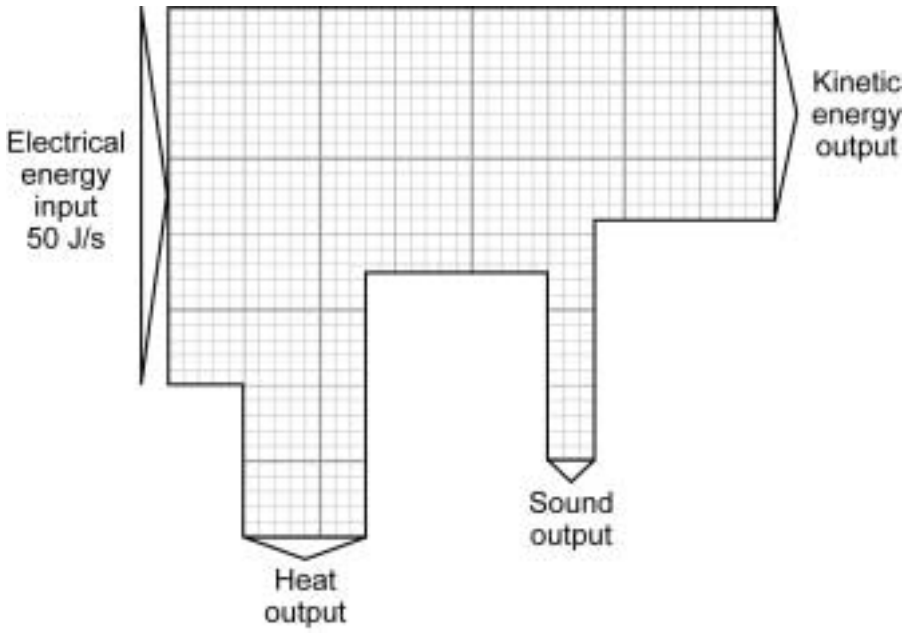
11

Turn over for the next question

6 Having more efficient electrical appliances in our homes saves money and can be better for the environment.

6 (a) We can use Sankey diagrams to show how efficient electrical appliances are.

This is a Sankey diagram for a small electric motor.



6 (a) (i) How much of the energy supplied to the electric motor is wasted?

..... J/s
(1 mark)

6 (a) (ii) Work out the **percentage** efficiency of the electric motor.

Show clearly how you work out your answer.

.....

.....

.....

.....

Percentage efficiency = ... %
(2 marks)

6 (a) (iii) Suggest an environmental reason why the percentage efficiency of the motor should be as high as possible.

.....

.....

.....

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(2 marks)

6 (b) A microwave oven has a power rating of 850 W.

If the microwave oven is turned on for 6 minutes, how much energy will it use?

Show clearly how you work out your answer.

State the units in your answer.

.....

.....

.....

.....

.....

(4 marks)

9

Turn over for the next question

7 Fuel scientists develop and blend fuels for use in motor vehicles.

A good fuel has the following characteristics:

- volatile
- easy to ignite
- produces a large amount of energy when it burns
- produces the minimum amount of pollution.

Information about some of the hydrocarbons that are found in petrol is given in the table.

Name	Chemical formula	Melting point in °C	Boiling point in °C
Butane	C_4H_{10}	–138	0
Pentane	C_5H_{12}	–130	36
Hexane	C_6H_{14}	–95	69

7 (a) (i) Which hydrocarbon in the table is a gas at room temperature?

.....

(1 mark)

7 (a) (ii) Hydrocarbons are compounds with low boiling points.

Explain why hydrocarbons have low boiling points.

.....

.....

.....

(2 marks)

7 (b) Heptane is a hydrocarbon. It has molecules containing 7 carbon atoms.

Suggest the chemical formula for heptane.

.....

(1 mark)

7 (c) A fuel scientist recommended increasing the amount of butane and decreasing the amount of hexane in petrol that is used in the UK in winter.

Use the information in the table to explain why.

.....

.....

.....

.....

(2 marks)

7 (d) Balanced equations for the complete combustion of butane and pentane are given below.

$$C_4H_{10} + 6^1/_2O_2 \rightarrow 4CO_2 + 5H_2O$$

$$C_5H_{12} + 8O_2 \rightarrow 5CO_2 + 6H_2O$$

7 (d) (i) Write a balanced equation for the combustion of hexane.

.....

(1 mark)

7 (d) (ii) Describe the pattern in the number of molecules in these equations.

.....

.....

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.....

(2 marks)

7 (e) Suggest why incomplete combustion occurs in a car engine.

.....

.....

(1 mark)

10

END OF QUESTIONS

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GCSE Science B Equations Sheet

Unit 2

power = potential difference × current
power = energy transferred ÷ time
total cost = number of kilowatt-hours × cost per kilowatt-hour
$\text{efficiency} = \frac{\text{useful energy out}}{\text{total energy in}}$
$\text{efficiency} = \frac{\text{useful power out}}{\text{total power in}}$
velocity = frequency × wavelength