Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

GCSE

A213/02

TWENTY FIRST CENTURY SCIENCE SCIENCE A

Unit 3: Modules B3 C3 P3 (Higher Tier)

FRIDAY 15 JUNE 2012: Afternoon

DURATION: 40 minutes
plus your additional time allowance

MODIFIED ENLARGED

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)

READ INSTRUCTIONS OVERLEAF

DC (NF/SW) 12MEP06274 63563/1

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**
- **Use black ink. HB pencil may be used for graphs and diagrams only.**
- **Answer ALL the questions.**
- **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).**

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.**

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Answer ALL the questions.

1 A patient with a medical problem may be treated using a radioactive material which emits beta radiation.

(a) Which of the following statements correctly describes this material?

Put ticks (✓) in the boxes next to the TWO correct statements.

If the material is heated, it will give off more radiation.	☐
The amount of radiation emitted will decrease with time.	☐
The emitted radiation can penetrate several centimetres of metal.	☐
The emitted radiation is absorbed by a single sheet of paper.	☐
The emitted radiation is an ionising radiation.	☐

[2]

(b) In the treatment, the radioactive material is injected into the patient's body.

Which of the following statements correctly describes an effect of the injection into the patient's body?

Put ticks (✓) in the boxes next to the two correct statements.

Healthy cells will not be affected.	☐
Diseased cells may be killed.	☐
The radioactive material cannot harm the patient.	☐
The radiation removes ions from the cells.	☐
The patient is contaminated by the injected material.	☐

[2]

(c) The patient must sign a consent form before having this treatment.

Suggest what information the patient requires before deciding whether to have the treatment or not.

_____

_____

_____

_____

_____

_____ **[3]**

[Total: 7]

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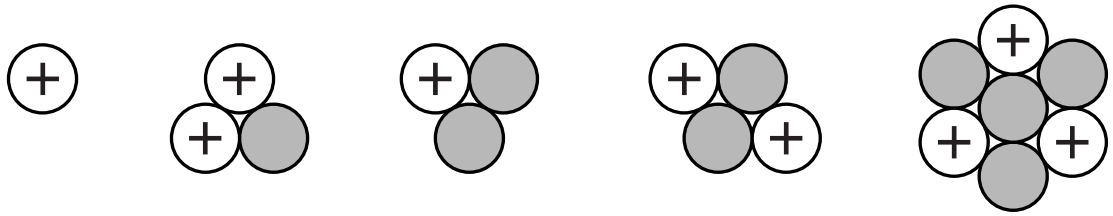
2 This question is about ELEMENTS and ISOTOPES.

(a) The diagram below represents the nuclei of five different atoms.

The circle with a + sign represents a proton.



How many different ELEMENTS are present?

answer _____ [1]

(b) (i) A radioactive material has a half-life of 12 years.

If you start with a sample of 200 grams of this material, which of the following would be the closest estimate to the mass in grams left after 30 years?

Put a (ring) around the correct value.

20

25

35

50

80

[1]

(ii) Which of the following treatments would change the half-life of these nuclei?

Put a tick (✓) in the correct box.

Changing the temperature of the sample. ☐

Combining the sample in a chemical reaction. ☐

Sealing up the sample in a thick lead box. ☐

None of the above will have any effect. ☐

[1]

[Total: 3]

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3 This question is about the generation of electrical energy in the UK in 2009.

The diagram opposite shows the energy input and output for all UK power stations in 2009.

The figures are all in terawatt hours (TWh).
1 TWh = 1000 million kWh.

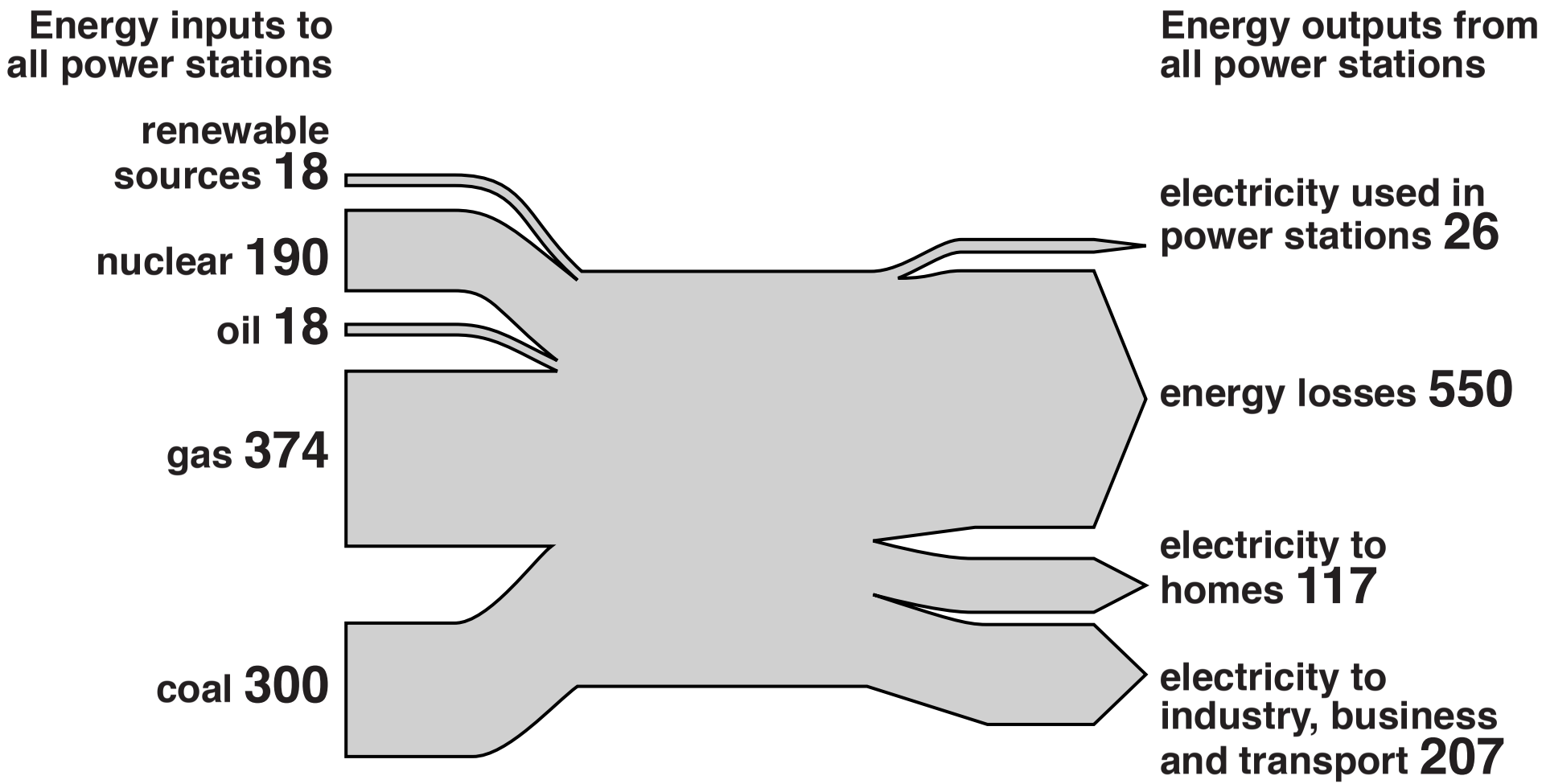
(a) It has been claimed that nuclear power provides about 20% of the input to the UK power stations.

Use data from the diagram to check this statement.

Show your working clearly.

calculation

conclusion _____ [2]


Energy inputs to all power stations
renewable sources 18
nuclear 190
oil 18
gas 374
coal 300
Energy outputs from all power stations
electricity used in power stations 26
energy losses 550
electricity to homes 117
electricity to industry, business and transport 207

(b) New technology allows power stations to be more efficient. They can

- **operate with half their current use of electricity**
- **reduce their energy losses by 10%.**

Suppose that all power stations were improved in this way.

Calculate the extra energy in TWh which would be available for homes, industry, business and transport.

You can assume the same energy input to the power stations.

Put a (ring) around the correct value.

13

55

68

392

508

[1]

(c) Over the next 50 years, it is predicted that

- **UK energy needs will continue to grow**
- **there will be less use of carbon fuels.**

Which of the following possibilities could fit this prediction?

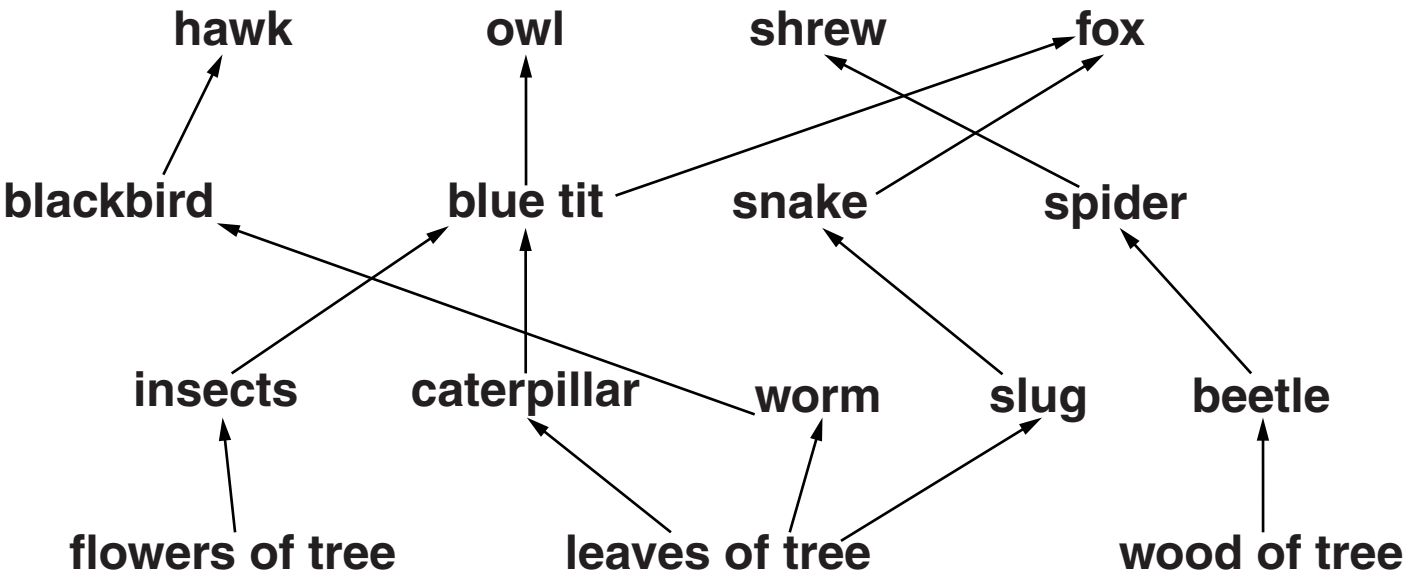
Put a tick (✓) in the correct box after each possible change.

POSSIBLE CHANGES	FITS THE PREDICTION	DOES NOT FIT THE PREDICTION
250 TWh input to nuclear power stations each year		
700 TWh input to carbon fuel power stations each year		
800 TWh output from all power stations each year		

[1]

[Total: 4]

4 The food web shows organisms living in a wood.



(a) USE ONLY INFORMATION FROM THE FOOD WEB to construct ONE complete food chain opposite.

Draw one straight line from a PRODUCER to its PRIMARY CONSUMER.

Then draw one straight line from this PRIMARY CONSUMER to its SECONDARY CONSUMER.

Then draw one straight line from this SECONDARY CONSUMER to its TOP PREDATOR.

PRODUCER	PRIMARY CONSUMER	SECONDARY CONSUMER	TOP PREDATOR
leaves of tree	beetle	blackbird	shrew
	slug	spider	owl
flowers of tree	worm	blue tit	hawk

[1]

(b) Organisms can sometimes become extinct.

Suggest ways in which this might happen.

_____

_____

_____

_____

_____ **[3]**

(c) Sustainability is an important part of using the environment.

What is meant by sustainability?

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

Different animals are kept alive to feed humans.	☐
Plants use the Sun for photosynthesis to provide nutrients for the food web.	☐
People who live on the Earth must have a good place to live.	☐
Ecosystems provide food, fuel and medicines for humans.	☐
Meeting the needs of people today without damaging the Earth for future generations.	☐

[1]

[Total: 5]

5 (a) Opposite are some statements from different people about evolution.

Who is using data to support the idea of evolution?

answer _____ [1]

(b) During human evolution, some humans gained a better chance of survival than others.

What was the reason for this?

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

Human numbers decreased so more of them survived.	☐
Human body systems could not adapt to new conditions.	☐
Some of the humans had larger brains.	☐
There were more predators.	☐
All humans had a plentiful food supply.	☐

[1]

AMRIT

Evolution cannot explain how features are passed from one generation to the next.

CHARLES

In the Galapagos, finches on different islands have different shaped beaks. This can be used as evidence for natural selection.

DEREK

We can now piece together how humans came to be like they are.

BEATRICE

Lamarck thought life started with simple living things and these got more complicated with each generation.

EDWARD

God made everything on Earth including the fossils.

(c) Many scientists were unwilling to accept Darwin's theory of evolution when it was first published. Some did not accept it because it did not agree with their religious beliefs.

Suggest one reason, OTHER THAN RELIGIOUS BELIEF, why scientists may not have accepted the theory of evolution when it was first published.

_____

_____ **[1]**

[Total: 3]

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6 (a) The human body has two communication systems, nervous and hormonal.

Each system has specific characteristics.

On the diagram opposite, draw one straight line from each SYSTEM to HOW THE INFORMATION IS CARRIED.

Then draw straight lines from HOW THE INFORMATION IS CARRIED to the SPEED OF RESPONSE.

Then draw straight lines from the SPEED OF RESPONSE to HOW LONG THE RESPONSE LASTS.

(b) Here are examples of nervous and hormonal responses.

Use your knowledge of the characteristics of both systems to suggest which system is involved.

Put ticks (✓) in the correct boxes.

responses	nervous	hormonal
changes at puberty		
release of eggs from the ovaries		
pupil response to bright light		
waving to a friend		
dropping a hot plate		

[2]

[Total: 3]

25

SYSTEM	HOW THE INFORMATION IS CARRIED	SPEED OF RESPONSE	HOW LONG THE RESPONSE LASTS
nervous	chemical	slow	disappears quickly
hormonal	electrical	fast	long time

[1]

7 Genetic information is passed on through our DNA.

Sometimes when DNA is being copied, mistakes are made.

Suggest how this, combined with other factors, could lead eventually to the production of a new species.

_____

_____

_____

_____

_____ **[3]**

[Total: 3]

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8 This is a question about farming.

(a) Organic farmers may replace nitrogen compounds in the soil using animal waste. They do not use synthetic fertilisers.

Explain how this makes organic farming more sustainable.

_____

_____

_____

_____ **[2]**

(b) Plants need nitrogen compounds to make proteins.

Farmers use animal waste or synthetic fertilisers to add nitrogen compounds to the soil.

(i) **Nitrogen compounds are also added to the soil by natural methods.**

Here are some sentences about how this may happen.

Only THREE of them are correct.

Choose the three correct sentences and put them in the correct order in the boxes below.

A	**Nitrogen oxides dissolve in rainwater.**
B	**Nitrogen dissolves in water to make nitrates.**
C	**Nitrogen and oxygen from the air react in thunderstorms.**
D	**Nitrogen is changed to nitrogen oxides in the plant.**
E	**Nitrogen is taken in by plant leaves.**
F	**Rain water containing nitrates soaks into the soil.**

The correct order is | | | |

[2]

(ii) Fred is not an organic farmer.

Fred has the choice of using synthetic fertilisers or animal waste.

One factor he considers is the sustainability of the fertiliser.

Suggest and explain TWO other factors which might affect his choice.

_____

_____

_____

_____

_____

_____ **[3]**

[Total: 7]

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9 (a) Biscuits contain sugar, starch and fat.

When Jon eats biscuits his blood sugar level rises.

Which two statements explain why this happens?

Put ticks (✓) in the boxes next to the TWO correct answers.

Biscuits contain starch that is digested into glucose.	☐
Biscuits contain starch which is digested into amino acids.	☐
Biscuits contain fat which is digested into fatty acids.	☐
Sugar can be absorbed directly into the blood.	☐
Biscuits contain starch molecules which are too large to be absorbed.	☐
Fat is digested into sugar.	☐

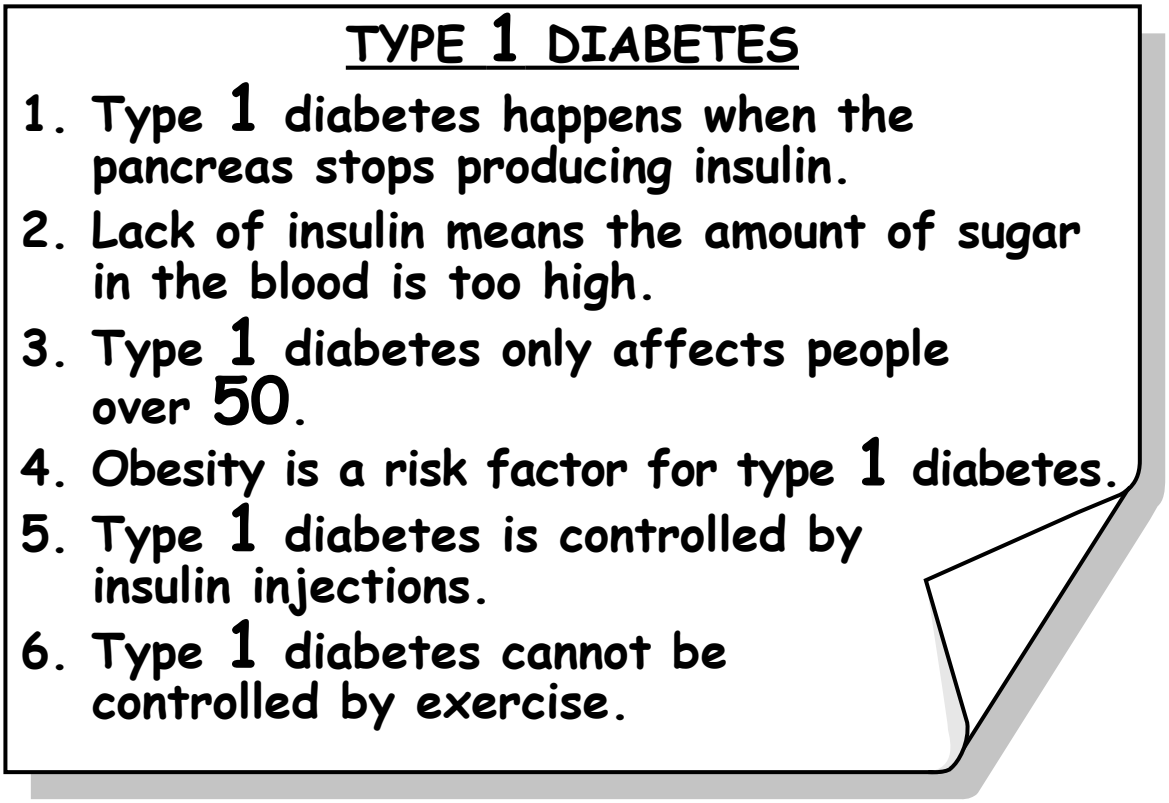
[2]

(b) Jon's mother has type 1 diabetes.

Jon makes some notes about type 1 diabetes.

Here is what he writes.

He makes some mistakes.



TYPE 1 DIABETES

1. Type 1 diabetes happens when the pancreas stops producing insulin.
2. Lack of insulin means the amount of sugar in the blood is too high.
3. Type 1 diabetes only affects people over 50.
4. Obesity is a risk factor for type 1 diabetes.
5. Type 1 diabetes is controlled by insulin injections.
6. Type 1 diabetes cannot be controlled by exercise.

Write down the numbers of the TWO sentences that contain mistakes.

sentences _____

and _____ **[2]**

[Total: 4]

10 This is a question about how proteins are used and removed from the human body.

Complete each of these sentences with the correct word.

Digestion breaks down protein in food to make amino acids.

Cells grow by building up amino acids into new

_____ .

Excess amino acids are broken down in the liver to

make _____ .

The kidneys excrete _____ .

[3]

[Total: 3]

END OF QUESTION PAPER

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