General Certificate of Secondary Education
June 2006

SCIENCE: SINGLE AWARD B (CO-ORDINATED)   3463/3F
Paper 3
Foundation Tier   **F**

Friday 16 June 2006   9.00 am to 9.45 am

For this paper you must have:
- a ruler

You may use a calculator.

Time allowed: 45 minutes

Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.
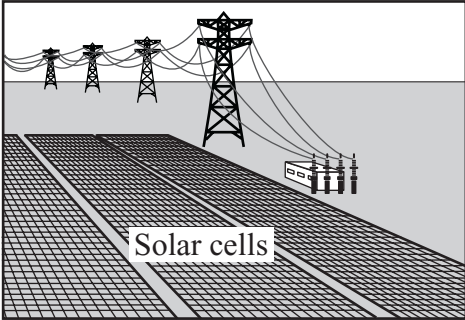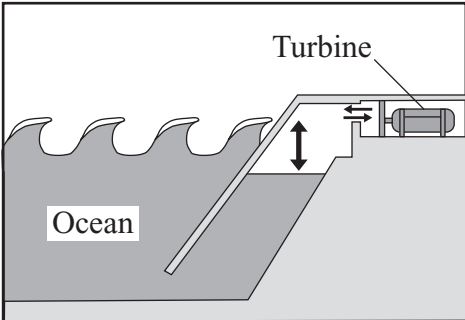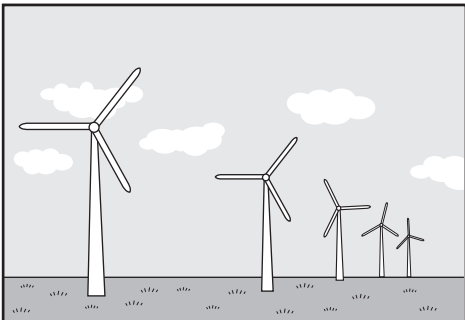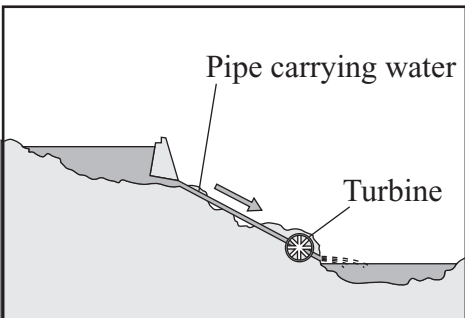
Information
- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

A Q A
ASSESSMENT and
QUALIFICATIONS
ALLIANCE

3463/3F

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

1 (a) The diagrams show four types of power station. Each one uses a different energy resource to generate electricity.

Draw straight lines to link each power station to its energy resource. Draw only **four** lines.

Power station

Energy resource

Solar cells

Falling water

Turbine

Ocean

Geothermal

Sunlight

Waves

Pipe carrying water

Turbine

Wind

(4 marks)

(b) A coal-burning power station generates 1000 million watts of power. A solar power station generates 250 million watts of power.

How many solar power stations would be needed to replace one coal-burning power station?

....

(1 mark)

(c) Electricity is generated at nuclear, coal or natural gas power stations.

(i) Which **one** of these power stations does **not** produce any waste gases?

....

(1 mark)

(ii) Which **one** of these power stations has the shortest start-up time?

....

(1 mark)

$$\boxed{7}$$

Turn over for the next question

Turn over ▶

2 (a)   The diagram shows a person using a sunbed.
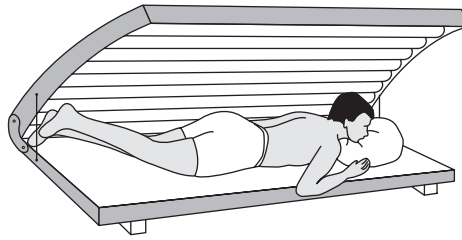
(i)   Which type of radiation is used in a sunbed to give a suntan?

Draw a ring around your answer.

infra red   light   microwave   ultraviolet

(1 mark)

(ii)   What can a high dose of radiation from a sunbed do to living cells?

....

....

(1 mark)

(b)   The box contains the information shown on the side of a sunbed.

230 V	**1.8 kW**
50 Hz	**7.8 A**

(i)   Which **one** of the following statements is true? Put a tick (✓) in the box next to your choice.

The sunbed uses an alternating current (a.c.) electricity supply. ☐

A 5 amp fuse should be used in the plug of the sunbed. ☐

The sunbed transfers 1.8 joules of energy every second. ☐

(1 mark)

(ii)   In one week the sunbed is used for a total of 6 hours.

Use the following equation to calculate the number of units of energy transferred by the sunbed in 6 hours.

Show clearly how you work out your answer.

energy transferred   =   power   ×   time
(kilowatt-hour, kWh)   (kilowatt, kW)   (hour, h)

....

....

Energy transferred = ... kWh

(2 marks)

5

Turn over ▶

3　(a)　Read the following statements.

J　–　It is made up of at least a billion galaxies.

K　–　It is one of the stars in the Milky Way.

L　–　It is a slightly squashed circle.

M　–　It keeps the Moon in orbit around the Earth.

N　–　It is a large number of stars grouped together.

O　–　It is the explosion of a massive star.

Which statement, **J**, **K**, **L**, **M**, **N** or **O**, describes:

(i)　the force of gravity;　　　　　　　　　　　Letter ....
(1 mark)

(ii)　the Sun;　　　　　　　　　　　　　　　Letter ....
(1 mark)

(iii)　the Universe;　　　　　　　　　　　　Letter ....
(1 mark)

(iv)　a supernova?　　　　　　　　　　　　Letter ....
(1 mark)

(b)   The Sun is in the main stable stage of its lifecycle.

(i)   How long will the Sun be in this stage of its lifecycle? Put a tick (✓) in the box next to your choice.

Hundreds of years

Thousands of years

Millions of years

Billions of years

(1 mark)

(ii)   Describe what will happen to the Sun after it has reached the end of the main stable stage of its lifecycle. The answer has been started for you.

At the end of the stable stage of its lifecycle the Sun will expand

....

....

....

....

....

....

(3 marks)

8

Turn over for the next question

Turn over ▶

4 (a) The diagrams, **A**, **B** and **C**, represent three different nuclei.

Diagram A　　　　**Diagram B**　　　　**Diagram C**

| 2 protons ⊕ | 3 protons ⊕ | 2 protons ⊕ |
| 4 neutrons ○ | 3 neutrons ○ | 2 neutrons ○ |

(i) Which **two** nuclei are isotopes of the same element?

.... and ....
(1 mark)

(ii) Which **two** nuclei have the same mass number?

.... and ....
(1 mark)

(iii) Give a reason for your choice of answer to part (a)(ii).

....

....
(1 mark)

(b) The tables below give examples of some stable nuclei and some unstable nuclei.

Stable nuclei	Unstable nuclei
boron-11	boron-12
carbon-12	carbon-14
oxygen-16	oxygen-15
lead-207	lead-209

(i) Write down, from the tables, the names of **two** radioactive nuclei.

.... and ....

(1 mark)

(ii) Write down, from the tables, the names of **two** non-radioactive nuclei.

.... and ....

(1 mark)

(c) Complete the following sentence by crossing out the **two** words in the box that are wrong.

The lungs of a person who has breathed in a radioactive gas will be most

damaged if the gas gives out
| alpha |
| beta |
| gamma |
radiation.

(1 mark)

6

Turn over for the next question

Turn over ▶

5   The diagram shows how a student joined several components, including a 6-volt lamp and four identical 1.5 volt cells, in a circuit.
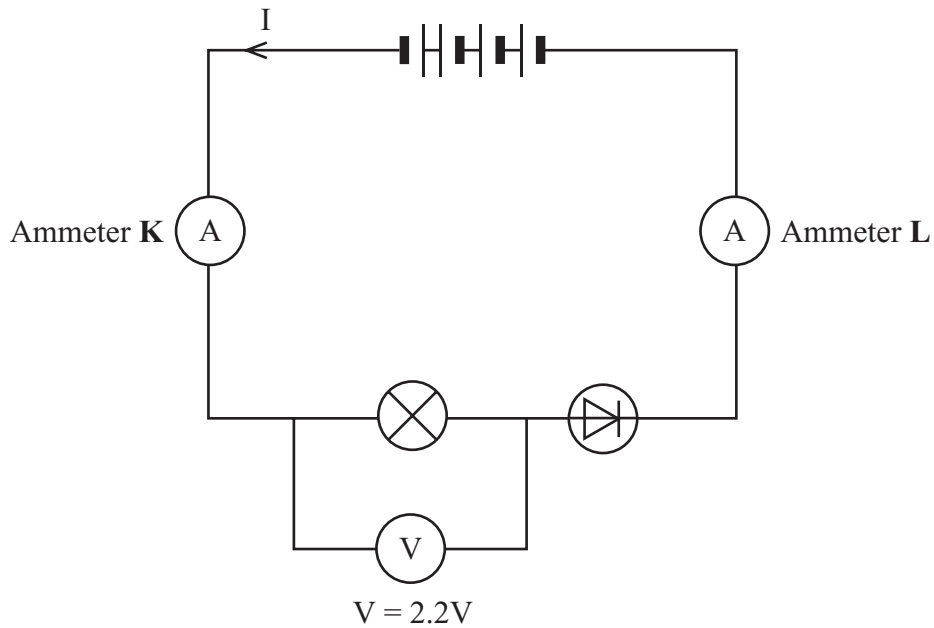
(a)   The reading on ammeter **K** is 0.05 A.

What is the reading on ammeter **L**?

....
(1 mark)

(b)   The student expected the lamp in the diagram to be much brighter and the reading on the voltmeter to be 6 volts.

(i)   Give **two** reasons why the reading on the voltmeter is much less than 6 volts. The voltmeter is working correctly.

1...

....

2...

....
(2 marks)

(ii) The student decides that the lamp is dim because the diode is connected the wrong way round. When the student reverses the connections to the diode the lamp goes out.

Explain why.

....

....
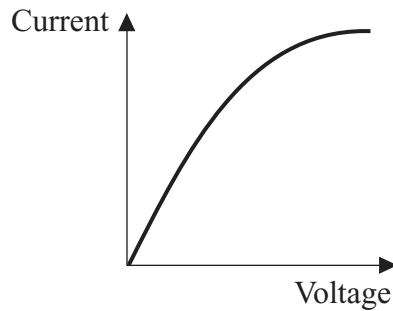
....

....

(2 marks)

(c) The graph shows how the current through a filament lamp changes as the voltage (potential difference) across it changes.

Explain why the graph is not a straight line.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

....

....

....

....

....

....

....

(4 marks)

9

Turn over ▶

6 (a) The diagram shows water waves made by a wave machine in a swimming pool.

In 10 seconds 5 complete waves go past a person standing in the pool.

Calculate the frequency of the water waves and give the unit.

Show how you work out your answer.

....

Frequency = ...

(2 marks)

(b) Water waves are transverse waves.

Give **one** other example of a transverse wave.

....

(1 mark)

(c) How is a transverse wave different from a longitudinal wave? You may draw a diagram to help you with your answer.

....

....

....

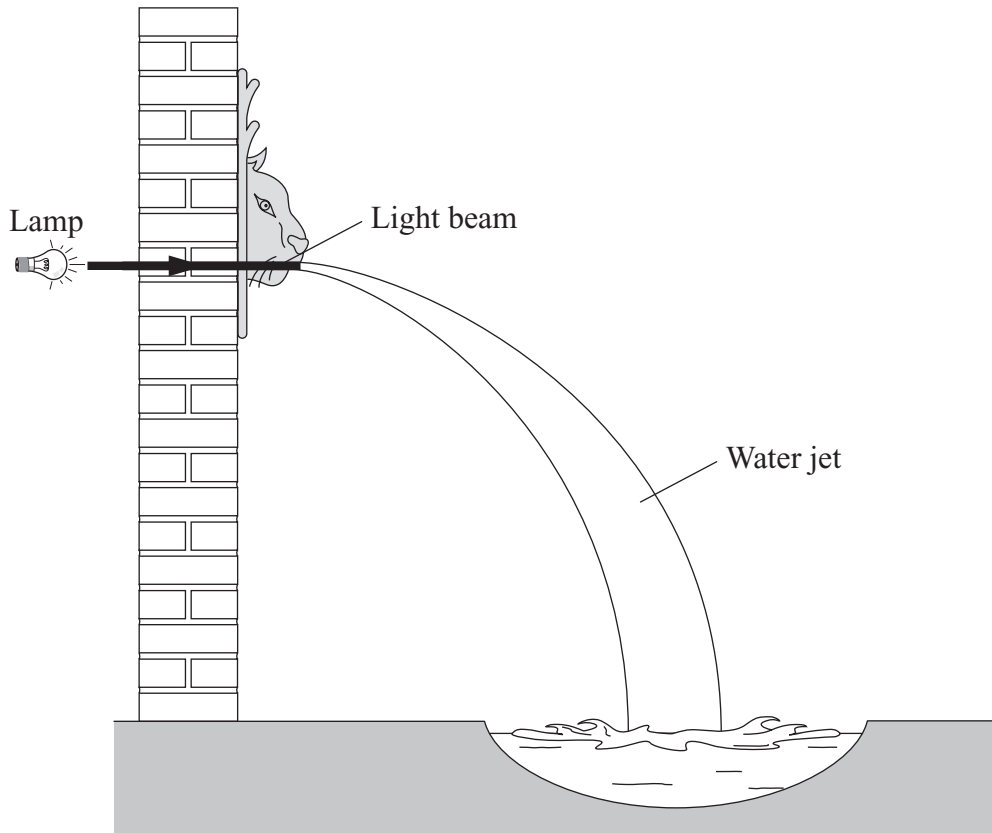...

(2 marks)

(d)   The diagram shows a garden fountain. The fountain features a light beam that is totally
internally reflected by the water jet.

Lamp

Light beam

Water jet

(i)   Draw the path of the light beam through the water jet.   *(1 mark)*

(ii)   Complete the following sentence by crossing out the **two** lines in the box that are
wrong.

For light to be totally internally reflected the angle between the light ray and the

normal must be
smaller than
equal to
bigger than
the critical angle.

(1 mark)

7

Turn over ▶

7 Converting sound waves into electrical signals allows information to be sent over long distances.

The diagram shows three analogue signals and one digital signal.

U

V

W

X

(a) Which signal, **U**, **V**, **W** or **X**, is the digital signal?

....

Give a reason for your choice.

....

....

(2 marks)

(b) Give **one** advantage of sending information as a digital signal instead of as an analogue signal.

....

....

(1 mark)

3

END OF QUESTIONS

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