



H

B621/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION
GATEWAY SCIENCE
SCIENCE B

Unit 1 Modules B1 C1 P1 (Higher Tier)

THURSDAY 5 JUNE 2008

Morning

Time: 1 hour



Candidates answer on the question paper.

Additional materials (enclosed):

None

Calculators may be used.

Additional materials: Pencil
 Ruler (cm/mm)



Candidate
 Forename

Candidate
 Surname

Centre
 Number

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Candidate
 Number

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INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

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

FOR EXAMINER'S USE		
Section	Max.	Mark
A	20	
B	20	
C	20	
TOTAL	60	

This document consists of **22** printed pages and **2** blank pages.

EQUATIONS

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

energy = mass \times specific heat capacity \times temperature change

energy = mass \times specific latent heat

fuel energy input = waste energy output + electrical energy output

power = voltage \times current

energy supplied = power \times time

energy (kilowatt hours) = power (kW) \times time (h)

wave speed = frequency \times wavelength

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Question 1 starts on page 4.

PLEASE DO NOT WRITE ON THIS PAGE

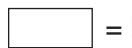
Answer **all** the questions.

Section A – Module B1

- 1 Karen sees a chart in a magazine.

The chart can be used to calculate the percentage of alcohol in her blood after she drinks some alcoholic drinks.

body mass in kg	units of alcohol drunk	percentage of alcohol in the blood								
		1	2	3	4	5	6	7	8	9
50	.04	.08	.11	.15	.19	.23	.26	.30	.34	
60	.03	.06	.09	.12	.16	.19	.22	.25	.28	
70	.03	.05	.08	.11	.13	.16	.19	.21	.24	
80	.02	.05	.07	.09	.12	.14	.16	.19	.21	
90	.02	.04	.06	.08	.11	.13	.15	.17	.19	
100	.02	.04	.06	.08	.09	.11	.13	.15	.17	
110	.02	.03	.05	.07	.09	.10	.12	.14	.15	
120	.02	.03	.05	.06	.08	.09	.11	.13	.14	



= below legal driving limit



= above legal driving limit

A single measure of spirits  or a half pint of beer  contains 1 unit of alcohol.

- (a) Karen drinks the following:



a single measure of spirits

a half pint of beer

a pint of beer

- (i) Work out the number of units that Karen has drunk.

answer units

[1]

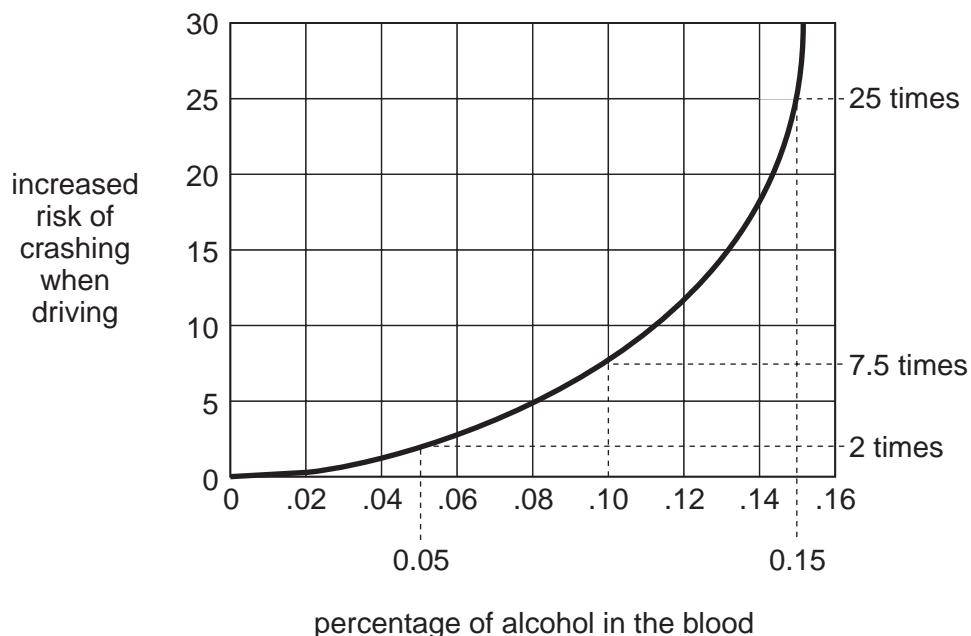
- (ii) Karen has a body mass of 90 kg.

Use the chart to find the percentage of alcohol in Karen's blood after drinking these drinks.

answer %

[1]

- (iii) This graph is from the same magazine.



Karen's friend Belinda has also been drinking alcohol.

The percentage of alcohol in her blood is 0.13%.

What advice would you give Belinda about driving after drinking these drinks?

Explain your answer using the chart and the graph.

.....
.....
.....

[2]

- (b) The alcohol in Belinda's blood could affect her driving.

Put a tick (✓) in the box next to the way that alcohol has this effect.

acting as a depressant by blocking her synapses

acting as a stimulant by increasing the efficiency of her receptors

acting as a stimulant by making her muscles contract

acting as a depressant by acting as a transmitter at her synapses

[1]

[Total: 5]

- 2 Garry likes eating peanuts.



He looks on the back of his peanut packet.

He finds a list of some of the nutrients that are found in the peanuts.

100 g of peanuts contains:

protein	7.4 g
carbohydrate	2.1 g
fat	15.9 g
fibre	1.8 g

- (a) When Garry eats the peanuts, they are digested in his digestive system.

- (i) Why do some of the nutrients need to be digested?

.....
.....

[1]

- (ii) Finish the sentences about how fat is digested in Garry's digestive system.

Fat digestion starts in the

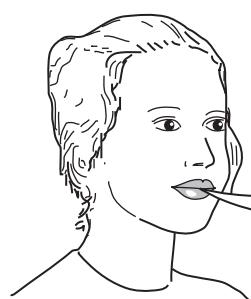
This is caused by the enzyme

The release of increases the rate of digestion by increasing the surface area of the fat droplets.

[3]

- (b) Garry has a friend Julie.

Julie is allergic to peanuts which makes her ill if she eats them.



If I eat peanuts, my body treats their proteins as foreign chemicals.

My white blood cells produce molecules that attack foreign chemicals.

Peanut proteins have many effects in my body. The small tubes carrying air to the air sacs in my lungs get narrower. It becomes very difficult for me to breathe.

Write down scientific words that mean the same as these words in Julie's description.

Choose your scientific words from this list.

acids antibiotics antibodies antigens

bronchioles capillaries trachea

- (i) the foreign chemicals
 (ii) the molecules that attack foreign chemicals
 (iii) the small tubes carrying air to the air sacs

[3]

[Total: 7]

- 3 Read the following description about a new discovery by scientists.

Then, answer the questions that follow.

Scientists have been investigating how ultraviolet (UV) radiation in sunlight can cause mutation. They have been shining UV radiation at the bases in DNA.

They have found that at least two of the bases, **C** and **T**, can take in the energy from UV light.

The bases then hold on to the energy for longer than originally thought.

The scientists think that this increases the chances of a mutation occurring.

- (a) The scientists found results for the bases **C** and **T**.

What letters represent the **other two** bases that are found in DNA?

..... and

[1]

- (b) When DNA absorbs energy, it might mutate.

How may the structure of DNA change in a mutation?

.....

..... [1]

- (c) Why can a mutation change how a cell functions?

.....

..... [1]

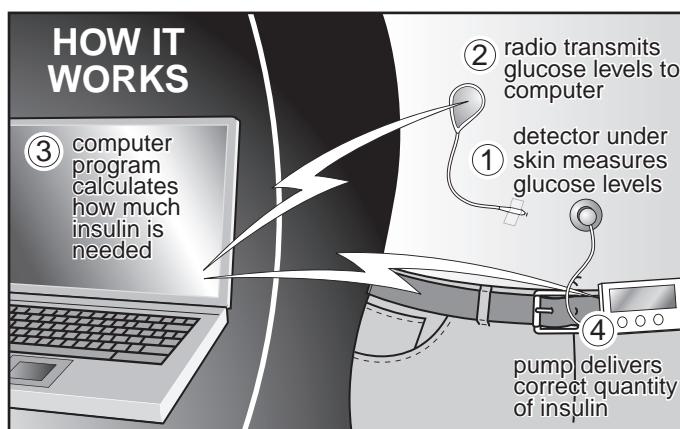
- (d) Radiation such as UV light can cause mutations.

Apart from UV radiation, write down **one other** cause of mutations.

..... [1]

[Total: 4]

- 4 Some people need to inject themselves with insulin. They need to know the correct dose of insulin needed. They have to prick their skin to get a drop of blood to measure their blood sugar level. Scientists have now developed a new system.



adapted from The Times, 6 November, 2006.

This system allows blood to be continuously monitored. The pump can then give the correct dose of insulin.

- (a) Why do some people need to take insulin?

..... [1]

- (b) What does insulin do in the body?

Put a tick (✓) in the box next to the correct answer.

converts excess glycogen in the liver to glucose

makes the cells in the pancreas take up less glucose

converts all the glucose in the blood into glycogen in the pancreas

converts excess glucose to glycogen in the liver

[1]

- (c) The new device adjusts the amount of insulin delivered to the person throughout the day and night.

Explain why the amount of insulin the body needs will vary at different times of the day and night.

.....
.....
..... [2]

[Total: 4]

Section B – Module C1

- 5 Some foods contain additives.

Look at the table. It gives some information about E numbers.

type of food additive	E number range
food colour	E101 to E199
preservative	E200 to E299
antioxidant	E300 to E321
emulsifiers and stabilisers	E322 and E400 to E499
sweeteners	E950 to E967

- (a) What type of food additive is E160?

..... [1]

- (b) Emulsifiers help oil and water to mix.

- (i) Write down the name of a food that contains an emulsifier.

Choose from the list.

lemonade

mayonnaise

orange squash

potato chips

answer [1]

- (ii) Describe how an emulsifier helps to keep the oil and the water from separating.

You may wish to draw a diagram.

.....

.....

..... [2]

- (c) **Active packaging** is used to improve the quality or safety of food.

Write down one example of how active packaging is used to improve the quality or safety of food.

..... [1]

- (d) Some foods must be cooked before they are eaten.

Write down **two** reasons why.

1

2

[Total: 7]

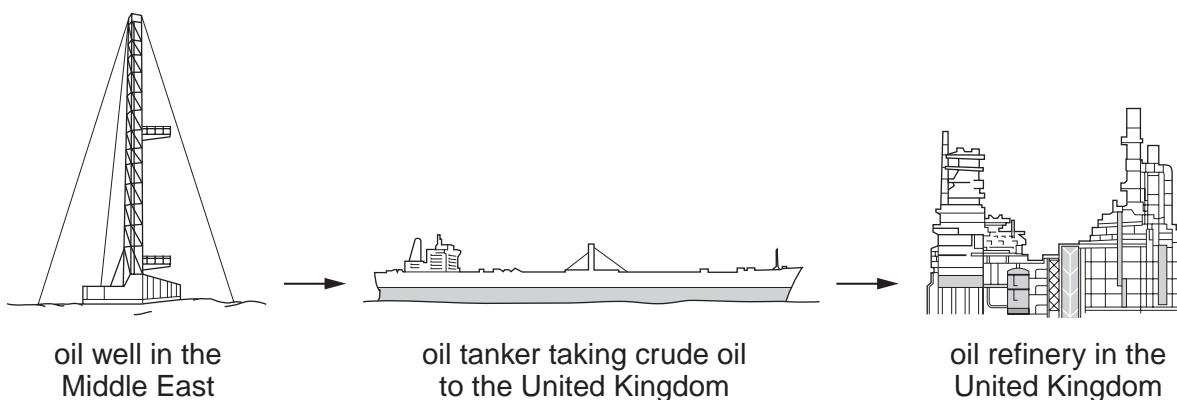
- 6 Crude oil is a fossil fuel that is found in the Earth's crust.
It is pumped to the surface in an oil well.

- (a) Crude oil is a **non-renewable** fuel.

Explain why.

..... [1]

- (b) Look at the diagram. It shows how crude oil is transported from an oil well to a refinery.



- (i) Crude oil is transported in a ship to oil refineries.
Sometimes these ships have accidents and crude oil spills out.
These spills make **oil slicks**.

Explain why oil slicks are a problem.

..... [1]

12

- (ii) One of the processes that happens in an oil refinery is fractional distillation.

Look at the table.

It shows the amount of each fraction made from 100 tonnes of crude oil.

It also shows the amount of each fraction needed for everyday uses.

fraction	amount made in tonnes	amount needed in tonnes
LPG	5	10
petrol	10	25
naphtha	10	5
paraffin	15	10
gas oil	5	5
fuel oil	40	30

Which fraction exactly matches the amount made to the amount needed?

Choose from the table.

..... [1]

- (iii) Another process that happens in an oil refinery is cracking.

Cracking converts large fractions into smaller fractions.

Explain why cracking is needed. Use the table to help you.

.....

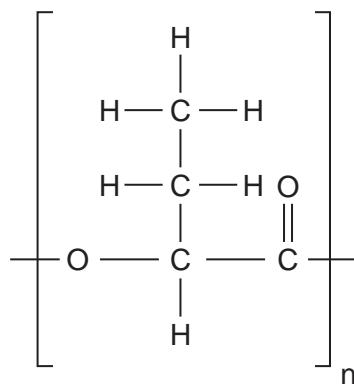
..... [2]

[Total: 5]

7 This question is about polymers.

(a) Look at the structure of a new polymer.

It is biodegradable.



This polymer is **not** a hydrocarbon.

Explain why.

.....

.....

[1]

(b) Gore-Tex® is used to make waterproof clothing.

It is made of nylon with an outer layer of PTFE / polyurethane.

The PTFE has small holes in it.

(i) The holes make Gore-Tex® waterproof and breathable.

Explain how.

.....

.....

[2]

(ii) The PTFE layer is combined with nylon.

Explain why.

.....

.....

[1]

[Total: 4]

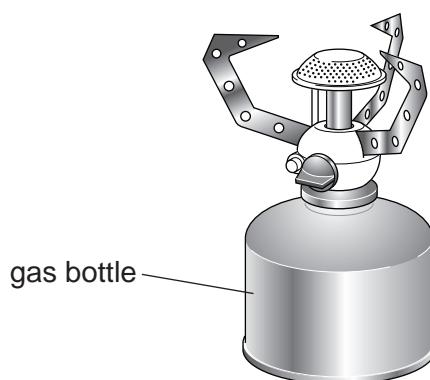
14

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- 8 This question is about fuels and combustion.

- (a) Look at the diagram of a camping stove.



A fuel is stored in the gas bottle.

Many factors need to be considered when choosing a fuel for this camping stove.

One factor is whether the fuel is expensive or not.

Write down **two** other factors that need to be considered.

1

2 [2]

- (b) Methane can be used as a fuel.

Methane, CH_4 , burns in oxygen, O_2 .

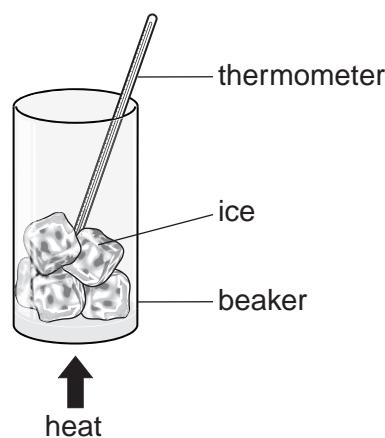
Carbon dioxide and water are made.

Write a balanced **symbol** equation for this reaction.

..... [2]

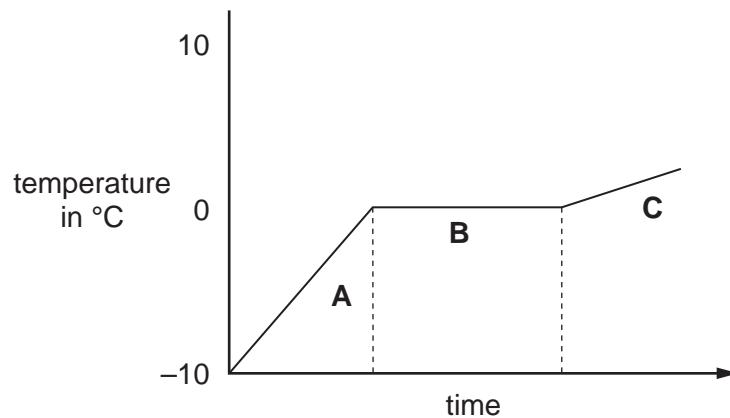
[Total: 4]

- 9 Dave collects some ice from the freezer.



He heats the ice with a Bunsen burner and measures the temperature.

Look at the graph of his results.



- (a) The ice melts in part **B**.

There is no change in temperature when the ice is melting even though the Bunsen burner is still heating the ice.

What is the energy from the Bunsen burner used for when the ice is melting?

.....

.....

.....

[2]

(b) Look at the energy statements **A**, **B**, **C** and **D** below.

- A** the energy needed to raise the temperature of 1 kg of ice by 1 °C
- B** the energy needed to heat ice
- C** the energy needed to melt 1 kg of ice
- D** the energy needed to cool ice

(i) Which letter describes the **specific latent heat** of ice?

Choose from the list.

A **B** **C** **D**

.....

[1]

(ii) Which letter describes the **specific heat capacity** of ice?

Choose from the list.

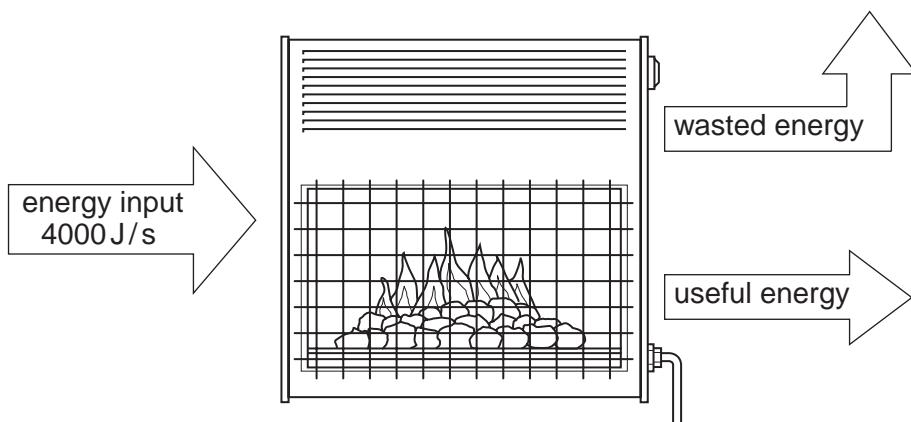
A **B** **C** **D**

.....

[1]

[Total: 4]

- 10 (a) Sandra uses a gas fire to heat her house.



The energy input to the fire is 4000 J each second.

Her gas fire is 80% efficient.

Some of the energy is wasted.

Calculate how much energy is **wasted** each second.

The equations on page 2 may help you.

.....
.....
.....

energy wasted each second = J

[3]

19

- (b) Look at the information about fitting insulation to Sandra's house.

insulation method	cost to fit in £	money saved each year in fuel bills in £	payback time in years
loft insulation	200	100	
double glazing		50	40
shiny foil behind radiators	5	10	0.5

- (i) Calculate the payback time for loft insulation.

.....

answer years [1]

- (ii) How much did it cost Sandra to fit double glazing?

.....

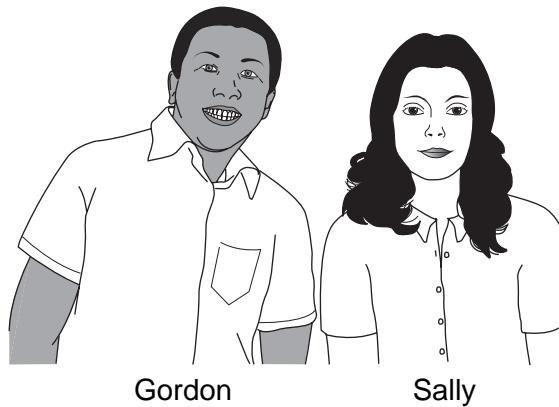
answer £ [1]

[Total: 5]

- 11 Exposure to the Sun can cause a suntan.

This exposure can also cause skin cancer.

Gordon and Sally like to sunbathe.



- (a) Gordon's skin is **darker** than Sally's.

Because of this, he has **less** chance of getting skin cancer.

Explain why.

.....
.....

[2]

- (b) Gordon and Sally decide to use sun cream.

Sally needs to know how long she can safely stay in the Sun.

Without sun cream, Sally can safely stay in the Sun for just 10 minutes.

She wants to stay in the Sun for 200 minutes.

Which sun factor cream should she use?

Choose from the list.

5 10 15 20

.....

[1]

21

(c) The ozone layer can protect people from harmful radiation.

(i) How does the **ozone layer** protect people?

.....

[1]

(ii) The ozone layer can be depleted.

What causes this?

.....

[1]

[Total: 5]

12 Microwaves are used for communication.

- (a) These waves have a high frequency.

What does frequency mean?

..... [1]

- (b) Mobile phones use microwave signals.

These **microwave signals** may cause problems.

Suggest **two** problems.

1

2

- (c) Television signals can be analogue or digital.

Some televisions only receive digital signals.

- (i) What is a **digital** signal?

..... [1]

- (ii) More information can be carried by digital signals than analogue signals.

Explain why more information can be carried.

..... [1]

- (iii) Digital televisions have better pictures than analogue televisions.

There is less interference with digital signals.

Explain why.

..... [1]

[Total: 6]

END OF QUESTION PAPER

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Copyright Acknowledgements:

Q.4 diagram Adapted from N. Hawkes, *The computer that could transform diabetics' lives* © The Times, London, 6 November 2006, www.timesonline.co.uk

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The Periodic Table of the Elements

1	2	3	4	5	6	7	0
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 aluminum 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
85 Rb rubidium 37	88 Sr strontium 38	93 Nb niobium 41	91 Zr zirconium 40	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45
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
[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	[268] Mt meitnerium 109
				[277] Hs hassium 108	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated

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Key

relative atomic mass
atomic symbol
atomic name (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.