

GENERAL CERTIFICATE OF SECONDARY EDUCATION
GATEWAY SCIENCE
BIOLOGY B

Unit 1: Modules B1 B2 B3 (Higher Tier)

TUESDAY 15 JANUARY 2008

Afternoon
Time: 1 hour

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

Candidate Number

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.
- Do **not** write outside the box bordering each page.
- 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 **60**.

FOR EXAMINER'S USE		
Section	Max	Mark
A	20	
B	20	
C	20	
TOTAL	60	

This document consists of **19** printed pages and **1** blank page.

Answer **all** the questions.

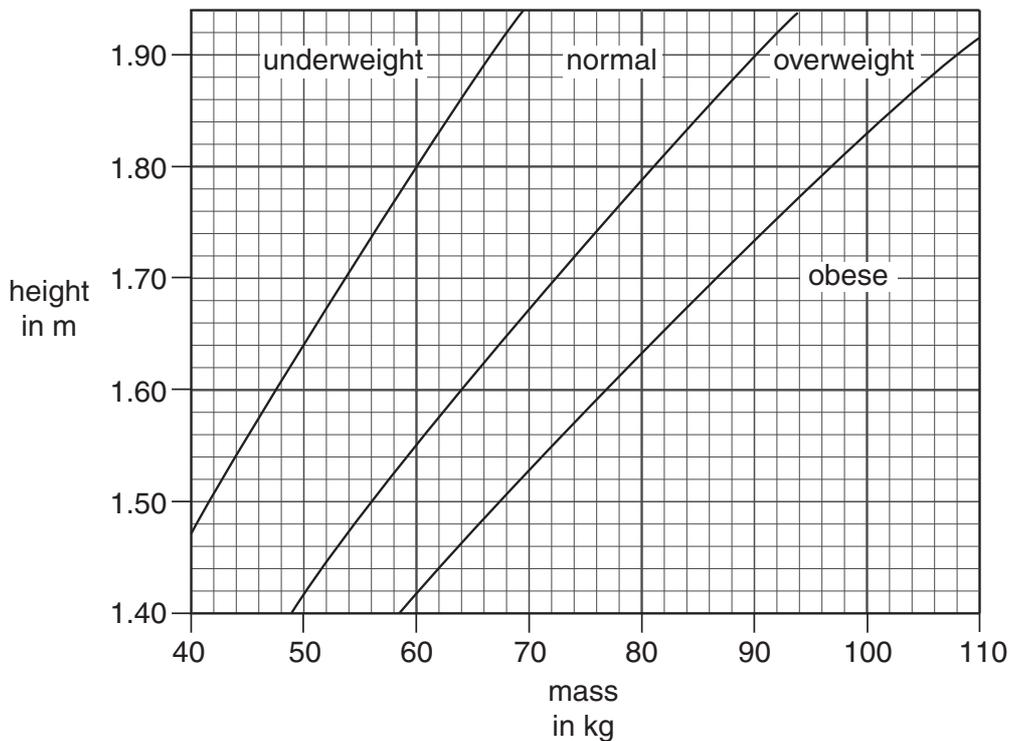
Section A – Module B1

1 Chris and Sam want to see if they have suitable balanced diets.

They measure their mass and height.

	mass in kg	height in m
Chris	90	1.85
Sam	50	1.75

(a) (i) Use the information in the table and the BMI chart to work out whether **Chris** is underweight, normal, overweight or obese.



Put a ring around the correct answer.

underweight **normal** **overweight** **obese**

[1]

(ii) Sam works out that he is slightly underweight.

How much should he increase his mass by to reach a normal mass?

Use the information in the table and the BMI chart to work out your answer.

answer kg

[1]

3

(b) Sam's doctor tells him to eat the recommended daily average intake of protein.

Work out Sam's recommended daily average intake (RDA).

Use information in the table and the formula:

$$\text{RDA in g} = 0.75 \times \text{body mass in kg}$$

answer [1]

(c) Sam can increase the amount of protein in his diet by eating more animal products such as meat or plant products such as beans.

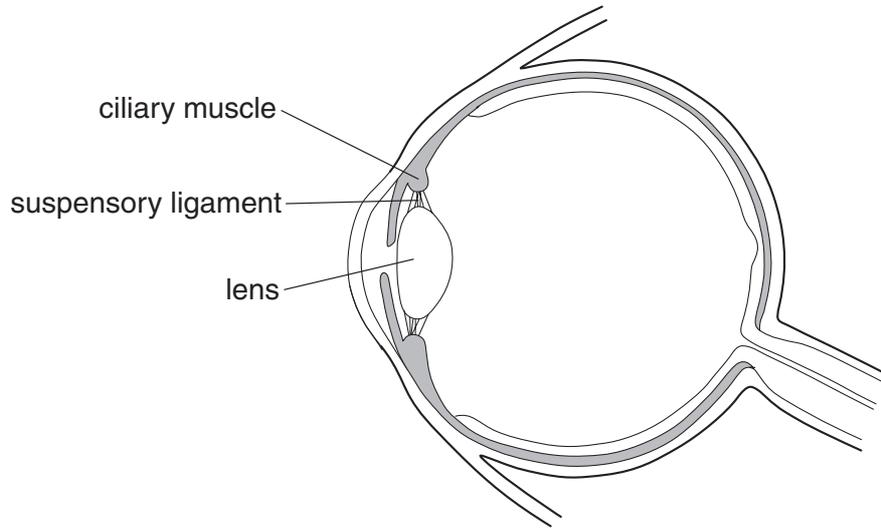
Write down **one** factor that could influence what he eats.

..... [1]

[Total: 4]

2 Look at the diagram of the eye.

It shows an eye looking at a near object.



(a) The lens changes shape to focus light.

Explain how the lens changes shape when the eye is focusing light from a **distant** object.

In your answer include the changes to the

- lens
- ciliary muscle
- suspensory ligaments.

.....

.....

.....

..... [3]

(b) Some people can only see with one eye.

Describe how this affects vision.

.....

..... [1]

[Total: 4]

3 Ayshea is running in a long-distance race.

During the race, Ayshea's breathing rate and heart rate increase.



(a) During the race, Ayshea's muscles produce a lot of heat.

One way she loses this extra heat is by sweating more.

(i) Explain how sweating causes Ayshea to lose heat.

..... [1]

(ii) Losing extra heat keeps Ayshea's body temperature the same.

What word describes keeping body temperature the same?

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

- dehydration homeostasis hypothermia insulation respiration**

[1]

(b) After the race, Ayshea sits down.

However, her breathing and pulse rate stay high for a while.

Explain why.

.....
.....
..... [2]

[Total: 4]

4 (a) Cystic fibrosis is an inherited disorder.

It is caused by a recessive allele.

Neil and Nancy are going to have a baby.

They both carry the recessive allele but neither has cystic fibrosis.

They have the alleles **Ff**.

What is the probability of Neil and Nancy having a child with cystic fibrosis?

Use a genetic diagram to work out your answer.

probability of child having cystic fibrosis [3]

(b) Other disorders can also be inherited.

Put a ring around the disorder that is inherited.

anaemia malaria red-green colour blindness scurvy [1]

[Total: 4]

5 Dominic has been smoking cigarettes for many years.

He now has a smokers' cough.

(a) The cells lining Dominic's trachea, bronchi and bronchioles are different from those of a non-smoker.

Explain how they are different.

.....
..... [1]

(b) Dominic wants to give up smoking cigarettes.

To help him, his doctor gives him some nicotine patches.

Explain why nicotine patches can help.

.....
..... [1]

(c) Dominic's doctor tells him that giving up cigarettes will help him to be more fit and healthy.

What is the difference between being **fit** and being **healthy**?

Being fit means

Being healthy means

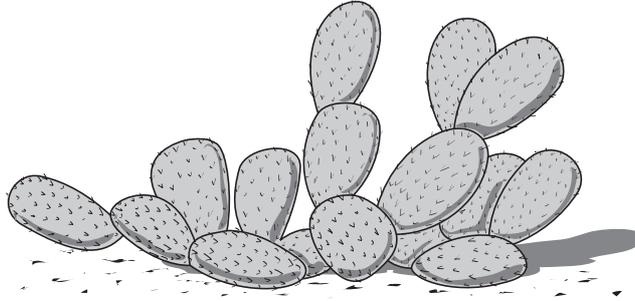
..... [2]

[Total: 4]

Section B – Module B2

- 6 Read the following article that appeared in a recent newspaper.

Money to grow Cacti!



Las Vegas is a city in the middle of the desert in America.

Water is in very short supply.

The local council have decided to take action.

They are paying local people one dollar per square metre to replace their grass lawns with a plant called the cow's tongue cactus.

They think that this will help to solve the water shortage.

- (a) Cacti are plants.

Write down **one** characteristic of cacti that places them in the plant kingdom.

..... [1]

- (b) The scientific name for the cow's tongue cactus is *Opuntia engelmannii*.

Put a tick (✓) in the box next to the system used to produce this name.

- | | |
|----------------|--------------------------|
| bimodal | <input type="checkbox"/> |
| binomial | <input type="checkbox"/> |
| classification | <input type="checkbox"/> |
| conservation | <input type="checkbox"/> |

[1]

(c) The council think that the cacti will need less water than grass.

The cacti have special adaptations that help them to live in dry areas.

Explain **two** of these adaptations.

- 1 adaptation
- how it helps
-
- 2 adaptation
- how it helps
- [2]

(d) Cacti that are better adapted to dry areas are more likely to survive.

When these surviving cacti reproduce they will pass on their adaptations.

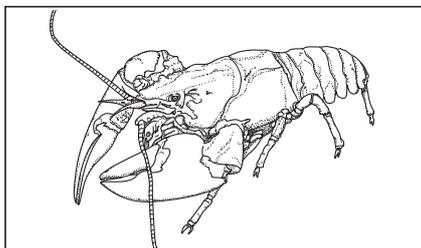
Cacti evolve by this process.

Write down the name given to this process.

..... [1]

[Total: 5]

7 Read the passage about the British crayfish.

British Crayfish in Danger

Crayfish are small animals that live on the bottom of rivers.

Scientists have discovered that British crayfish are becoming endangered due to a larger, faster breeding American crayfish.

These crayfish were brought over from America for food but escaped into rivers. This affected the community living in the rivers.

There is a plan to move a population of British crayfish to a habitat where there are no American crayfish.

(a) The British and the American crayfish are different species.

Put a tick (✓) in the box next to the statement that tells you that they are different species.

They cannot mate and produce fertile crayfish.

They have different coloured claws.

They usually live in different countries.

One breeds much faster than the other.

[1]

(b) The plan to move the British crayfish is part of a conservation programme.

(i) Write down **two** reasons why people think that it is important to set up conservation programmes.

1

.....

2

..... [2]

- (ii) Setting up a conservation programme for the crayfish should be quite easy. People have also tried to set up conservation programmes for whales. This has been much more difficult. Suggest **two** reasons why.

.....
.....
.....
.....
..... [2]

[Total: 5]

- 8 Burning fossil fuels such as oil produces a number of substances that can cause pollution. One of these substances is carbon dioxide.

- (a) Many scientists think that increasing levels of carbon dioxide may alter the temperature of the Earth.

Finish the following sentences to show how they think this might happen.

Radiation from the sun passes through the surrounding the Earth.

The Earth's surface is warmed and some of the radiation is re-radiated.

The carbon dioxide in the air some of this radiation.

The Earth therefore warms up.

This process is called [3]

- (b) Some scientists think that the temperature of the Earth may **not** rise much.

They say that increasing carbon dioxide levels may increase the photosynthesis rate of plants.

Explain why this may stop the temperature from becoming too high.

In your answer use ideas about limiting factors.

.....
.....
..... [2]

[Total: 5]

[Turn over

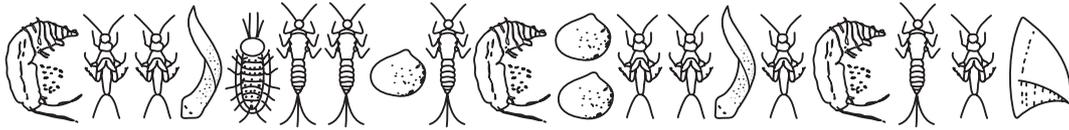
9 Byron wants to investigate two ecosystems near his house.

One is a natural pond.

The other is a pond that had been dug in a field that contained cows.

(a) He samples the small animals living in the natural pond.

These are the animals that he catches in this pond.



natural pond

(i) He sampled about 0.5 m³ of the water in the pond.

The pond contains 200 m³ of water in total.

Estimate the number of flatworms () living in the pond.

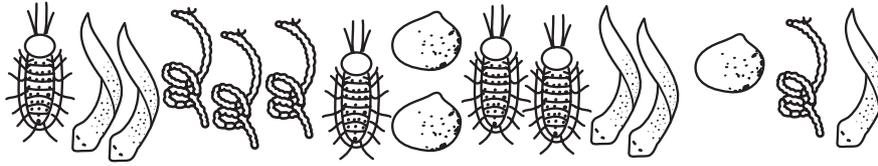
total number of flatworms = [2]

(ii) Write down **one** reason why this estimate of the number of flatworms in the pond may be inaccurate.

.....
..... [1]

(b) Byron then looks at the pond in the cows' field.

He samples in the same way and finds the following animals.



pond in cows' field

Byron is worried that one of the ponds is polluted.

Suggest what he should look for in the samples to prove that one of the ponds is polluted.

.....

.....

..... [2]

[Total: 5]

Section C – Module B3

10 Scott is learning about cells.

(a) He finds out that muscle cells contain large numbers of mitochondria.

Explain why muscle cells need large numbers of mitochondria.

.....
..... [2]

(b) Scott uses a microscope to look at a plant leaf cell.

He sees three structures that are **not** in muscle cells.

Write down the names of **two** of these structures.

1
2 [2]

(c) Scott looks on the internet and finds out about stem cells.

Stem cell research: Yes or no?

The debate on stem cell research continues.

New laboratories for stem cell research are being built in Newcastle.

Scientists will use stem cells taken from early embryos to make different body tissues.

Some scientists claim the research could lead to the cure of some diseases.

However, some people object to this research.

(i) Explain what is meant by the term **stem cell**.

.....
..... [1]

(ii) Some people object to stem cell research.

Suggest **one** reason why.

.....
..... [1]

11 Look at the picture.

It shows someone cloning a plant by taking a cutting.



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(a) The plant stem needs to be dipped into plant hormone.

Explain why.

.....
..... [1]

(b) Plants can also be cloned by tissue culture.

Describe the method used.

In your answer include

- the precautions taken
- the conditions needed.

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

(c) During cloning, cells divide by mitosis.

During mitosis, chromosomes in the nucleus divide.

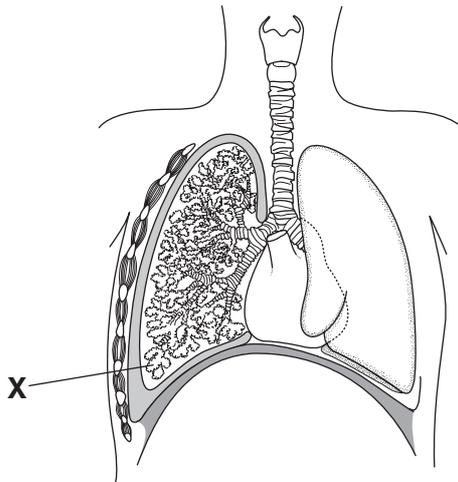
Describe **one other** thing that happens to the chromosomes during mitosis.

..... [1]

[Total: 5]

[Turn over

12 Look at the diagram. It shows the lungs and heart.



(a) Write down the name of part X.

..... [1]

(b) Oxygen leaves the lungs and enters the blood.

Describe how oxygen enters the blood.

Include ideas about concentration in your answer.

.....
.....
.....
..... [2]

(c) The cells lining part X are very thin.

This helps them carry out their function.

Explain why.

.....
..... [1]

[Total: 4]

13 Read the article about bacterial mutations.

Bacterial mutations

There are many types of bacteria.

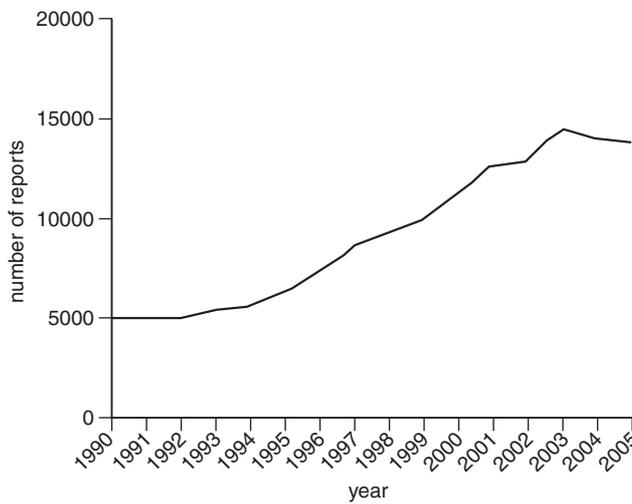
New strains occur because bacteria keep mutating.

Some of these new strains have an advantage when it comes to resisting antibiotics.

MRSA is a bacterium which is resistant to antibiotics.

(a) Look at the graph.

It shows the number of MRSA cases between 1990 and 2005.



Estimate the rise in cases between 1990 and 2003.

..... [1]

(b) Mutations can occur spontaneously or are caused by some factors.

Write down **two** factors that can cause mutations to occur.

1

2 [2]

(c) Mutations are changes to DNA.

(i) How could the structure of DNA change?

..... [1]

(ii) Why may a DNA change alter the functioning of a cell?

..... [1]

[Total: 5]

END OF QUESTION PAPER

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