

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
SCIENCE A**

A213/01

Unit 3: Modules B3 C3 P3 (Foundation Tier)

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)

**Wednesday 26 January 2011
Afternoon**

Duration: 40 minutes



Candidate forename		Candidate surname	
Centre number		Candidate number	

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- Do **not** write in the bar codes.

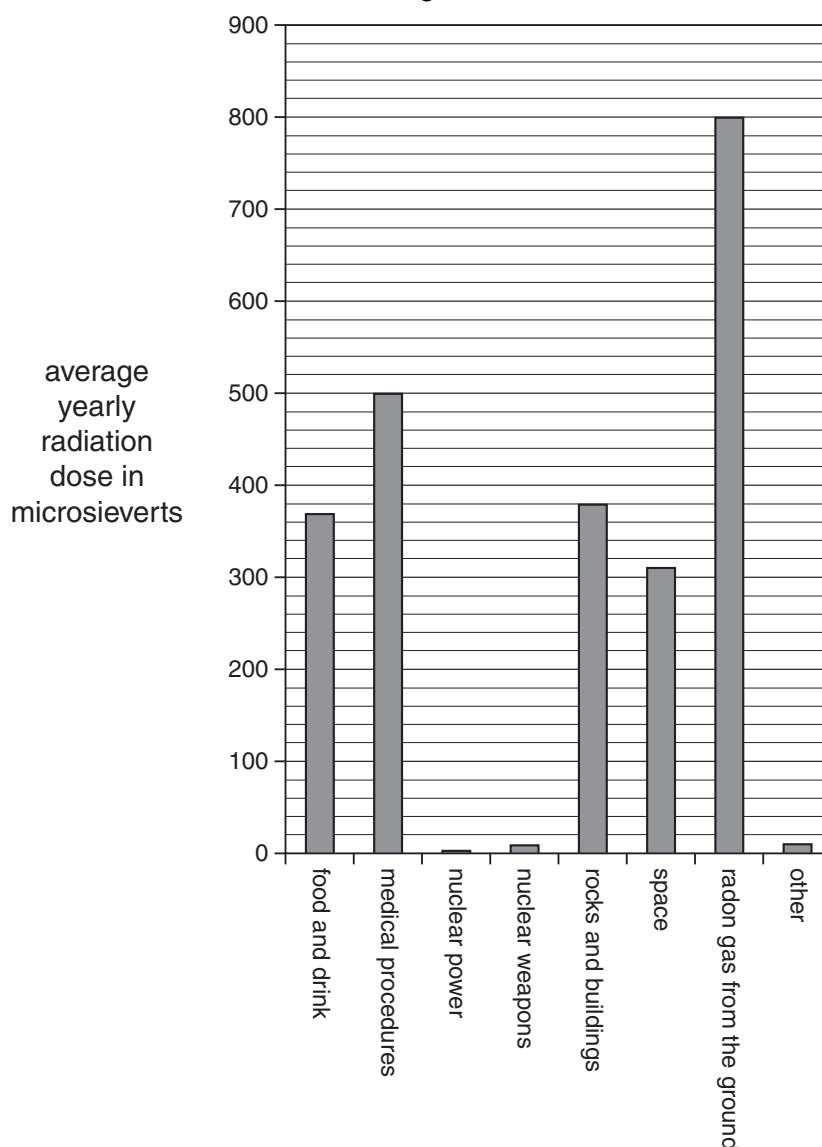
INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- This document consists of **16** pages. Any blank pages are indicated.

2

Answer **all** the questions.

- 1 The bar chart below shows the average radiation dose from all sources for people living in Europe.



- (a) Some of the following statements about the average dose per person in Europe are true, and some are false.

Put a tick (✓) in the correct box after each statement.

	true	false
Nuclear weapons give a tiny fraction of the total dose.	☐	☐
The dose from rocks and buildings is 340 microsieverts.	☐	☐
Radon gas is the largest cause of radiation dose.	☐	☐
The dose from space is more than the dose from food and drink.	☐	☐

[2]

3

(b) Here is a list of medical procedures.

Which of these gives the patient a dose of ionising radiation?

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

giving drugs to treat cancer

☐

operating to remove an appendix

☐

radiotherapy to treat cancer

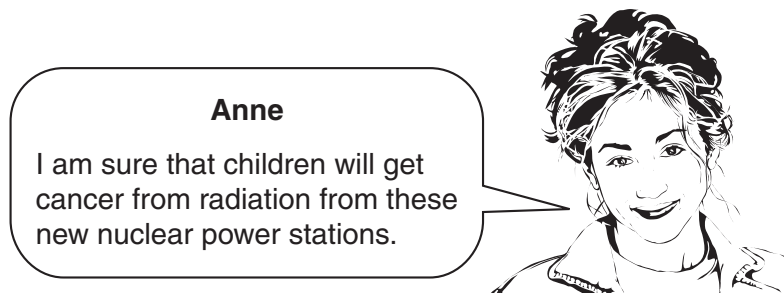
☐

ultrasound scan of a pregnant woman

☐

[1]

(c) Anne is very worried about plans to build new nuclear power stations in Britain.



Use information from the bar chart to explain to Anne why she may not need to worry.

.....

.....

.....

..... [3]

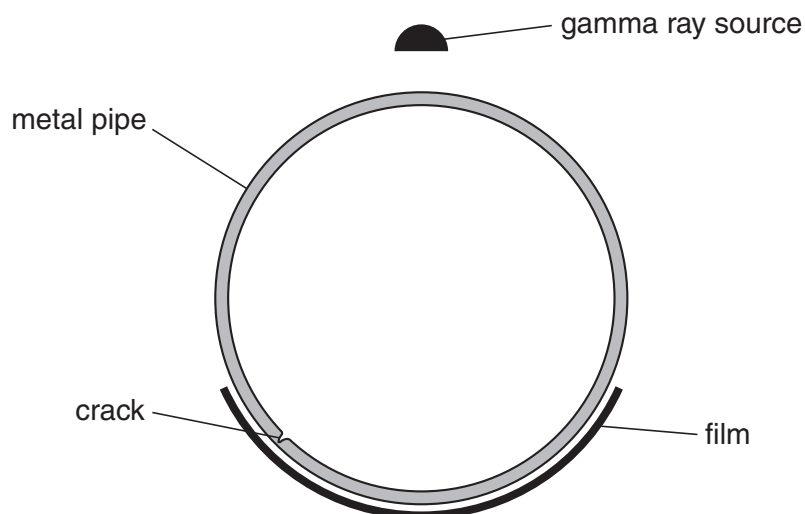
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4

- 2 Metal pipes have joins in them. To test these joins, gamma rays can be used.

The gamma rays that get through the tube are picked up on film, just like an X-ray.

The film shows any cracks, just as an X-ray can show a crack in a broken bone.



- (a) What is the reason for using gamma radiation instead of alpha radiation?

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

Gamma radiation is ionising.

☐

Gamma radiation is not as dangerous as alpha radiation.

☐

Gamma radiation is part of the electromagnetic spectrum.

☐

Gamma radiation is more penetrating than alpha radiation.

☐

[1]

5

(b) Pipes could be tested with X-rays instead of gamma rays.

X-ray sources need powerful electrical supplies.

In some places, it is better to use small, portable gamma ray sources.

Which of these pipes would be better tested with gamma rays?

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

A pipe in the desert.

☐

A pipe in a power station.

☐

A pipe in a factory.

☐

A pipe in a hospital.

☐

[1]

(c) Workers testing pipes with gamma rays are at risk from radiation.

Suggest **two** ways in which the pipe testing company can make the workers as safe as possible.

.....

.....

..... [2]

[Total: 4]

6

- 3 In many countries, electricity is generated by burning waste plant material, called **biomass**. One of the biggest renewable electrical power stations in the USA burns the waste from sugar plants.



- (a) Use **four** letters from the statements **A**, **B**, **C**, **D** and **E** below to complete the flow diagram showing how electricity is generated in this power station.

- A** This turns a turbine.
- B** Water is boiled into steam.
- C** This makes a generator spin.
- D** Heat is released from a nuclear reaction.
- E** A transformer changes the electrical voltage.



[2]

7

- (b) This power station produces carbon dioxide when the plant material burns. However, it is described as **carbon neutral**, because it does not add extra carbon dioxide to the atmosphere.

The statements below are all correct.

Put ticks (✓) in the boxes next to the **two** statements that explain why this power station is carbon neutral.

All the carbon in plants comes from the atmosphere.

☐

Coal, which contains carbon, comes from materials like the sugar plants.

☐

All the carbon dioxide given off by the power station comes from burning plants.

☐

Nuclear power does not involve burning any fuel so does not add carbon dioxide to the atmosphere.

☐

Sugar is a carbohydrate, so it contains carbon.

☐

[2]

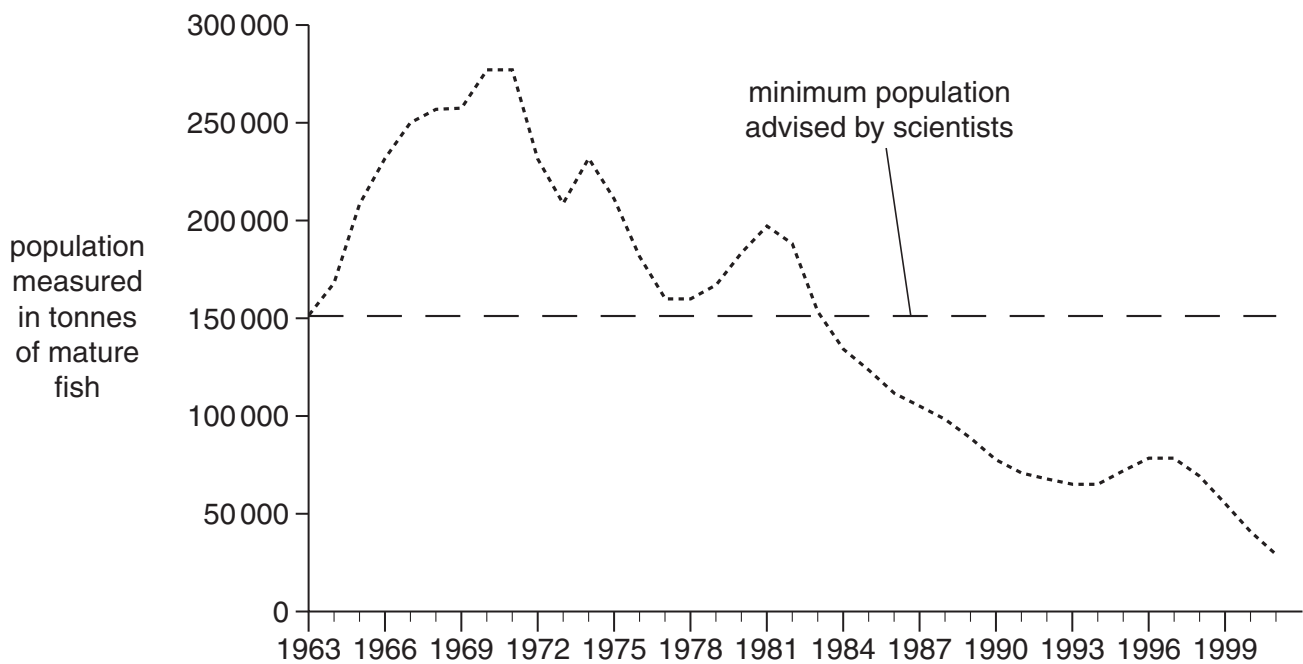
[Total: 4]

4 Fish are an important part of the human diet.



(a) Look at the graph.

It shows the estimated population of mature North Sea cod between 1963 and 2001.



Describe the changes in the cod population between 1963 and 2001.

.....

.....

..... [2]

- (b) (i) Some scientists think that North Sea cod are in danger of extinction due to over fishing. This would be an example of an extinction caused by human activity.

Write down **one** species which has become extinct due to human activity.

..... [1]

- (ii) The possible extinction of North Sea cod due to over fishing is an example of using the environment in an unsustainable way.

Explain why it is important to use the environment in a sustainable way.

Use these ideas in your answer

- biodiversity
- food webs
- possible resources.

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

[Total: 6]

5 Scientists place humans in the hominid family.

The table gives details of some hominid species that have been discovered.

species	when they first lived (millions of years ago)	where they lived	brain volume in cm ³
<i>H. habilis</i>	2.20	Africa	660
<i>H. erectus</i>	1.40	Africa, Europe and Asia	1100
<i>H. neanderthalensis</i>	0.35	Europe, W. Asia	1700
<i>H. sapiens</i>	0.20	worldwide	1850
<i>H. floresiensis</i>	0.10	Indonesia	400

(a) Most scientists think that hominids first evolved in Africa.

Which piece of data from the table supports this explanation?

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

H. sapiens is found worldwide.

☐

H. floresiensis did not live in Africa.

☐

H. habilis lived longest ago and was found in Africa.

☐

H. neanderthalensis was found not far from Africa.

☐

[1]

(b) Most scientists also think that as hominids evolved their brains became larger.

Which species provides evidence that **disagrees** with this?

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

H. habilis

☐

H. erectus

☐

H. neanderthalensis

☐

H. sapiens

☐

H. floresiensis

☐

[1]

11

- (c) Use words from the list to complete the sentences about hominid evolution.

common ancestor descendant different
extinct friend selected similar

Scientists think that all hominids shared a

All the species of hominids except *H. sapiens* are

[2]

- (d) (i) Hominids evolved only a few million years ago. However, scientists think that life on Earth first began much earlier.

When is life on Earth thought to have started?

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

35 million years ago	☐
350 million years ago	☐
3500 million years ago	☐
35 000 million years ago	☐
350 000 million years ago	☐

[1]

- (ii) Use words from the list to complete the sentences about evolution.

asexual reproduction genes gene therapy
growth natural selection variation

Evolution takes place by a process called

This process depends on

that is caused by differences in

[3]

[Total: 8]

13

(c) There are two types of diabetes.

These are type 1 and type 2 diabetes.

State and explain **one** way that the two types of diabetes are different.

.....

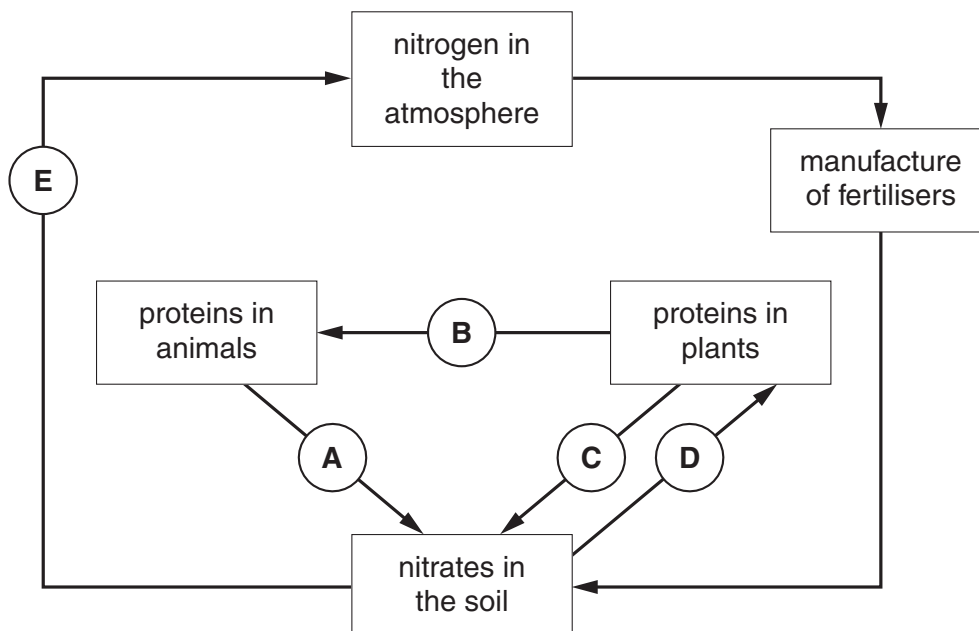
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.....

..... [2]

[Total: 6]

7 The diagram shows the continual cycling of nitrogen.



(a) Which arrow, **A**, **B**, **C**, **D** or **E**, shows plants making proteins?

arrow [1]

(b) Which **two** arrows from **A**, **B**, **C**, **D** and **E** show decay?

arrows and [1]

[Total: 2]

8 Some students are discussing different types of farming.

Look at what they say.

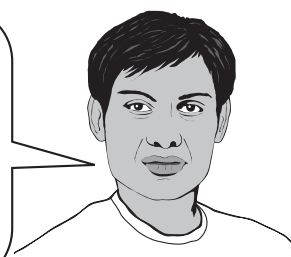


Barry

Some farmers use animal waste to fertilise the soil.

Anwar

Some farmers do not spray their crops with chemicals. No one knows what harm the chemicals may do.

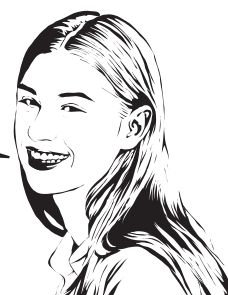


Donna

Intensive farmers put pesticides and fertilisers on their fields even though they know it harms the environment. This is because it increases their crop yield.

Clare

Pesticides often kill insects that are food for other animals.



Flora

I only buy organic food. You never know what effect pesticides on crops may have on your body.



Ed

I do not think it matters whether you buy food from organic or intensive farms. Just buy the food that you like.

- (a) (i) Which **two** people are talking about methods used by organic farmers to grow crops?

answers and [2]

- (ii) Who is talking about using renewable resources?

answer [1]

- (iii) Who suggests that the benefits of intensive farming outweigh the risks?

answer [1]

15

(b) Below are two methods that **organic farmers** use to control pests.

Draw **one** straight line from **each** method to the reason why it works.

You should only draw **two** lines.

method	reason why it works
	There are fewer predators in the fields.
Fields are smaller.	Pests cannot reach the crops.
	Pests that eat one crop may not eat a different one.
Crops are rotated.	Pests eat the weeds not the crops.
	Walls and hedges are habitats for natural predators.

[2]

[Total: 6]

END OF QUESTION PAPER

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