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 4 JUNE 2009: 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) OV90663 10008/1

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 Elloise is ill and has a high temperature.

(a) A high temperature can damage the body.

(i) Write down ONE way that a high temperature can damage the body.

_____

_____ **[1]**

(ii) Elloise sweats.

This helps her body to cool down.

Describe how sweating helps her body to cool down.

_____

_____ **[1]**

(iii) Sweating to cool down is an example of HOMEOSTASIS.

What is meant by homeostasis?

_____

_____ **[1]**

(b) Elloise takes a pain killer.

Look at the list of drugs.

ANABOLIC STEROID

ASPIRIN

CAFFEINE

NICOTINE

TEMAZEPAN

Write down the name of ONE pain killer.

Choose your answer from the list.

_____ **[1]**

(c) Elloise goes to her doctor.

She asks for some antibiotics to treat her illness.

The doctor tells her that her illness is caused by a virus.

Should the doctor give Elloise antibiotics?

_____

Explain your answer.

_____

_____ **[1]**

(d) After a few days Elloise recovers from her illness.

This is because her white blood cells produce chemicals.

These chemicals lock onto the viruses and destroy them.

Look at the list.

ANTIBODY

ANTIGEN

GENE

TOXIN

VECTOR

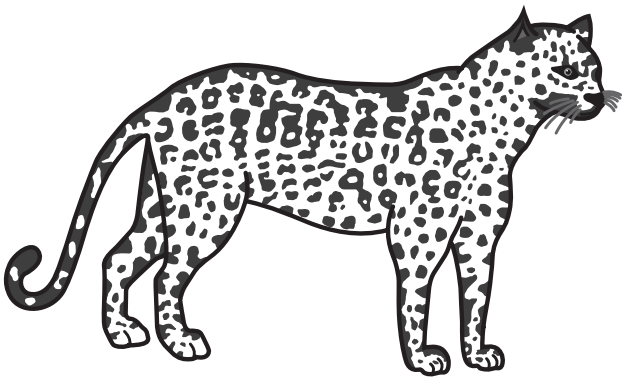
Which part of a virus do the chemicals from white blood cells lock onto?

Choose your answer from the list.

_____ **[1]**

[Total: 6]

2 This question is about leopards.



(a) Leopards have 38 chromosomes in each skin cell.

(i) How many chromosomes are in a leopard kidney cell? _____ [1]

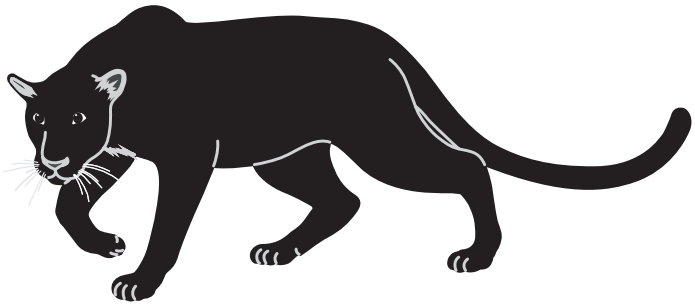
(ii) How many chromosomes are in a leopard sperm cell?_____ [1]

(b) Leopards usually have spotted fur.

However, some leopards are born with very dark fur.

These are called black panthers.

The dark fur is controlled by a recessive allele.



(i) What are <u>ALLELES</u>?

_____

_____ **[1]**

(ii) Two spotted leopards have a black panther cub.

Use a fully labelled genetic diagram to show how.

Use the symbol D for the allele for spotted fur.

Use the symbol d for the allele for dark fur.

[2]

[Total: 5]

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3 Chris is an athlete. He competes in several sports.

(a) Chris does archery.

When Chris aims, the lenses in his eyes change shape to focus light from the distant target.

The change in shape of the lenses is caused by the ciliary muscles and suspensory ligaments in his eyes.

Describe the changes that take place to focus light from the <u>DISTANT</u> target.

(i) How does the shape of the lenses change?

_____ **[1]**

(ii) How do the ciliary muscles change?

_____ **[1]**

(iii) How do the suspensory ligaments change?

_____ **[1]**

(b) Chris runs in a cross country race.

After he finishes the race he continues to breathe rapidly.

Explain why rapid breathing is needed to allow him to recover from the race.

_____

_____

_____

_____

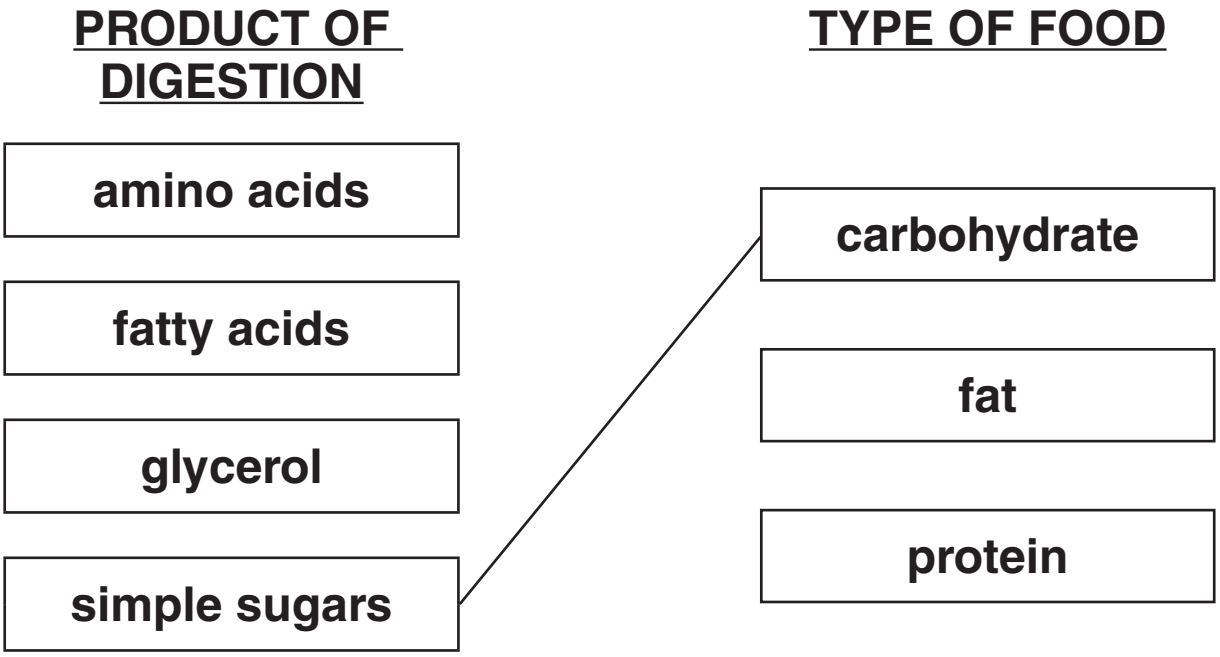
_____ **[3]**

(c) Chris eats a balanced diet.

(i) When Chris eats a meal, the food is chemically digested.

Draw straight lines from each PRODUCT OF DIGESTION to the TYPE OF FOOD it came from.

One line has been drawn for you. Draw THREE MORE.



[2]

(ii) Digestion breaks food down into smaller molecules.

Why is it important that food is digested?

_____

_____ **[1]**

[Total: 9]

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SECTION B – MODULE C1

4 This question is about food additives.

Emulsifiers and flavour enhancers are two types of food additive.

(a) Emulsifiers help oil and water to mix and not separate.

Write down ONE food that contains an emulsifier.

_____ [1]

(b) Monosodium glutamate (MSG) is a flavour enhancer.

It is added to potato crisps.

Explain why.

_____

_____ [1]

(c) (i) Sodium hydrogencarbonate is a raising agent.

It helps cakes to rise when they are cooked.

A gas called carbon dioxide is made.

What is the chemical test for carbon dioxide?

Test _____

Result of test _____ [2]

(ii) Sodium hydrogencarbonate, $NaHCO_3$, breaks down when it is heated.

Sodium carbonate, Na_2CO_3, carbon dioxide, CO_2, and water, H_2O, are made.

Write a balanced <u>SYMBOL</u> equation for this reaction.

_____ **[2]**

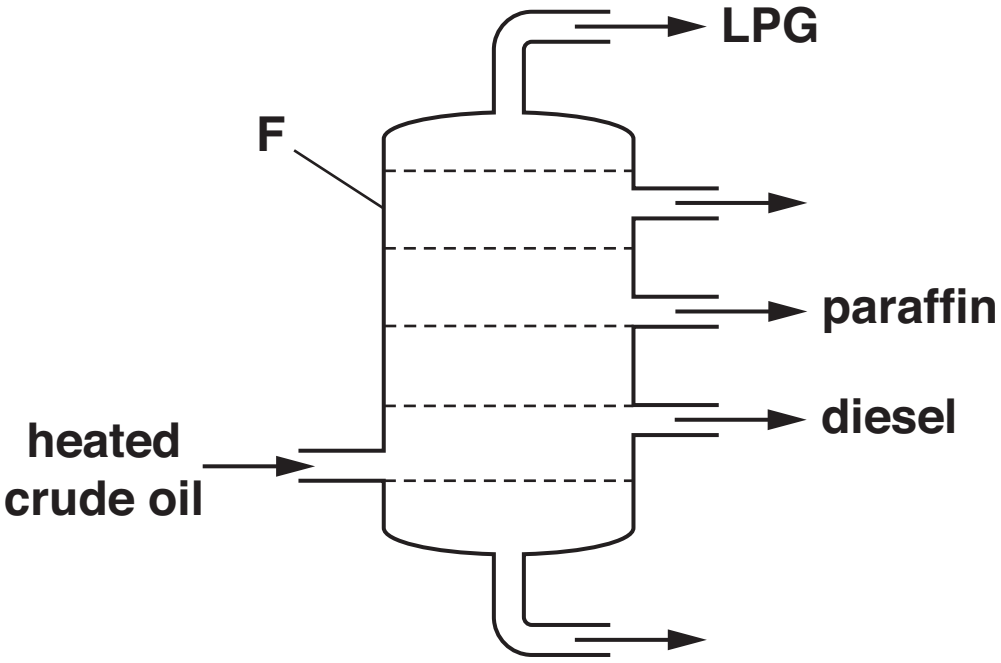
[Total: 6]

5 This question is about fuels.

Crude oil can be separated into fractions.

The process is called fractional distillation.

Look at the diagram. It shows how crude oil is separated.



(a) Write down the name of apparatus F.

_____ **[1]**

(b) Place an X on the diagram to show the COLDEST part in apparatus F.

Your X should be INSIDE apparatus F. [1]

(c) Diesel has a higher boiling point than LPG.

What is the relationship between boiling point and molecular size?

_____

_____

Explain this relationship in terms of forces between molecules.

_____

_____ **[2]**

[Total: 4]

6 This question is about esters.

Esters are useful substances. They can be used to make perfumes and solvents.

(a) Look at the list.

ALCOHOL

ALKANE

POLYMER

PROTEIN

WATER

Complete the word equation to show how an ester is made.

Use words from the list.

acid + _____ → ester + _____ [2]

(b) Ethyl ethanoate is an ester. It is used to remove nail varnish.

Water cannot be used to remove nail varnish.

Explain why water will not dissolve nail varnish.

Use ideas about

- **the force of attraction between water molecules**

_____

_____

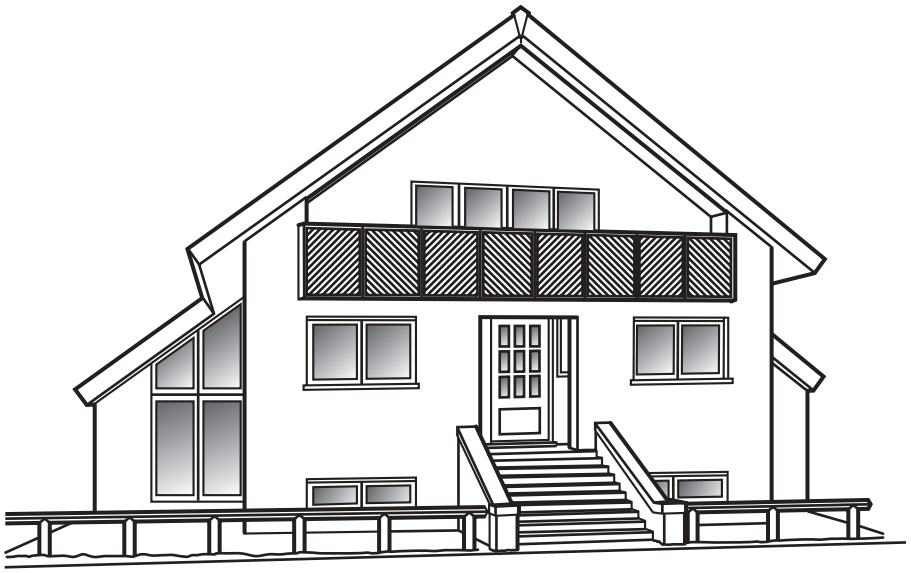
- **the force of attraction between water molecules and the particles in nail varnish.**

_____

_____ **[2]**

[Total: 4]

7 Phil wants to choose a fuel to heat his house.



(a) Two factors Phil needs to think about when choosing a fuel are

- **the cost of the fuel**
- **the energy released by the fuel.**

Write about <u>OTHER</u> factors which Phil needs to think about.

_____

_____

_____

_____ **[2]**

(b) The amount of fossil fuels burnt each year worldwide is increasing.

Write down <u>ONE</u> reason why.

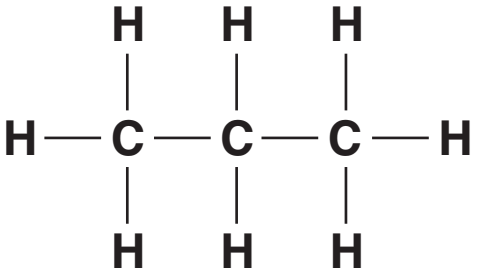
_____

_____ **[1]**

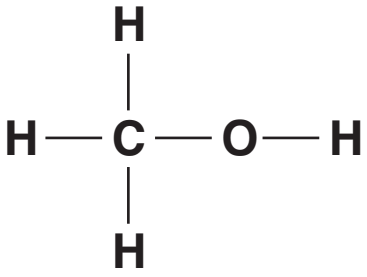
[Total: 3]

8 This question is about carbon compounds.

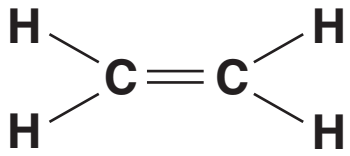
Look at the displayed formulas.



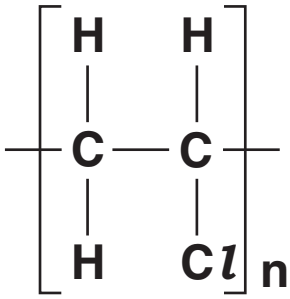
propane



methanol



ethene



poly(chloroethene)

carbon dioxide

(a) Which compound is a <u>SATURATED</u> hydrocarbon?

_____ **[1]**

(b) The molecular formula of ethene is C_2H_4.

Write down the molecular formula of methanol.

_____ **[1]**

(c) Poly(chloroethene) is a polymer.

Look at the displayed formula of poly(chloroethene).

Poly(chloroethene) is made from a monomer called chloroethene.

Draw the displayed formula of chloroethene.

[1]

[Total: 3]

SECTION C – MODULE P1

9 Justin is eating a meal.

The temperature of the ROOM is 20 °C.

(a) Justin notices two things

- **his meal cools down**
- **his drink warms up.**

(i) Explain why his meal cools down.

_____ **[1]**

(ii) Explain why his drink warms up.

_____ **[1]**

(b) Temperature is measured in degrees Celsius (°C).

Heat is measured in joules (J).

Complete the following two sentences.

Choose from

CAPACITY COLDNESS

ENERGY HOTNESS MASS

Temperature is a measure of the

_____ of an object.

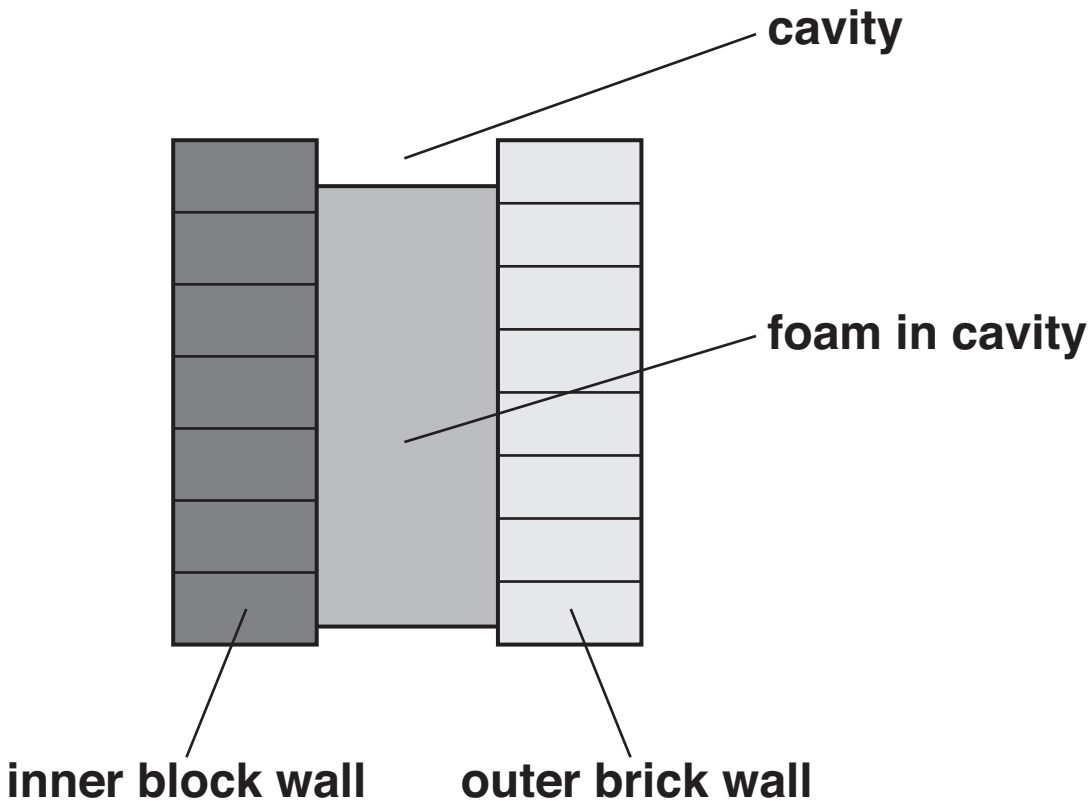
Heat is a measurement of the _____

in an object. **[2]**

[Total: 4]

10 The outer and inner walls of a house have a gap between them.

The gap is called the <u>CAVITY</u>.



(a) The cavity is often filled with <u>FOAM</u>.

This reduces the heat loss from the house.

Explain how.

_____

_____

_____ **[2]**

(b) In older houses the cavity in the wall is NOT filled with foam.

The cavity contains air.

Explain how heat energy is lost through the wall.

through the brick _____

_____

in the cavity _____

_____ **[2]**

[Total: 4]

11 Microwaves are used to cook food in a microwave oven.

(a) Explain how the microwaves cook the food.

In your answer write about

- **particles**
- **energy**
- **how the centre of the food gets cooked.**

_____

_____

_____

_____ **[3]**

(b) Microwaves with a higher <u>FREQUENCY</u> are used.

Suggest how the <u>ENERGY</u> of the microwaves changes.

_____ **[1]**

[Total: 4]

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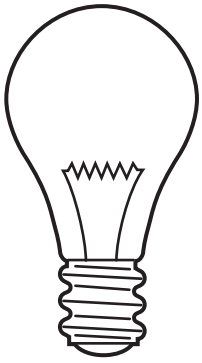
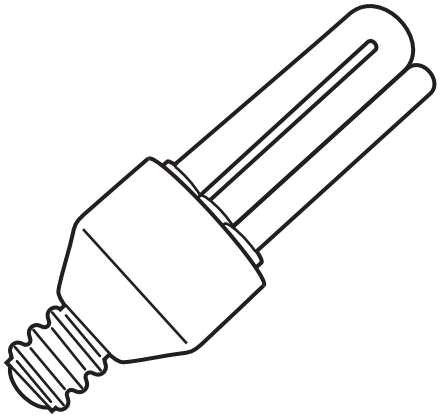
12 Diane has two types of electric light bulbs in her house.



filament bulb



low energy bulb

(a) Diane finds the diagram opposite from a website.

It shows the energy INTO and OUT OF a filament bulb.

Calculate the efficiency of the filament bulb.

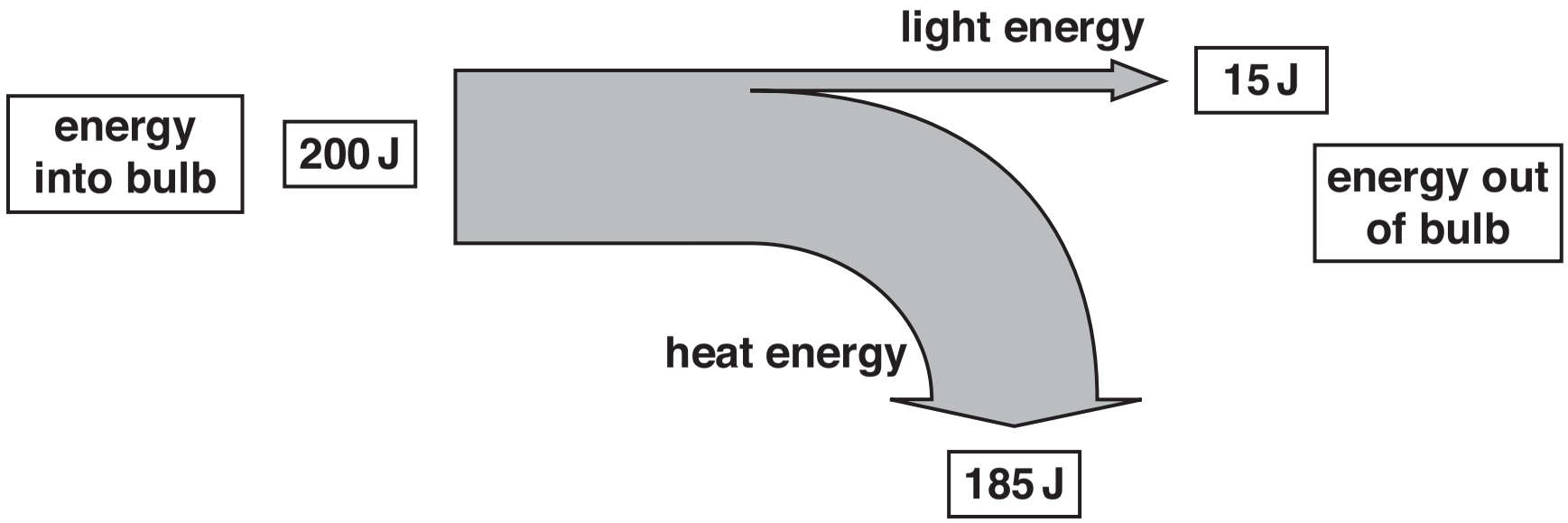
The equations on page 3 may help you.

_____

_____

_____

answer _____ [2]


energy into bulb
200 J
light energy
15 J
energy out of bulb
heat energy
185 J

(b) Diane replaces all of the bulbs in her house with low energy bulbs.

This costs her £150.

She now saves £30 each year on electricity.

Calculate the <u>PAYBACK</u> time for the energy saving bulbs.

_____

_____

_____

answer _____ years [2]

[Total: 4]

13 (a) Radio waves can be transmitted over long distances.

One method uses layers in the Earth's atmosphere.

(i) Explain how the radio waves return to Earth.

_____

(ii) Which part of the atmosphere causes the waves to return to Earth?

_____

[2]

(b) Microwaves are used for wireless communication.

Look at this information about microwaves

- **a microwave has a <u>WAVELENGTH</u> of 0.1 metres**
- **it also has a <u>FREQUENCY</u> of 3 000 000 000 hertz.**

Calculate the <u>SPEED</u> of the microwaves.

The equations on page 3 may help you.

_____

_____

_____

answer _____ metres per second [2]

[Total: 4]

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.