

GENERAL CERTIFICATE OF SECONDARY EDUCATION
GATEWAY SCIENCE
BIOLOGY B

B631/02

Unit 1 Modules B1 B2 B3 (Higher Tier)

Candidates answer on the question paper.
A calculator may be used for this paper.

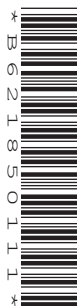
OCR supplied materials:
None

Other materials required:

- Pencil
- Ruler (cm/mm)

Thursday 13 January 2011
Morning

Duration: 1 hour



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 **60**.
- This document consists of **20** pages. Any blank pages are indicated.

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3

Answer **all** the questions.**Section A – Module B1**

1 This question is about hormones.

(a) Write down the name of the hormone that lowers the blood sugar level.

..... [1]

(b) Sex hormones cause secondary sexual characteristics in females.

One example is that periods start.

Write down **one other** example of a female secondary sexual characteristic.

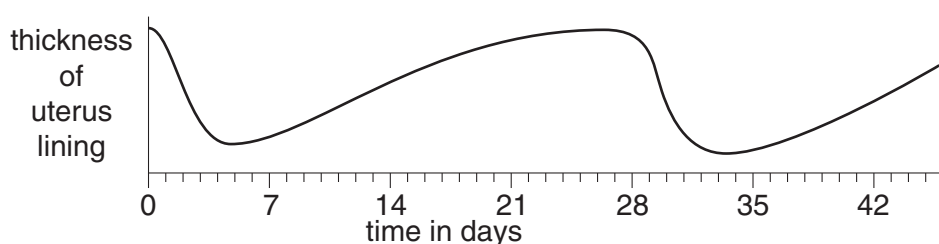
.....

..... [1]

(c) Periods are part of the menstrual cycle.

The thickness of the uterus lining changes during the menstrual cycle.

Look at the graph.



Oestrogen and progesterone control the thickness of the uterus lining.

Describe the effect each hormone has on the uterus lining.

oestrogen

progesterone [2]

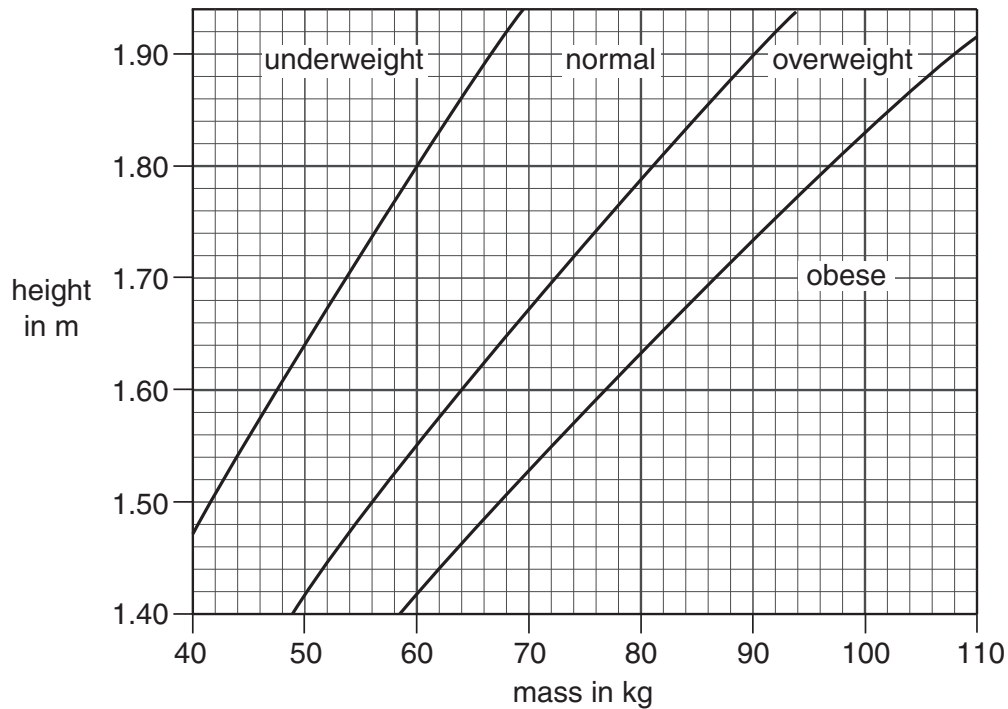
[Total: 4]

4

2 Jack thinks he is overweight.

(a) Jack is 180 cm tall and has a mass of 110 kg.

(i) He uses a BMI (Body Mass Index) chart to find out if he is overweight.



Look at the chart.

Is Jack underweight, normal, overweight or obese?

..... [1]

(ii) Calculate Jack's BMI.

Use the formula

$$\text{BMI} = \frac{\text{mass in kg}}{(\text{height in m})^2}$$

.....

BMI = [2]

5

(b) Jack decides to try a new healthy lifestyle.

As part of his new healthy lifestyle Jack decides to drink less alcohol and stop smoking.

(i) The epithelial cells in Jack's trachea are damaged by cigarette smoke.

Write down **one** way the cells are damaged.

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

(ii) The liver can be damaged by alcohol.

Explain why.

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

(c) Jack decides to go running to get fit.

(i) During his run he gets hot and starts to sweat more.

Explain how sweating causes Jack to lose heat.

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

(ii) During his run Jack uses anaerobic respiration to release energy.

Lactic acid builds up in his muscles causing pain.

What happens to this lactic acid?

..... [1]

[Total: 7]

- 3** Scientists have studied the DNA of elephants so they can compare it to the DNA of extinct woolly mammoths.

- (a)** Elephant DNA contains the same four bases as human DNA.

Write down the **four** letters of the bases in elephant DNA.

..... [1]

- (b)** Long coiled molecules of DNA form chromosomes inside the body cells.

- (i)** Elephant body cells each contain 28 **pairs** of chromosomes.

How many chromosomes are in an elephant's egg cell?

..... [1]

- (ii)** If elephants and mammoths had been able to breed together their offspring would have had 57 chromosomes in their body cells.

Calculate how many chromosomes were in each body cell of a mammoth.

.....

.....

answer [1]

- (c)** Most mammoths had dark fur, however the remains of a mammoth with light fur have been found.

The light fur is caused by the mutation of a single gene.

- (i)** The DNA of the mutated gene is different from the DNA of the original gene.

Suggest how it is different.

..... [1]

- (ii)** Light fur colour is caused by a recessive allele.

Was the light coloured mammoth heterozygous or homozygous for fur colour?

.....

Explain your answer.

.....

..... [1]

[Total: 5]

7

4 Nain has been immunised against mumps using a vaccine.

She now has active immunity to mumps.

(a) The vaccine contains a harmless form of the mumps virus.

Write about the effect of the virus vaccine on Nain.

Your answer should include

- how the body detects the virus
- how the body responds
- why the immunity remains.

.....

.....

.....

.....

..... [3]

(b) New treatments for infectious diseases are tested on animals.

The treatments are tested to see if they work.

Write down **one other** reason why they are tested.

..... [1]

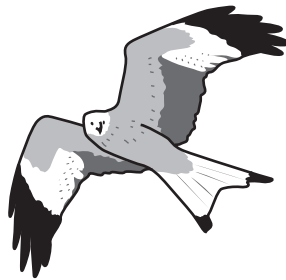
[Total: 4]

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Section B – Module B2

- 5 Look at the picture of a red kite.



- (a) Red kites are **endangered**.

One hundred years ago, only 10 breeding pairs were living in the UK.

Red kites were found only in Wales.

Scientists have successfully re-introduced red kites into England and Scotland.

There are now about 1000 breeding pairs in the UK.

- (i) What word describes the **number** of red kites living in the UK?

Put a ring around the correct answer.

collection

community

population

species

[1]

- (ii) Describe **how** red kites can be protected and encouraged to breed successfully.

.....

.....

..... [2]

- (b) Natural ecosystems have been replaced by artificial ecosystems.

This may have caused the reduction in the number of red kites.

Suggest **one** reason why.

.....

..... [1]

[Total: 4]

- 6 (a) Anna visits a rocky shore and notices there are many limpets on the rocks.



Limpets are animals that move very slowly when the tide is out.

Anna wants to estimate the number of limpets on the rocky shore.

She samples the limpets in ten different places using a quadrat.

- (i) Anna collects some results to help with her estimate.

The table shows her results.

area of rocky shore	160 m ²
size of quadrat used	0.25 m ²
total number of limpets in 10 quadrats	40
average number of limpets in 1 m ²	

Calculate the average number of limpets in **1 m²**.

.....

answer [2]

- (ii) Use the results to estimate the number of limpets on the rocky shore.

.....

answer [1]

- (b) Anna visits a different rocky shore.

The tide is coming in.

She only has time to take samples at five places at the top of the rocky shore.

Complete the sentences.

Taking samples from only five places makes the estimate **unreliable** because

.....

.....

Taking samples from only the top of the rocky shore makes the estimate **unreliable** because

.....

..... . [2]

- (c) Periwinkles also live on the rocky shore.

Look at the statements about limpets and periwinkles.

A They both have a soft body inside a shell.

B They both feed on seaweed.

C They are both coloured for camouflage.

D They both live in the same rock pools.

Periwinkles and limpets have similar **ecological niches**.

Which **two** statements together explain why?

Choose **two** from **A**, **B**, **C** and **D**.

..... and

[1]

[Total: 6]

7 Look at the picture.

It shows a fossil of a plant leaf in a piece of rock.



(a) (i) Complete the stages to show how the fossil was formed.

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

dead gases hard minerals soft water waxy

The plant dies and falls into mud.

The parts of the plant decay.

Sediment covers the plant.

The remains of the plant are gradually replaced by [2]

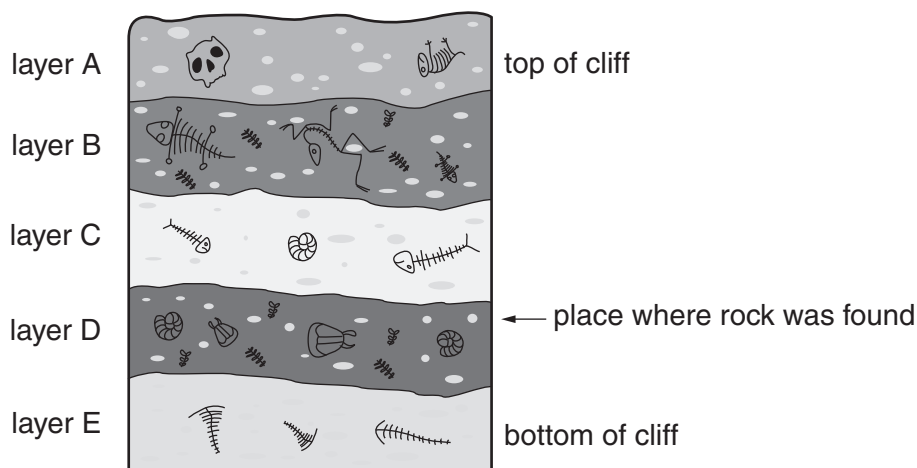
(ii) The remains of this plant leaf have been preserved in rock.

Write down **one other** way that the remains of animals and plants from many years ago can be preserved.

..... [1]

13

(iii) The rock was found in a cliff face. Look at the diagram of the cliff face.



Scientists use fossils to provide evidence of evolution.

Write down **two** reasons why fossil evidence is not complete.

1

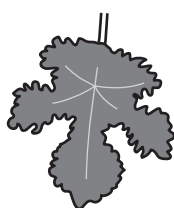
.....

2

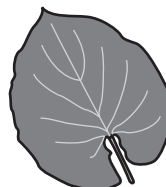
..... [2]

(b) Scientists think that the remains of plant leaves found in layer B belong to a different species to those found in layer D.

leaf in layer D



leaf in layer B



Explain how the species of plant found in layer D might have **evolved** into the species of plant found in layer B.

Use ideas about natural selection in your answer.

.....

.....

.....

..... [2]

[Total: 7]

8 This question is about photosynthesis.

(a) Plant leaves are adapted for photosynthesis.

The leaf cells contain a green pigment.

Look at the list.

cellulose
chlorophyll
glucose
oil
starch

Write down the name of the green pigment.

Choose from the list.

..... [1]

(b) Complete the balanced symbol equation for photosynthesis.

$6\text{CO}_2 + \text{.....} \rightarrow \text{.....} + 6\text{O}_2$ [1]

(c) Why does photosynthesis happen faster in summer than winter?

..... [1]

[Total: 3]

Section C – Module B3

- 9 (a) Gill has two children, Jenny and Richard.

Gill has passed on some of her chromosomes to her children.

She passed on these chromosomes in her egg cells.

- (i) What type of cell division produces egg cells?

..... [1]

- (ii) Is it likely that Jenny and Richard each inherited an identical set of chromosomes from Gill?

.....

Explain your answer.

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

- (iii) Egg cells are fertilised by sperm cells.

What word describes a fertilised egg cell?

Put a ring around the correct answer.

acrosome

clone

foetus

gamete

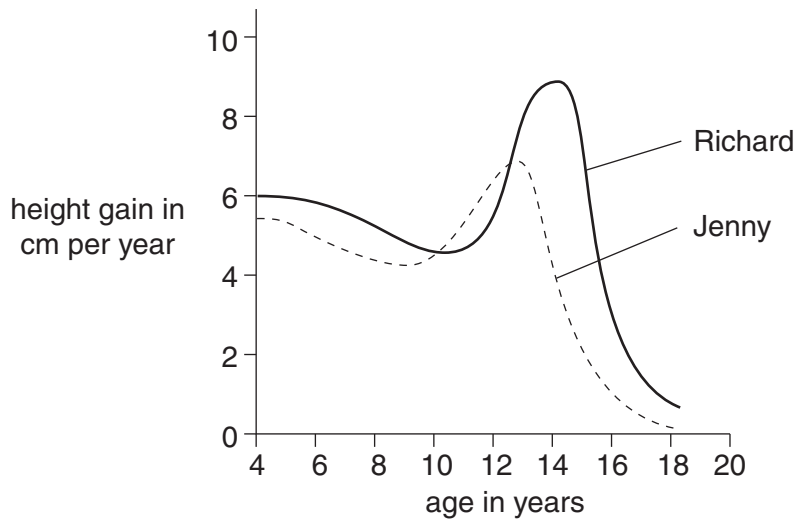
zygote

[1]

16

(b) Look at the graph.

It shows how Jenny and Richard gain height as they grow.



Use the graph to answer the questions.

(i) At what **age** is Jenny growing at her fastest rate?

..... [1]

(ii) At what **age** does Richard **start** puberty?

..... [1]

(iii) Jenny reaches adulthood at 18 years.

What will then happen to Jenny's height?

..... [1]

[Total: 6]

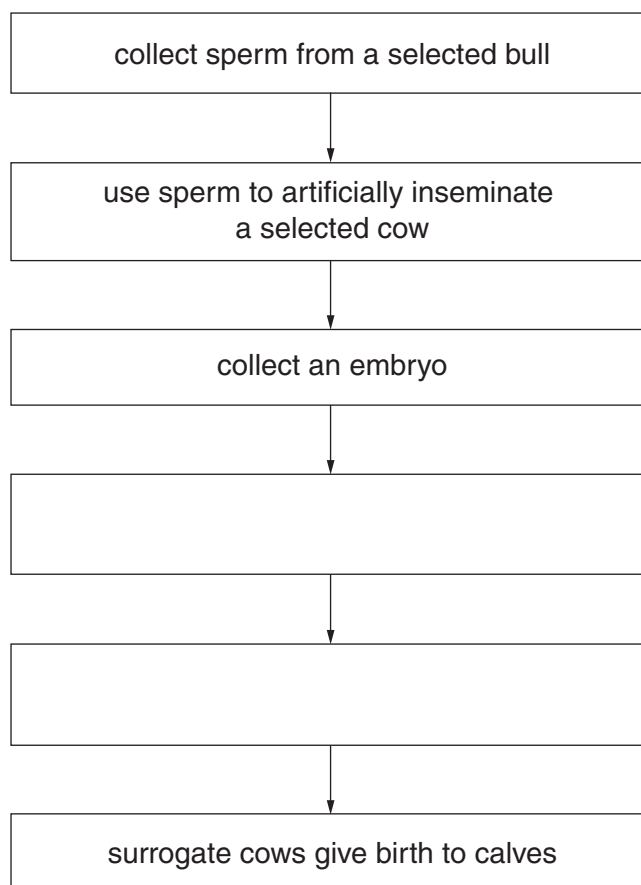
17

10 (a) A farmer wants to produce genetically identical calves.

He uses a technique called **embryo transplant**.

(i) Embryo transplant involves several stages.

Complete the flow diagram to show all the stages.



[2]

(ii) Embryo transplant has advantages compared with selective breeding.

One advantage of embryo transplant is that the new calves are genetically identical.

Suggest **one other** advantage of this technique.

.....

 [1]

(iii) Producing new cows by embryo transplant may lead to a **reduced gene pool** in cows.

What is meant by a reduced gene pool?

..... [1]

18

(b) As the embryo calves grow, their cells divide.

(i) Just before cells divide, the DNA in the cells copies itself.

This is called **DNA replication**.

Describe how DNA replication happens.

You may use labelled diagrams to help you answer.

.....

.....

.....

.....

..... [3]

(ii) Some of the cells in the embryo calves are called **stem cells**.

As an embryo grows, what happens to the **proportion** of its cells that are stem cells?

Choose your answer from the list.

Put a ring around the correct answer.

decreases

increases

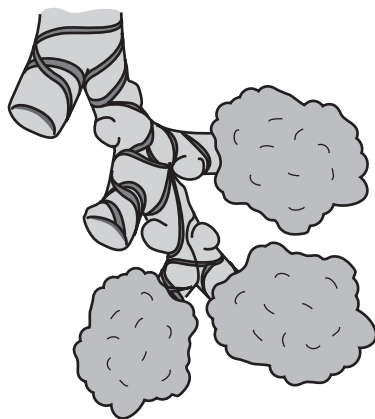
stays the same

[1]

[Total: 8]

11 Bob has been a cigarette smoker for many years.

- (a) (i) Look at the diagram of some of the alveoli in Bob's lungs compared with some alveoli from a non-smoker.



Bob



non-smoker

Bob's lungs do **not** absorb oxygen into the blood as well as a non-smoker's lungs.

Explain why.

.....
 [1]

- (ii) Oxygen enters the blood by diffusion from the alveoli.

Does any oxygen enter the alveoli from the blood?

.....

Explain your answer.

.....
 [1]

- (iii) Oxygen in the blood is carried by red blood cells.

Write down the name of the new substance formed when oxygen enters red blood cells.

..... [1]

- (b) Bob has a high level of cholesterol in his blood.

This restricts the blood flow in the artery taking blood to the ventricle walls in his heart.

- (i) Explain how a high level of cholesterol can restrict blood flow.

.....
 [1]

- (ii) A restricted blood flow stops the ventricles working efficiently.

Suggest what effect this will have on the body.

.....
 [1]

- (iii) Bob's doctor says that Bob should have a by-pass operation.

He will use a blood vessel from Bob's leg to replace the artery affected by cholesterol.

It is better to take the replacement blood vessel from Bob's leg and **not** a donor.

Explain why.

.....
 [1]

[Total: 6]

END OF QUESTION PAPER

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