

Twenty First Century Science

PILOT Examination Questions

GCSE Science Jan 2005

**Keeping healthy, Radioactive materials, Life on Earth
(Higher Tier)**

Please note:

- **These questions are not Sample Assessment Materials (SAMs) for the new OCR specification (for Sept 2006).**
- **The style of question varies from that used for the new specifications.**
- **For up to date SAMs see the OCR website:
www.gcse-science.com**
- **These questions are provided for classroom use by teachers, to develop students' understanding of Ideas about Science.**
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Answer **all** the questions.

- 1 The twin spacecraft Voyager 1 and Voyager 2 were launched by NASA in 1977.



The spacecraft travelled across our Solar System, sending photographs and information about different planets back to Earth. By 1989, the spacecraft had explored all the giant outer planets of our Solar System and 48 of their moons.

- (a) Explain why spacecraft have not visited all the stars and planets within our Universe.

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- (b) Space exploration is very expensive.

Suggest why scientists want to find out more about space.

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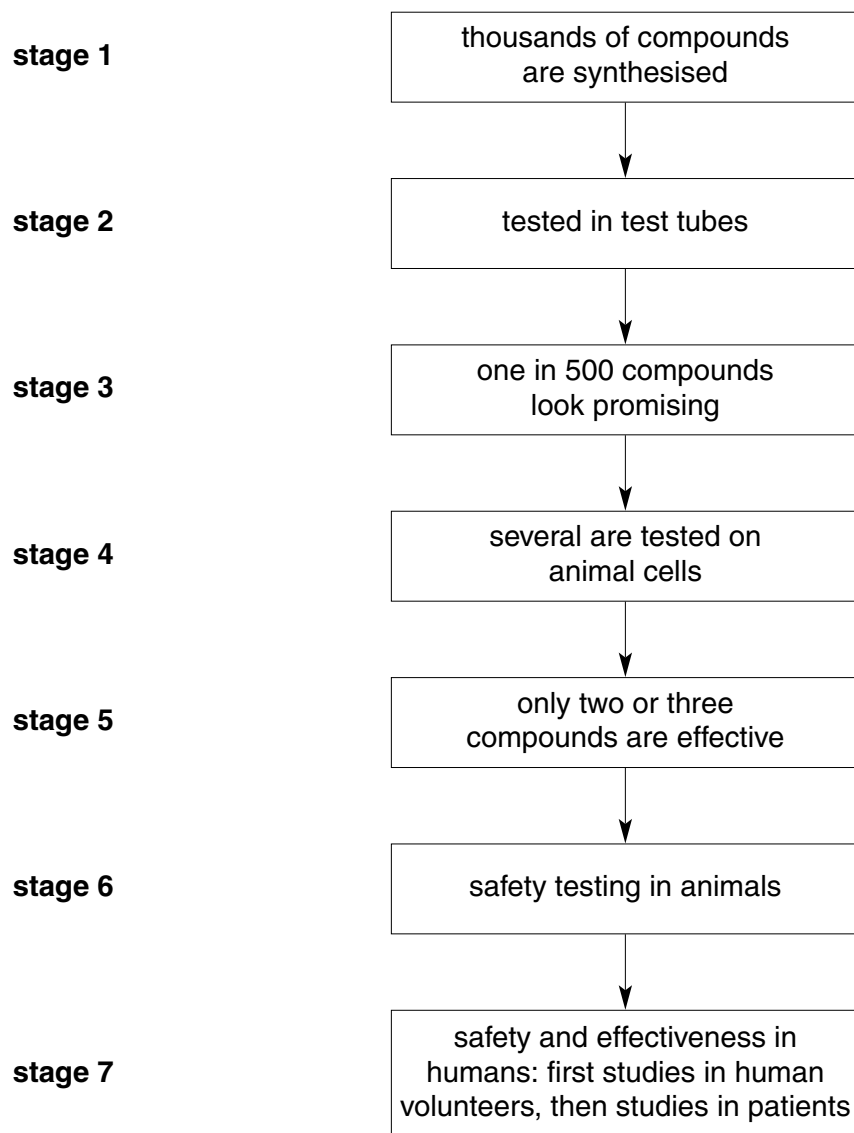
[Total: 4]

2 Many new drugs are developed from natural sources.

Many natural substances have some drug activity but they often have harmful side effects.

Scientists try to develop new drugs from these natural substances.

The scientists follow a standard procedure for researching and developing a new medicine.



(a) Explain why the chemicals are not tested on humans before **stage 7**.

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..... [2]

(b) Explain why studies are carried out on human volunteers, before the patients in **stage 7**.

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..... [2]

(c) Different people have different views about using animals in medical research.

Suggest why some people disagree with using animals in medical research.



One mark is for a clear, ordered answer.

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..... [2+1]

[Total: 7]

3 This is part of a leaflet that was issued by the Department of Medicines Management.

Do you have cough, cold or flu symptoms?

Coughs, colds and flu are caused by viruses.

Each year, most people suffer from at least one bout of flu, or a cough and cold.

Antibiotics will not help you if you have a cold or flu.

(a) Explain what causes the symptoms of flu.

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..... [2]

(b) Explain why flu cannot be treated with antibiotics.

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(c) A vaccination against flu has been developed.

Some people, such as the elderly and people with long-term diseases, may become seriously ill if they catch flu.

These people are encouraged to have the flu vaccination.

Explain why people are encouraged to have a vaccination.

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..... [2]

[Total: 6]

4 This is a newspaper article about biodiversity.

Goodbye cruel world

The number of lions in the world has dropped by 90% in 20 years.

Fewer than 8 000 tigers remain, with three of the eight sub-species already extinct.

The world's population of black rhinos has dropped from 100 000 in 1960 to about 3100 today.



(a) Human activity is the main cause of extinction.

(i) Name one **other** species that has become extinct or is endangered due to human activity.

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(ii) Describe **two** examples of human activity that have led to a species being in danger of becoming extinct.

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(b) The 29th of December is International Biodiversity Day.

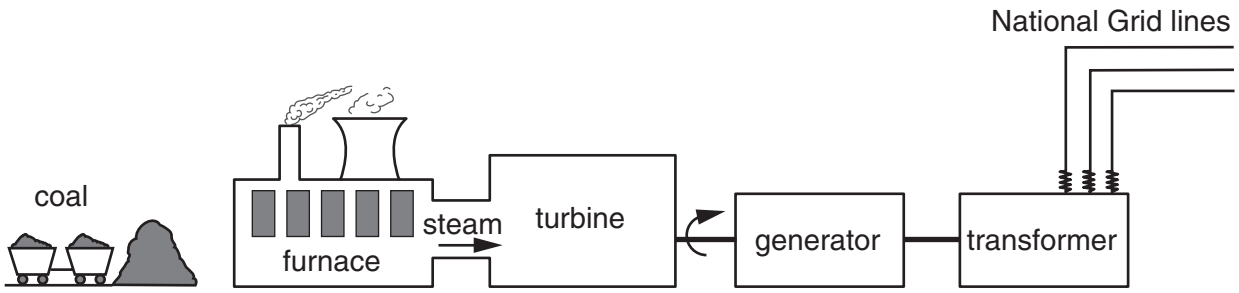
Biodiversity is the number of different species that live in a habitat.

Explain why maintaining biodiversity is important.

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..... [2]

[Total: 5]

5 (a) The diagram shows how a coal-fired power station generates electricity for the National Grid.



(i) Describe the processes that take place when coal is burned to generate electricity.

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..... [3]

(ii) Electricity is described as a secondary energy source.

Explain what is meant by a **secondary energy source**.



One mark is for using correct spelling, punctuation and grammar.

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..... [1+1]

- (b) The government aims for 10% of all electricity to be generated from renewable sources by 2010.

Read this information.

Wind farms planned for Britain's coasts

Huge areas off the coasts of Britain will be opened to huge wind farms.

Each may contain up to 300 turbines.

Up to 20 000 new jobs will be created.

Campaigners describe this as the dawn of a new clean energy age.

The new turbines will be the biggest ever anywhere in the world.

They will be sited five miles out to sea to lessen the visual impact.

The first project involves 30 turbines off the North Wales coast.

The energy produced by the proposed new developments will be enough to power more than 3.5 million households.



Some people are not convinced about building wind farms on this scale. Here are some of their thoughts.



a keen birdwatcher says

Research shows that wind farms kill birds. An offshore farm in North Wales could harm the last colony of little terns in Wales. The birds are protected 24 hours a day on land, but we have no idea where they feed.

Wind power is not completely clean. You have to build huge concrete foundations under the sea. There will have to be a land based station and service roads and so on. Power stations will have to be kept on standby for when the wind isn't blowing.



said an energy expert



a man who lives on the
Welsh coast says

The government is more interested in big projects and not in energy conservation. They should tell people to use less energy. I'm in favour of renewables but not at the expense of our countryside and coast.

Use the information given and your knowledge about power generation to discuss the disadvantages and benefits of building wind farms to generate some of the country's electricity.

You should identify in your discussion who would suffer from the disadvantages and who would benefit from such a development.

disadvantages

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benefits

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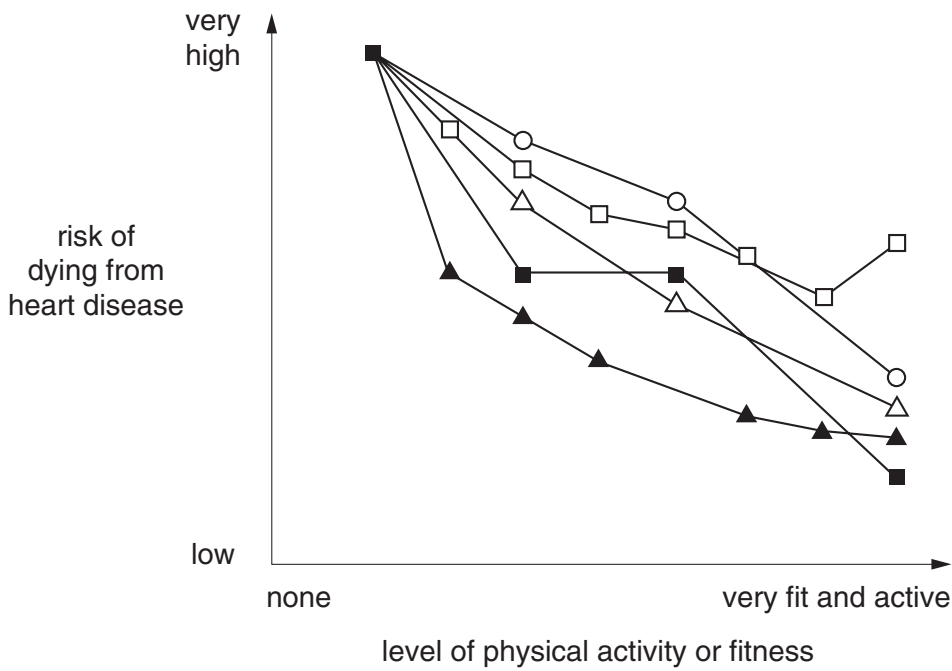
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..... [6]

[Total: 11]

- 6 Five groups carried out research about the effect of increased levels of exercise on the risk of dying from heart disease.

The graph shows the results of the five different research projects.



- (a) (i) Describe what is shown by these results.

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..... [1]

- (ii) Suggest **two** reasons for the variation between the findings of the different groups.

1

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2

..... [2]

(b) A professor of heart medicine made the following statement at a conference.

“You may enjoy exercise; it may be helpful socially; it may make you look and feel better. But all the rest is a myth. Exercise will not make you healthy. It will not make you live longer. Fitness and health are not the same thing.”

The professor has not produced any hard evidence to support his arguments.

Discuss reasons for and against accepting the final statement, **Fitness and health are not the same thing.**

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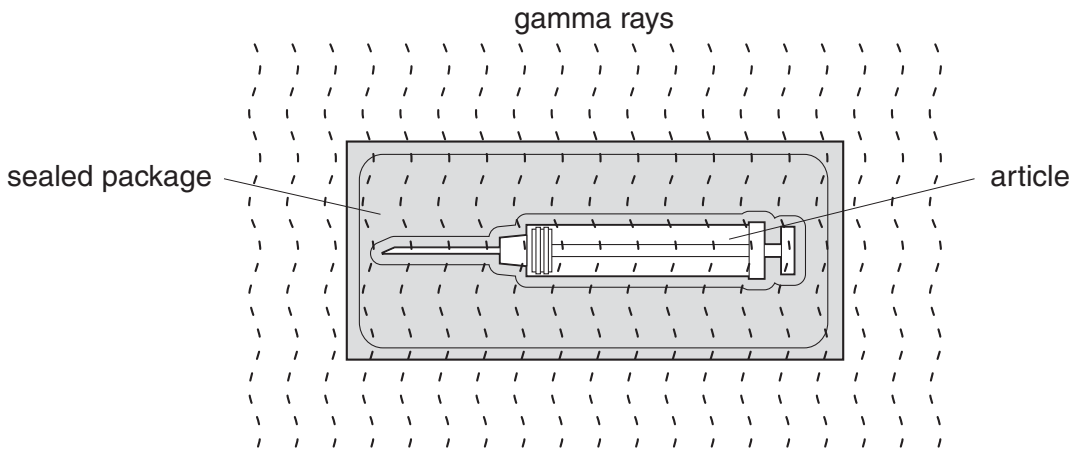
against

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..... [4]

[Total: 7]

- 7 Many medical products are sterilised using gamma radiation. The radiation passes through packaging to sterilise the product inside.



- (a) What properties of gamma rays make them more suitable for sterilising medical products than alpha or beta particles?

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 [2]

- (b) A radioactive source commonly used is cobalt-60, which emits gamma rays and has a half-life of about 5.26 years.

- (i) Explain what is meant by saying that cobalt-60 has a **half-life** of 5.26 years.

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 [2]

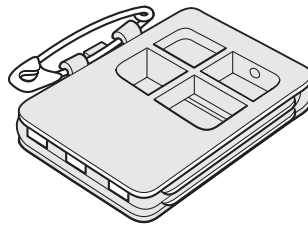
- (ii) Another radioactive source, iron-59 also emits gamma radiation. It has a half-life of 45 days.

Use your ideas about half-life to suggest why iron-59 would be less suitable as the source of gamma radiation for sterilisation.

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 [2]

- (c) Workers who operate the sterilisation process wear a badge to record their exposure to ionising radiation.



- (i) The amount of ionising radiation that the workers are exposed to must be limited.

Explain why.

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 [2]

- (ii) The badge can be used to calculate the radiation dose the worker has received.

What information does the measured radiation dose give us about the risk to the worker?

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- (d) Name **one** other group of people who are at risk from exposure to radiation and suggest what precautions they can take to reduce the risk.

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 [2]

[Total: 11]

8 Charles Darwin is known for his theory of evolution by natural selection.

For 30 years, Darwin researched his theory and gathered huge amounts of evidence to support it. He exchanged letters with other naturalists.

In 1859, Darwin published his book 'On the Origin of Species'.

(a) Suggest what sort of evidence Darwin gathered to support his theory.

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(b) When Darwin's book was published, some people accepted his theory but many people were against the theory.

(i) Suggest a reason for people's acceptance of Darwin's theory.

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(ii) Suggest a reason for many people's refusal to accept Darwin's theory.

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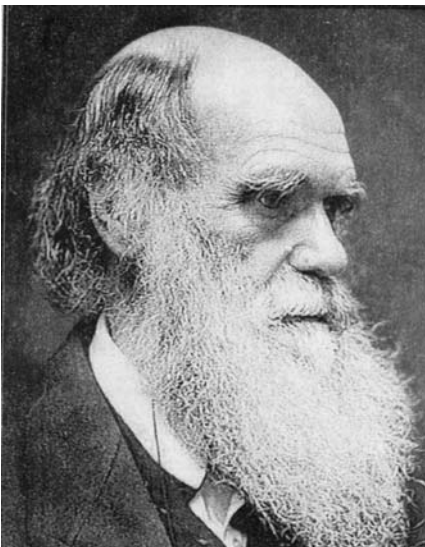
- (c) Recently, a professor in Scotland has discovered work published by James Hutton, 60 years before Darwin's book.

The following is taken from a newspaper.

**The original theory of evolution?
Published 60 years before Darwin**



James Hutton wrote about natural selection in 1794



Charles Darwin published his book in 1859

James Hutton's book 'Principles of Knowledge' suggested basic ideas of natural selection. At the time of publication, his book was criticised for being too long and difficult. Few people read his book.

- (i) Suggest why Darwin gained the reputation as the famous scientist who first suggested the theory of natural selection, even though similar work had been published earlier.

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(ii) The newspaper article goes on to say:

“Natural selection is the driving force of evolutionary change.”

Explain what this means.

Use an example to support your answer.

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[Total: 9]

END OF QUESTION PAPER