

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
SCIENCE A

Unit 3 Modules B3 C3 P3 (Higher Tier)

WEDNESDAY 11 JUNE 2008

Afternoon
Time: 40 minutes

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 **42**.

FOR EXAMINER'S USE

| Qu. | Max. | Mark |
|--------------|-----------|------|
| 1 | 4 | |
| 2 | 5 | |
| 3 | 5 | |
| 4 | 6 | |
| 5 | 8 | |
| 6 | 5 | |
| 7 | 7 | |
| 8 | 2 | |
| TOTAL | 42 | |

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

2
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Answer **all** the questions.

- 1 Sandy is a warden for a conservation group.
He notices that there are fewer sea birds nesting on the cliffs this year than in previous years.
He is worried that some species of birds may die out.

(a) Which of the following could be reasons for the reduced sea bird population?

Tick (✓) the **two** most likely reasons.

- The weather is better this year.
- There is less food for the birds this year.
- Fewer of last years' chicks survived the winter.
- Fewer people in the area have cats as pets.
- Changes in the tides sent many birds off course.

[2]

(b) Sandy believes that human activity is responsible for the reduction in bird population.
He writes down these observations.

Put a tick (✓) in the **two** boxes next to the **indirect** causes of reduction.

- Birds trapped in fishing nets are being drowned.
- Noise from the harbour is disturbing the nesting birds.
- Birds often feed on the same species of fish that the fishermen catch.
- Birds die when they try to eat litter from the beaches.

[2]

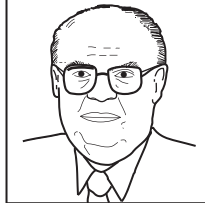
[Total: 4]

- 2 Evolution is a scientific theory. It says that all living things evolved from a common ancestor by mutation and natural selection.

Two scientists are discussing evolution. Here are some of their statements.

A. The fossil record shows a gradual change from simple organisms to more complex organisms.

Dr Peters



B. We know that mutations are happening in species today to produce differences. This could lead to new species being formed.

C. Selective breeding may produce very different looking animals but they are still the same species.

Professor Li



D. Most mutations are harmful to life and don't have any benefit to the animal.

E. Many fossils look identical to animals we see today.

- (a) Which **two** of the statements **A, B, C, D** and **E** support the theory of evolution?

statements and [2]

- (b) Scientists still argue about how life on Earth **began**.

Which of the following statements show why they disagree?

Put a tick (✓) in the boxes next to the **three** correct reasons.

Most mutations are harmful to life.

Scientists always like to have something to argue about.

The fossil record shows some gradual changes.

Scientists interpret the same evidence in different ways.

Scientists have many different ideas about where life came from.

No one knows exactly what the conditions were like on Earth millions of years ago.

[3]

[Total: 5]

- 3 Homeostasis maintains a constant internal environment.
It uses both nervous and hormonal communication.

(a) Here are some sentences about nervous communication.

- A Nervous communication produces a very fast response.
- B The nervous system is involved with homeostasis.
- C Nerve cells link receptors to effectors to produce a response.
- D The central nervous system coordinates the rest of the nervous system.
- E Receptors in the skin are part of the nervous system.

(i) Which sentence **A**, **B**, **C**, **D** or **E** describes the function of the brain and spinal cord?

..... sentence [1]

(ii) Pulling your hand away from a hot surface to prevent burning is an example of nervous communication.

Which **three** sentences taken together explain why?

..... sentences, and [2]

(b) Here are some sentences about hormonal communication.

- A Hormones travel in the blood stream.
- B A hormonal response is long lasting.
- C Hormones are involved in homeostasis.
- D The level of sugar in the blood must be kept within certain limits.

The control of blood sugar is hormonal.

Which **two** of the sentences **A**, **B**, **C** and **D** show why?

..... sentences and [2]

[Total: 5]

4 The Food Standards Agency is encouraging the use of clear labelling on foods.

(a) Which **two** of these statements describe the role of the Food Standards Agency?

Put a tick (✓) in the **two** correct boxes.

It carries out risk assessments on food.

It is expected to protect the public's health.

It campaigns for the environment.

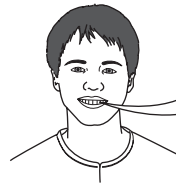
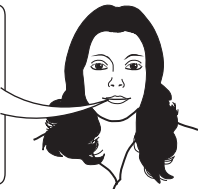
It looks after consumer interests in relation to food.

It promotes organically grown food.

[2]

(b) Five people are talking about the risk of eating sugar in their diet.

Anna
I enjoy sweet drinks but make sure they are sugar-free.



Danny
I know sugar is unhealthy but sugary drinks give me energy quickly when I play football.



Peter
I have always eaten lots of sugar and I've never had a day's illness.



Rajid
I only eat small amounts of sweet food.



Karen
I just eat what is put in front of me.

(i) Which **two** people have taken steps to reduce their risk?

..... and [2]

(ii) Who has decided that the benefits of eating sugar outweigh the risk?

..... [1]

(iii) Karen thinks she might change her eating habits to eat less sugar.

What information will help her make the best decision?

Put a tick (✓) in the box by the **best** answer.

The chance of a high sugar diet making her ill.

The treatments she would receive for any illness due to a high sugar diet.

The chance of becoming ill due to a high sugar diet and the possible consequences of treatment.

[1]

[Total: 6]

5 Joe is a farmer.

- (a) These boxes show information about intensive and organic farming and the effect on the environment.

Draw straight lines from each **method used** to the correct **type of farming** and also from the **method used** to its **effect on the environment**.

| type of farming | method used | effect on the environment |
|-------------------|-------------------------------------|------------------------------|
| | manure added to fields | uses non-renewable resources |
| intensive farming | chemical fertiliser added to fields | recycles waste |
| organic farming | crops grown in large fields | increases wildlife habitats |
| | crops grown in small fields | reduces numbers of wildlife |

[4]

- (b) Joe changes his farming methods to become an organic farmer.

- (i) What **must** he do before his crops can be labelled '**organic**'?

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

Tell all his customers that his food is organic.

Put adverts in the local papers.

Meet the UK national standards for organic farming.

Tell his neighbouring farmers that his farm is organic.

[1]

(ii) Both intensive and organic farmers have to replace elements used by the crops.

What are these elements?

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

hydrogen, nitrogen and oxygen

phosphorus alone

oxygen alone

nitrogen, phosphorus and potassium

[1]

(c) The number of organic farms in Britain is increasing.

Which two statements explain this increase?

Put a tick (✓) in the boxes next to the **two** best answers.

Crops are larger and look the same.

Fewer people work on each acre of farm.

Many people have enough money to choose what they eat.

The costs of transporting organic food are always lower.

People want to buy the cheapest food that they can find.

People believe organic food is healthier.

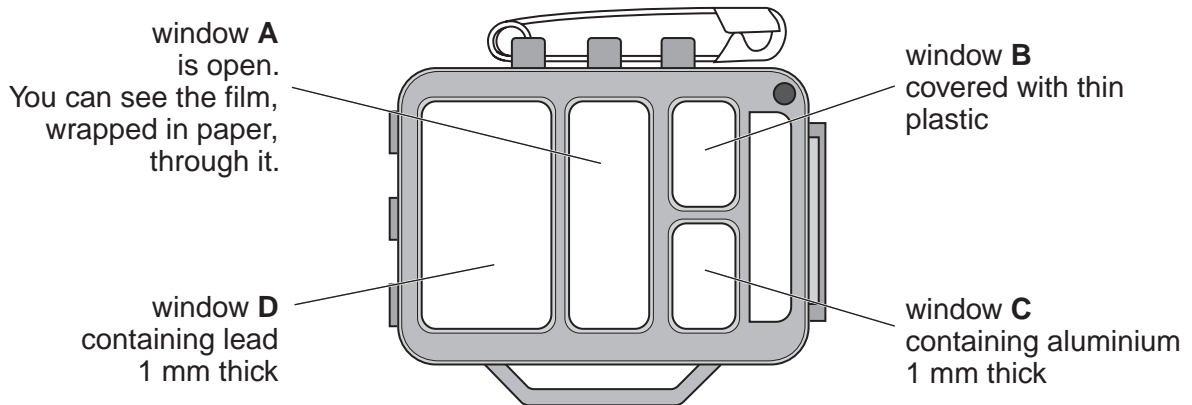
[2]

[Total: 8]

- 6 Workers exposed to radiation can use badges to detect the radiation dose they are exposed to.

Radiation is detected by a photographic film wrapped in paper.

The badge has four windows. One window is open and the other windows are covered by thin plastic, aluminium or lead. Lead is much denser than aluminium.



- (a) A salesman for the badge says 'The badge will not detect alpha radiation. This is not very important when the risk is from irradiation from a source outside your body.'

Which of the following best explain these two statements?

Put a tick (✓) in the box next to each of the **two** best explanations.

- | | |
|--|--------------------------|
| Alpha radiation is a helium nucleus. | <input type="checkbox"/> |
| Alpha radiation cannot penetrate paper. | <input type="checkbox"/> |
| Alpha radiation contains neutrons. | <input type="checkbox"/> |
| Alpha radiation is stopped by dead skin cells. | <input type="checkbox"/> |
| Alpha radiation has a very long half-life. | <input type="checkbox"/> |

[2]

(b) The unit of radiation dose is the sievert.

It is a measure of the possible harm to your body.

Which of the following is the sievert based on?

Put a tick (✓) in the box next to each of the correct answers.

- amount of radiation
- half-life of the radiation source
- weight of a person
- type of radiation
- number of neutrons in a radioactive atom

[2]

(c) Different types of radiation have different penetrating powers.

Which **two** windows detect most of the beta radiation?

windows and.....[1]

[Total: 5]

7 The British government is considering building some new nuclear power stations.

(a) Four people are talking about the risks of nuclear power.



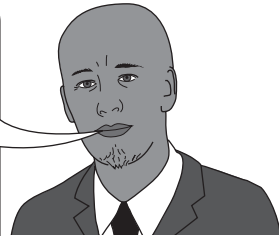
Andy
I'm against all these new nuclear power stations. There's bound to be an accident sooner or later.

Betty
The waste produced in nuclear power stations will be radioactive for thousands of years. It must be stored very safely to keep it out of harm's way for such a long time.



Chris
The chance of an accident in a nuclear power station is very small. There have been no accidents in Britain since the early days of nuclear power, and technology has improved a lot since then.

Dan
People living in my area don't want nuclear power stations. They are afraid their children will be damaged by radiation.



Who talks about **actual risks**, and who talks about **perceived risks**?

Put a tick (✓) in the correct box for each person.

| person | talks about a real risk | talks about a perceived risk |
|--------|-------------------------|------------------------------|
| Andy | | |
| Betty | | |
| Chris | | |
| Dan | | |

[3]

(b) Some people suggest that the government should use the 'precautionary principle'.

Which of the following sayings is closest to the precautionary principle?

Put a tick (✓) in the correct box.

A bird in the hand is worth two in the bush.

Better safe than sorry.

Look after the pennies and the pounds will look after themselves.

Every cloud has a silver lining.

[1]

(c) Complete the following sentences about how a nuclear fission reactor works.

Choose the **best** words from this list.

atom
chain reaction
control rod
coolant
fuel rod
nucleus

Uranium in the gives off neutrons.

More neutrons are produced by a

The rate of energy production is reduced when neutrons are absorbed

by the

[3]

[Total: 7]

- 8 The Radiological Protection Agency says, 'It is very difficult to measure the risk of very low radiation doses. However, we should assume the risk is proportional to the dose.'

Here are some examples of low radiation doses.

| | |
|--|--------------|
| typical background radiation dose in Australia | 2.0 mSv/year |
| typical background radiation dose in North America | 3.0 mSv/year |
| typical background radiation dose in United Kingdom | 2.3 mSv/year |
| average extra dose to US nuclear industry employees | 2.9 mSv/year |
| average extra dose to Australian uranium miners | 5.0 mSv/year |
| average extra dose for aircrew flying from UK to Australia | 0.1 mSv/year |

- (a) What is the likely annual dose of an Australian uranium miner?

Put a **ring** around the correct answer.

2 mSv/year **5 mSv/year** **7 mSv/year**
10 mSv/year **12 mSv/year**

[1]

- (b) A dose of 100 mSv is estimated to give a risk of cancer later in life of 0.5%.

What would be the cancer risk from background radiation of living in Australia for 10 years?

risk is%.

[1]

[Total: 2]

END OF QUESTION PAPER

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