

GENERAL CERTIFICATE OF SECONDARY EDUCATION
APPLIED SCIENCE: DOUBLE AWARD

Unit 2: Science for the needs of society
 HIGHER TIER

TUESDAY 17 JUNE 2008

Morning
 Time: 1 hour

Candidates answer on the question paper
Additional materials (enclosed): None

Additional materials (required):
 Calculators may be used
 Pencil
 Ruler (cm/mm)



Candidate Forename

Candidate Surname

Centre Number

Candidate Number

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**.
- The marks allocated and the spaces provided for your answers are a good indication of the length of answers required.

FOR EXAMINER'S USE

Qu.	Max.	Mark
1	9	
2	9	
3	11	
4	12	
5	11	
6	8	
TOTAL	60	

This document consists of **14** printed pages and **2** blank pages.

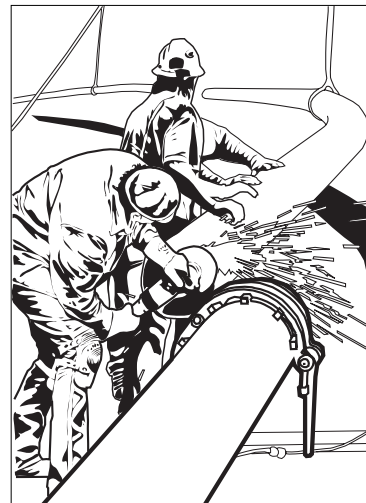
Answer **all** the questions.

- 1 This news report is about a new gas pipeline that opened in 2006.

The Daily News October 2006

GAS PIPELINE TO CUT FUEL PRICES

This week, the world's longest gas pipeline started to carry methane gas from Norway to Easington on the east coast of the UK. The pipeline will carry 20% of all the gas supplies needed in the UK. The extra supply is expected to make fuel gas prices cheaper.



- (a) The pipeline carries methane gas.

Methane is an organic gas that is a very good fuel.

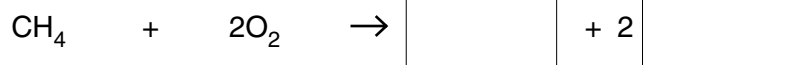
It gives out a lot of energy when it burns.

- (i) Complete the symbol equation to show what happens when methane burns.

word equation

methane + oxygen → carbon dioxide + water

symbol equation

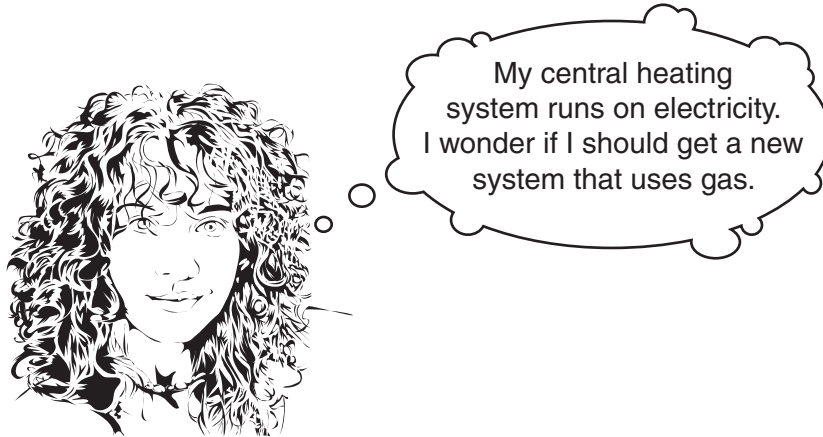


[1]

- (ii) Explain why methane is called an **organic** gas.

.....
 [1]

- (b) Liz reads the news report. She wonders whether she should change her central heating system.



What other information does Liz need to think about before she decides to switch to gas?

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

- (c) The news report explains how the pipeline was made.

Building the pipeline used up 1/3 of the total iron produced in the world in 2005. Some of the iron ore used to produce the iron was quarried in Norway. Local people objected to the increased quarrying, but it went ahead anyway. Steel is an ideal material to use because the pipeline needs to last under the sea for about 50 years.

- (i) The article says that people objected to the increased quarrying of iron ore.

What problems does quarrying cause?

.....
.....
..... [3]

- (ii) Suggest **two** properties that would be important to think about when choosing the material to make the pipeline.

1.
2. [2]

[Total: 9]

[Turn over

2 Max works in a planetarium.

The planetarium projects images of the stars in the night sky onto the ceiling of a dome.



One of Max's jobs is to give a talk to the visitors.

(a) Max tells the visitors about the different types of telescopes used by astronomers.

(i) Two new types of telescope use X-rays and gamma rays.

Write down **two** differences between the wave properties of X-rays and gamma rays.

difference 1

difference 2 [2]

(ii) Name **two** other types of telescope.

1.

2. [2]

(b) Max also has to describe different objects in the sky.

Write a short speech Max could use to tell customers about **stars**, **galaxies** and **the solar system**.

You should explain what each object is.

.....

.....

.....

.....

..... [4]

(c) Max often finds people do not understand about light-years.

Which **one** of the following statements is correct?

Put a tick (✓) in the correct box.

- light-years are a unit of time
- light-years are a unit of brightness
- light-years are a unit of distance

[1]

[Total: 9]

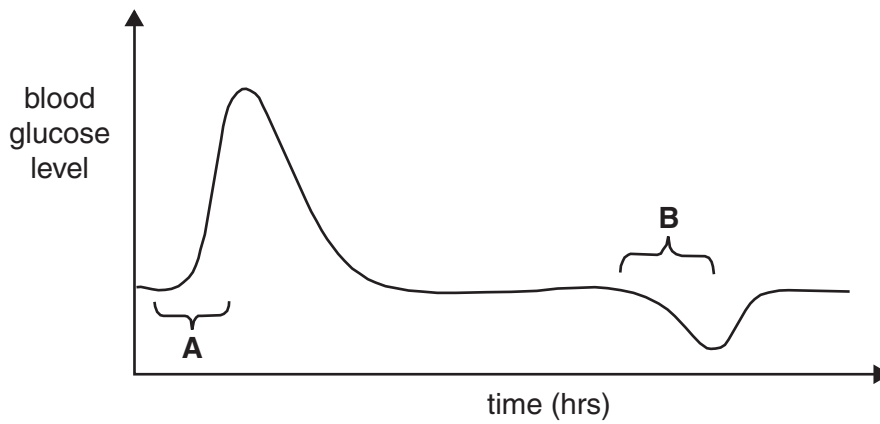
3 John has diabetes.

He has been given a new device that will measure his blood glucose levels.



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(a) The graph shows how John's blood glucose level changed during a morning.



Suggest what John was doing at times **A** and **B**.

time **A**

time **B** [2]

(b) One treatment for diabetes is to inject insulin.

(i) When John was first diagnosed with diabetes he was not given insulin.

Suggest the treatment that John used to control his diabetes **without** using insulin.

..... [1]

(ii) This treatment did not work well. John then used insulin injections.

Explain **one** way in which insulin controls blood glucose levels.

You should include in your answer,

- what happens to the glucose
- where it happens
- the overall effect on blood glucose concentration.

.....

.....

.....

..... [3]

(c) The instructions for the device say that, “The control of blood glucose levels is an example of homeostasis”.

What is meant by homeostasis?

.....

..... [2]

(d) John uses a sharp needle to prick his finger to get a drop of blood for his device.

Sometimes his finger twitches when he pricks his finger.

This is a reflex action.

A reflex action involves many body parts.

- A spinal cord
- B brain
- C receptor
- D muscle
- E motor neurone
- F sensory neurone

Put the letters of the body parts in the order a nerve impulse will travel in a reflex arc.

One should **not** be used.

One has been done for you.

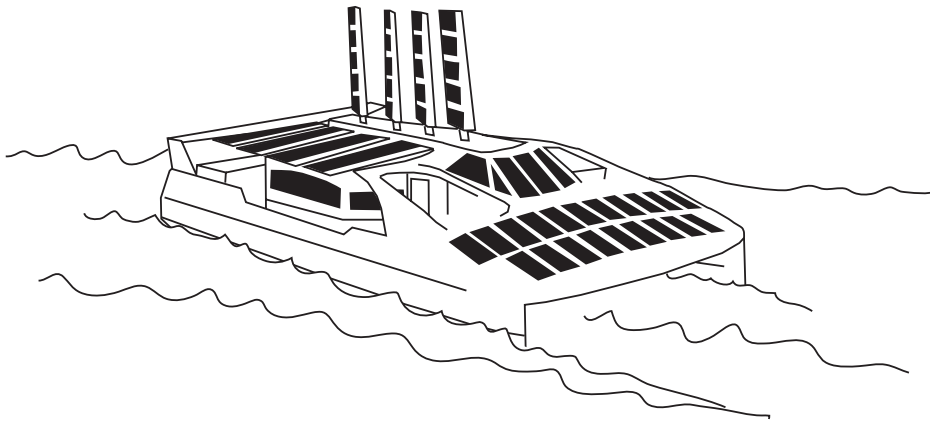


[3]

[Total: 11]

[Turn over

4 A new type of passenger ferry has been built to take passengers from San Francisco to Alcatraz.



The ferry has solar panels on its roof.

The panels can be moved up to make sails.

Electricity produced by the solar cells is stored in batteries.

The ferry also has a small engine that uses diesel fuel.

(a) (i) What three energy **sources** are used to provide the power to move the ferry?

1.

2.

3.

[1]

(ii) Which of these energy sources is non-renewable?

..... [1]

(b) The ferry has a small diesel engine.

Explain why the diesel engine is needed.

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

(c) (i) The solar panels are not very efficient.

One solar panel receiving 1000J of solar energy will only produce 120J of electrical energy.

Calculate the efficiency of the solar panel.

You must show your working.

efficiency = % [3]

(ii) Some scientists say that using solar cells is not necessarily good for the environment.

Suggest **two** ways, other than efficiency, that solar cells may not be a good energy source.

- 1.
.....
- 2.
..... [2]

(d) The batteries that store the electrical energy also provide electrical power to the ferry motor.

The batteries have a voltage of 12V.

If the motor is using 360W of electrical energy, what is the electric current?

You must show your working.

current = amps [3]

[Total: 12]

5 A bioscience company wants to produce a new variety of bean plant.



(a) (i) The company wants the new variety of bean plant to survive in very dry conditions.

Describe the main stages involved in producing the new variety of bean plant by **selective breeding**.

.....
.....
.....
.....
.....
..... [3]

(ii) A selective breeding programme could result in a reduction of the gene pool.

What problems might this lead to?

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

(b) Another company is trying to produce a similar plant by genetic engineering.

When genetic engineering is used the following four actions must be carried out.

- A isolation of genes
- B insertion of genes
- C selection of desired genes
- D replication of genes

What is the correct order for these actions?

first

--	--	--	--

 last

[3]

(c) The genetic engineering company produced the new bean plant and started to sell it to farmers.

The farmers in very dry regions are pleased because they are now able to grow beans.

Some people object to genetically modified crops.

Should the genetically engineered beans be planted?

You must include advantages and disadvantages in your answer.

.....
.....
.....
..... [3]

[Total: 11]

6 Sea water is one of the most common materials on the Earth.

Sea water is made up of water and dissolved salts.

The properties of the water and salts are very different.

One reason for this is because they have different types of chemical bond.

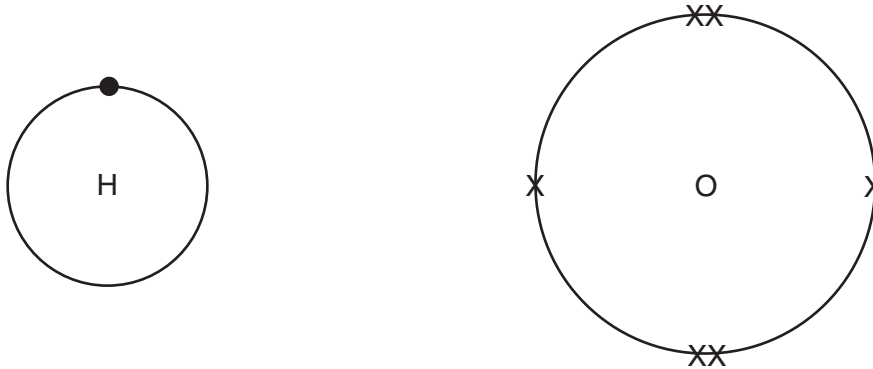
(a) Water molecules are made up of atoms of hydrogen and oxygen.

(i) In the water molecule, electrons are shared between the atoms.

What is this type of bond called?

..... [1]

(ii) These dot and cross diagrams of hydrogen and oxygen atoms show the electrons in the outer shell.



Draw a dot and cross diagram to show the bonds in a molecule of water.

[2]

(iii) Write the balanced chemical equation for the reaction of hydrogen gas, H_2 , with oxygen gas, O_2 , to produce water.

[2]

(b) The salts from seawater have ionic bonds, for example, sodium chloride.

Describe how an ionic bond is formed.

You should include ideas about electrons, ions and charge.

You may use diagrams in your answer.

.....

.....

.....

..... [3]

[Total: 8]

END OF QUESTION PAPER

14
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15
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