

PAPER 2 PREPARATION AND REVISION

Includes work on the following sections:

B5 - Homeostasis and Response

B6 - Inheritance, Variation and Evolution

B7 - Ecology



BIOLOGY

B5 content - Homeostasis and Response (Paper 2)

- Homeostasis and Body Temperature
- The Nervous System, The Brain and The Eye
- Hormones (endocrine system, blood glucose, water balance)
- Reproduction (sex hormones, menstrual cycle, reducing fertility, increasing fertility[HT])
- Plant hormones (functions of plant hormones, uses of plant hormones[HT])

Required practicals:

- Reaction time (page 48 in revision guide)
- The effect of light and gravity on cress seeds (page 55 in revision guide)

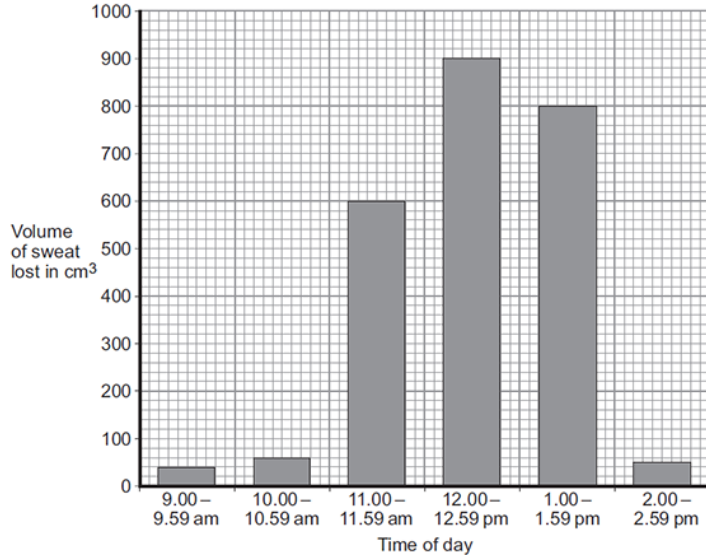
Make notes for Homeostasis and Body Temperature (P. 46 - 47)

- The importance of homeostasis
- Control systems
- Control of body temperature

Homeostasis and body temperature exam style question

Q1.

A scientist measured the volume of sweat lost between 9.00 am and 2.59 pm in one day by one person. The graph below shows the results.



(a) (i) Suggest what happened at 11.00 am.

Tick (✓) **one** box.

The person moved into a cold room.

The person removed their coat.

The person started running a race.

(1)

(ii) Calculate the total volume of sweat lost between 11.00 am and 1.59 pm.

Total volume of sweat lost = _____ cm³

(1)

(iii) Suggest **one** way the person could replace the water that was lost as sweat.

(1)

(b) (i) Sweating helps keep our internal body temperature within a narrow range.

Which organ monitors body temperature?

Tick (✓) **one** box.

brain

kidney

pancreas

(1)

(ii) The organ that monitors internal body temperature receives information about temperature from the skin.

Which structures in the skin send impulses with this information?

Tick (✓) **one** box.

capillaries

glands

receptors

(1)

(c) How does sweating help to control body temperature?

(1)

(Total 6 marks)

Make notes for the nervous system and the eye (P. 48 - 49)

- The nervous system
- The brain
- The eye

Make notes for hormones (P. 50 - 51)

- The endocrine system
- Control of blood glucose
- Water balance

Hormones exam style question

Q3.

Diabetes is a disease in which blood glucose (sugar) concentration may rise more than normal.

(a) Which organ in the body monitors this rise in blood sugar?

Draw a ring around your answer.

liver

pancreas

stomach

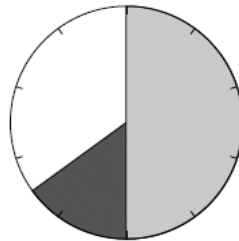
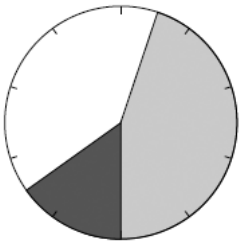
(b) One way of treating diabetes is by careful attention to diet.

Chart 1 shows the recommended diet for a person with diabetes.

Chart 2 shows a diet for a person without diabetes.

Chart 1 Person with diabetes

Chart 2 Person without diabetes



Key

Energy from: Carbohydrate Protein Fat

How is the recommended diet of a person with diabetes different from the diet of a person without diabetes?

Use information from the charts.

Tick (✓) **two** box.

(1)

The diabetic should get more energy from fat.

The diabetic should get more energy from protein.

The diabetic should get less energy from carbohydrate.

The diabetic should get less energy from protein.

(2)

(c) Other than diet, give **one** way in which diabetes may be treated.

Make notes for hormones and reproduction (P. 52 - 53)

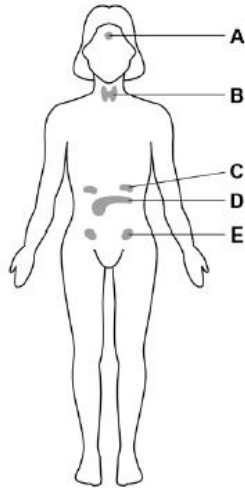
- The sex hormones
- Control of the menstrual cycle
- Reducing fertility
- Increasing fertility

Reproduction exam style question

Q4.

The menstrual cycle in a woman is controlled by hormones.

The diagram shows some of the glands in a woman's body that produce hormones.



The hormones that control the menstrual cycle are produced by the pituitary gland and by the ovaries.

(a) Which gland is the pituitary gland?

Tick **one** box.

A B C D E

(b) Which gland is the ovary?

Tick **one** box.

A B C D E

(c) Complete the sentence.

In the menstrual cycle, one egg is released approximately every _____ days.

(1)

(d) Which hormone is used in the oral contraceptive pill?

Tick **one** box.

Adrenaline

Insulin

Progesterone

Testosterone

(1)

(e) Describe how the oral contraceptive pill stops a woman becoming pregnant.

(2)

(f) Complete the sentences.

Choose the answers from the box.

adrenaline insulin oestrogen progesterone testosterone

(1)

Development of the female secondary sex characteristics is controlled

by _____.

Sperm production is stimulated by _____.

(1)

(2)

(Total 8 marks)

Plant hormones exam style question

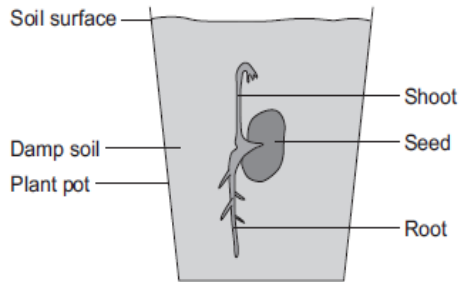
Q5.

A student investigated growth in plants.

The student:

- planted a seed in damp soil in a plant pot
- put the plant pot in a dark cupboard.

The image below shows the result after 5 days.



(a) Draw a ring around the correct answer to complete each sentence.

(i) After the 5 days, the root had grown

- | |
|---|
| away from water. |
| in the direction of the force of gravity. |
| towards light. |

(1)

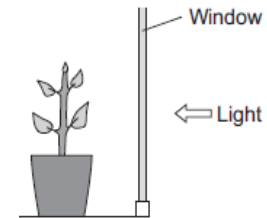
(ii) After the 5 days, the shoot had grown

- | |
|-------------------------------|
| against the force of gravity. |
| away from light. |
| towards water. |

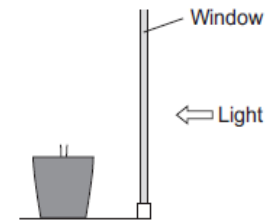
(1)

(b) After the plant had grown, the student put the plant pot by a window with lots of light.

The illustration below shows this.



(i) Complete the diagram below to show the appearance of the student's plant after 20 days by the window.



(ii) Explain the advantage to the plant of growing in the way that you have drawn in part (b)(i).

(1)

(2)

(Total 5 marks)

B5 Required Practical Notes

– Reaction time (page 48 in revision guide)

– The effect of light and gravity on cress seeds (page 55 in revision guide)

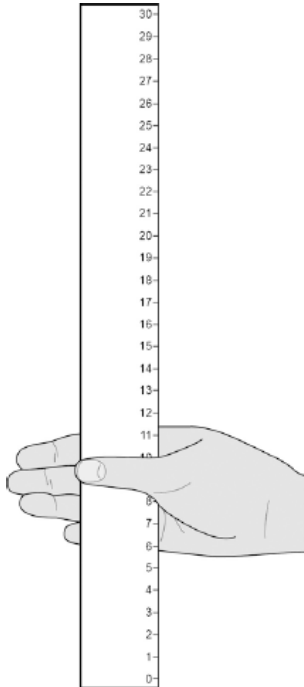
Required practical exam style question

Q6.

Two students investigated reflex action times.

This is the method used.

1. Student **A** sits with her elbow resting on the edge of a table.
2. Student **B** holds a ruler with the bottom of the ruler level with the thumb of Student **A**.
3. Student **B** drops the ruler.
4. Student **A** catches the ruler and records the distance, as shown in the diagram below.
5. Steps 1 to 4 were then repeated.



- (a) Suggest **two** ways the students could improve the method to make sure the test would give valid results.

1. _____

2. _____

(2)

- (b) The table below shows Student **A**'s results.

Test Number	Distance ruler dropped in mm
1	117
2	120
3	115
4	106
5	123
6	125
7	106

What is the **median** result?

Tick **one** box.

106

115

116

117

123

(1)

Required practical exam style question continued

- (c) The mean distance the ruler was dropped is 116 mm.

Calculate the mean reaction time.

Use the equation:

$$\text{reaction time in s} = \sqrt{\frac{\text{mean drop distance in cm}}{490}}$$

Give your answer to 3 significant figures

Mean reaction time = _____ s

(3)

- (d) The students then measured Student **A**'s reaction time using a computer program.

This is the method used.

1. The computer shows a red box at the start.
2. As soon as the box turns green the student has to press a key on the keyboard as fast as possible.
3. The test is repeated five times and a mean reaction time is displayed.

Student **A**'s mean reaction time was 110 ms.

Using a computer program to measure reaction times is likely to be more valid than the method using a dropped ruler.

Give **two** reasons why.

1. _____

2. _____

(2)

- (e) A woman has a head injury.

Her symptoms include:

- finding it difficult to name familiar objects
- not being able to remember recent events.

Suggest which part of her brain has been damaged.

(1)

- (f) A man has a head injury.

He staggers and sways as he walks.

Suggest which part of his brain has been damaged.

(1)

(Total 10 marks)

B5 Revision - Homeostasis and Response (page 46-55 in revision guide)

Name three things that must be controlled by the body:

- 1.
- 2.
- 3.

Why do we need reflexes?

How can we map the brain?

What are the three main regions of the brain?

-
-
-

Why is contraception used?

Where does auxin build up in a plant shoot?

What happens to pupil size in dim light and why?

What does the body do when we get too hot?

What does the body do when we get too cold?

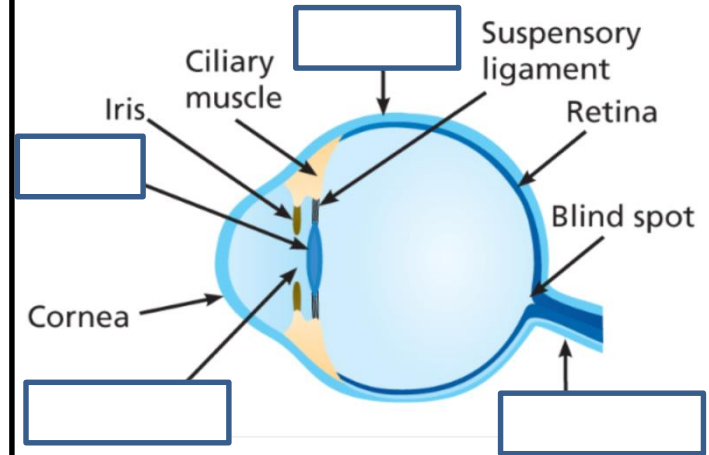
Why is the pituitary gland often called the master gland?

List 2 advantages of kidney dialysis:

- 1.
- 2.

How many days in length is the average menstrual cycle?

Fill in the missing eye diagram labels:



Complete the table below on the different types of diabetes:

Diabetes	Cause	Treatment
Type 1		
Type 2		

KEY WORDS:

Homeostasis
Receptor
Reflex action
Synapse
Cerebellum
Cerebral cortex
Medulla
MRI

Retina
Iris
Negative Feedback
Vasodilation
Vasoconstriction
Insulin
Donor
Dialysis

B6 content - Inheritance, Variation and Evolution

(Paper 2)

- ❑ Sexual and asexual reproduction (asexual, sexual and meiosis)
- ❑ DNA and Protein Synthesis (genome, structure of DNA, making proteins, mutations[HT])
- ❑ Patterns of inheritance (Gregor Mendel, modern ideas, genetic crosses, genetic disorders, sex determination)
- ❑ Variation and Evolution
- ❑ Manipulating Genes (selective breeding, genetic engineering, cloning)
- ❑ Classification (classification, extinction, evolutionary trees, speciation)

Make notes for sexual and asexual reproduction (P. 74 - 75)

- Asexual reproduction
- Sexual reproduction and meiosis
- Asexual versus sexual reproduction

Asexual reproduction exam style question

Q1.

(a) Use words from the list to complete the sentences.

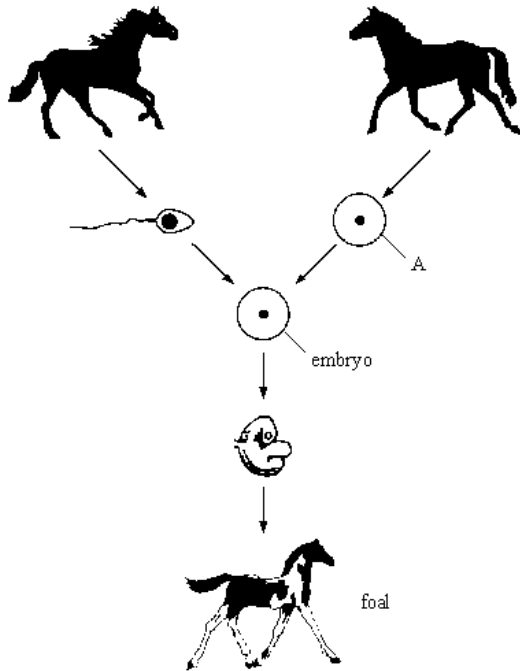
alleles chromosomes gametes genes mutations

The nucleus of a cell contains thread-like structures called _____.

The characteristics of a person are controlled by _____

which may exist in different forms called _____.

(b) The drawing shows some of the stages of reproduction in horses.



(i) Name this type of reproduction _____

(1)

(ii) Name the type of cell labelled A _____

(1)

(c) When the foal grows up it will look similar to its parents but it will **not** be identical to either parent.

(i) Explain why it will look similar to its parents.

(3)

(1)

(ii) Explain why it will **not** be identical to either of its parents.

(2)

(Total 8 marks)

Make notes for DNA and protein synthesis (P. 76 - 77)

- The genome
- The structure of DNA
- Making proteins

DNA and protein synthesis exam style question

Q2.

Our understanding of genetics and inheritance has improved due to the work of many scientists.

(a) Draw **one** line from each scientist to the description of their significant work.

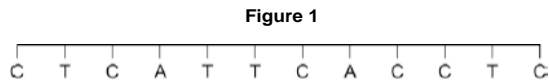
Scientist	Description of significant work
Charles Darwin	Carried out breeding experiments on pea plants.
Alfred Russel Wallace	Wrote 'On the origin of species'.
Gregor Mendel	Worked on plant defence systems.
	Worked on warning colouration in animals.

(b) In the mid-20th century the structure of DNA was discovered.

What is a section of DNA which codes for one specific protein called?

(c) **Figure 1** shows one strand of DNA.

The strand has a sequence of bases (A, C, G and T).



How many amino acids does the strand of DNA in **Figure 1** code for?

Tick **one** box.

- 2
- 3
- 4

(d) Mutations of DNA cause some inherited disorders.

One inherited disorder is cystic fibrosis (CF).

A recessive allele causes CF.

Complete the genetic diagram in **Figure 2**.

- Identify any children with CF.
- Give the probability of any children having CF.

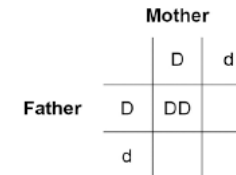
Each parent does not have CF.

The following symbols have been used:

D = dominant allele for **not** having CF

d = recessive allele for having CF

Figure 2



(3)

(1)

Probability of a child with CF = _____

(3)

(e) What is the genotype of the mother shown in **Figure 2**?

Tick **one** box.

- Heterozygous
- Homozygous dominant
- Homozygous recessive

(1)

(Total 9 marks)

Make notes for patterns of inheritance (P. 78 - 79)

- Gregor Mendel
- Modern ideas about genetics
- Genetic crosses
- Genetic disorders
- Sex determination

Patterns of inheritance exam style question

Q3.

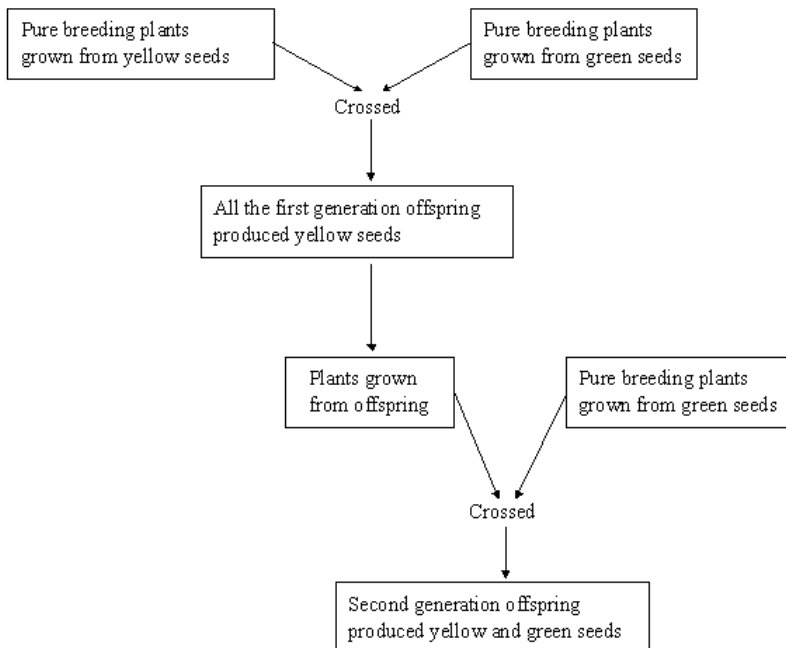
In the 1850s, Gregor Mendel carried out breeding experiments using peas.

- (a) The importance of Mendel's work was not recognised until the early 1900s.

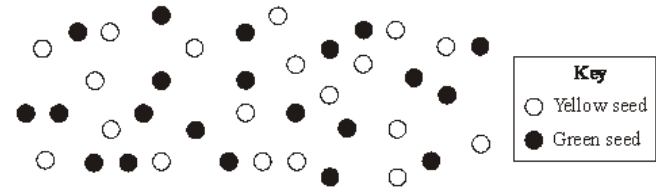
Explain why.

- (b) A student repeated one of Mendel's experiments.

The flow chart shows her procedure.



The diagram shows a representative sample of seeds produced by second generation plants.



- (i) Describe how the student could obtain a sample that is representative of seeds produced by the second generation.

(2)

(1)

- (ii) What was the approximate ratio of yellow seeds to green seeds in the seeds produced by the second generation?

(1)

- (iii) Seed colour in peas is controlled by a single gene which has two alleles.

Use a genetic diagram to show why this ratio of yellow seeds to green seeds was produced by the second generation.

Use the symbol **A** to represent the dominant allele, and **a** to represent the recessive allele.

(4)

(Total 8 marks)

Make notes for Variation and Evolution (P. 80 - 81)

- Variation
- Natural selection
- Evidence for evolution

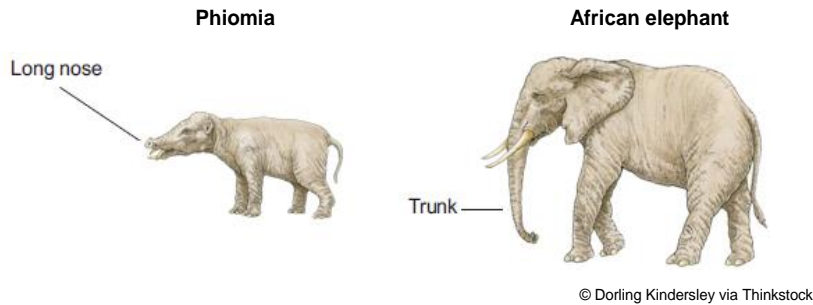
Variation and evolution exam style question

Q4.

The image below shows:

- *Phiomia*, an ancestor of elephants
- a modern African elephant.

Phiomia lived about 35 million years ago.



Both *Phiomia* and the African elephant reach up into trees to get leaves.

In the 1800s, Darwin and Lamarck had different theories about how the long nose of *Phiomia* evolved into the trunk of the African elephant.

- (a) (i) Use Darwin's theory of natural selection to explain how the elephant's trunk evolved.

(4)

- (ii) Lamarck's theory is different from Darwin's theory.

Use Lamarck's theory to explain how the elephant's trunk evolved.

(2)

- (b) (i) In the 1800s, many scientists could **not** decide whether Lamarck's theory or Darwin's theory was the right one.

Give **two** reasons why.

1. _____

2. _____

(2)

- (ii) Before the 1800s, many people had a different idea to explain where all the living things on Earth came from.

What idea was this?

(1)

(Total 9 marks)

Make notes for manipulating genes (P. 82 - 83)

- Selective breeding
- Genetic engineering
- Cloning

Manipulating genes exam style question

Q5.

Many different types of animals are produced using selective breeding.

Some cats are selectively bred so that they do not cause allergies in people.

(a) Suggest **two other** reasons why people might selectively breed cats.

1. _____

2. _____

(2)

(b) Selective breeding could cause problems of inbreeding in cats.

Describe **one** problem inbreeding causes.

(1)

(c) Many people have breathing problems because they are allergic to cats.

The allergy is caused by a chemical called Fel D1.

Different cats produce different amounts of Fel D1.

A cat has been bred so that it does not produce Fel D1.

The cat does **not** cause an allergic reaction.

Explain how the cat has been produced using selective breeding.

(4)

(Total 7 marks)

Make notes for classification (P. 84 - 85)

- Principles of classification
- Extinction
- Evolutionary trees
- Speciation

Classification exam style question

Q6.

Figure 1 shows a ring-tailed lemur.

Figure 1



The table below shows part of the classification of the ring-tailed lemur.

Classification group	Name
Kingdom	<i>Animalia</i>
Phylum	<i>Chordata</i>
	<i>Mammalia</i>
	<i>Primates</i>
	<i>Lemuroidea</i>
Genus	<i>Lemur</i>
	<i>catta</i>

(a) Complete the table above to give the names of the missing classification groups.

(2)

(b) Give the binomial name of the ring-tailed lemur.

Use information from the table above.

(1) _____

Lemurs are only found on the island of Madagascar.

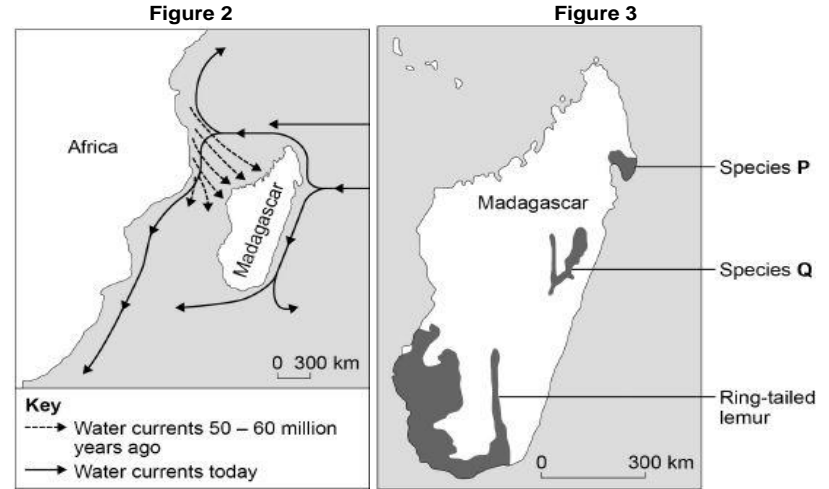
Madagascar is off the coast of Africa.

Scientists think that ancestors of modern lemurs evolved in Africa and reached Madagascar about 50-60 million years ago.

Today there are many species of lemur living on Madagascar.

Figure 2 shows information about water currents.

Figure 3 shows the distribution of three species of lemur on Madagascar.

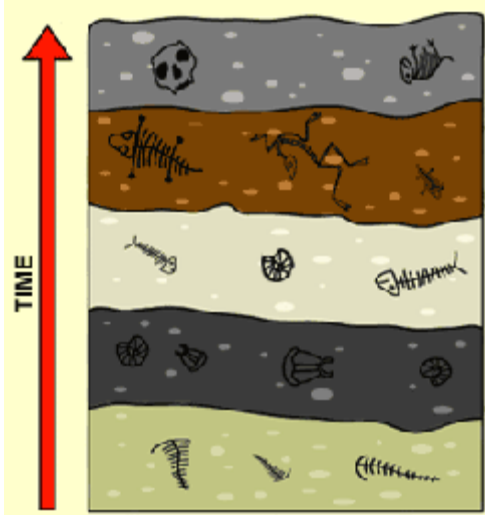


(c) Suggest how ancestors of modern lemurs reached Madagascar.

(1)

(d) Describe how the ancestors of modern lemurs may have evolved into the species shown in Figure 3.

B6 - Inheritance, Variation and Evolution (page 74-85 in revision guide)



Label the oldest fossil layer.

Label the newest fossil layer.

What can we learn from fossils?

Parents Cc x cc

Complete the Punnett square and identify the probability of their child being normal, a carrier or having Cystic Fibrosis.

	C	c
C		
c		

CC (normal) = %

Cc (carrier) = %

cc (affected) = %

List two characteristics that are inherited:

- 1.
- 2.

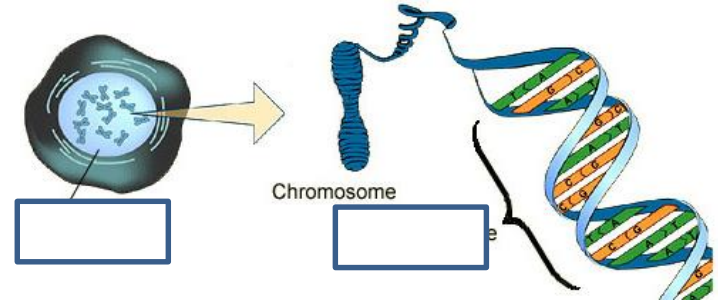
What was Lamarck's theory, and why was he wrong?

Why didn't people initially believe Darwin's theory of evolution by Natural selection?

Give two problems that can occur with inbreeding animals.

- 1.
- 2.

Complete the missing boxes: (Words: gene, nucleus).



Complete the table below:

	Meiosis	Mitosis
Sexual or asexual?		
No. of divisions		
No. of daughter cells		

KEY WORDS:

Fossils
Extinction
Allele
Carrier
Dominant
Recessive
Variation

Punnett square
Mendel
Environmental
Inherited
Lamarck
Darwin
Natural selection
Evolution

Fossil
Sediment
Layer
Fossil record
Selective breeding
Genetic
Engineering
Hybrid

B7 content - Ecology (Paper 2)

- ❑ Ecosystems (relationships between organisms, adaptations, stable ecosystems)
- ❑ Cycles and Feeding relationships
- ❑ Disrupting Ecosystems (biodiversity, pollution, overexploitation, conserving biodiversity)
- ❑ Feeding the World (need for more food, manipulating energy flow, biotechnology)

Required practicals:

- Investigating the population size of a common species in a habitat (page 87 in revision guide)
- Investigating the decay of milk (page 88 in revision guide)

Make notes for ecosystems (P. 86 - 87)

- Relationships between organisms
- Adaptations
- Studying ecosystems

Ecosystems exam style question

Q1.

Living organisms are classified into the following groups:

- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species

(a) Which scientist first suggested this type of classification system?

Tick **one** box.

Alfred Russel Wallace

Carl Linnaeus

Charles Darwin

Gregor Mendel

The stone plant, *Lithops bromfieldi*, is adapted to live in very dry deserts.

Figure 1 shows several stone plants.

Figure 1



(b) Give the genus to which the stone plant belongs.

(1)

(1)

Ecosystems exam style question continued

(c) The stone plant has many adaptations that help it to survive in the desert.

Draw **one** line from each adaptation to how the adaptation helps the stone plant to survive.

Adaptation	How the adaptation helps survival
Plants look like stones	Can trap a lot of light
Leaves with thick, waxy cuticles	Absorb water from deep in the ground
Many long, branching roots	Help cross-pollination
Thick, fleshy leaves	Are not easy to see and so are not eaten
	Reduce water loss
	Store water

The jerboa is a small desert animal.

Figure 2 shows a jerboa.

Figure 2



The jerboa is adapted for survival in the desert.

The jerboa spends the daytime in its underground burrow.

The jerboa only leaves its burrow to look for food during the night.

(d) Describe how these adaptations help the jerboa to survive in the desert.

(2)

(4)

(e) What type of adaptations are described in Question (d)?

Tick **one** box.

Behavioural

Functional

Structural

(1)

(Total 9 marks)

Make notes for cycles and feeding relationships (P. 88 - 89)

- Decomposition
- Recycling materials
- Feeding relationships

Cycles and feeding relationships exam style question

Q2.

A gardener investigates if turning over the waste in a compost heap makes the waste decay more quickly.

The gardener:

- makes two separate heaps of garden waste, heap **A** and heap **B**
- turns over the material in heap **A** every 2 weeks
- does **not** turn over the material in heap **B**
- estimates the amount of decay in the two heaps after 6 months.

The diagram shows the two heaps of garden waste at the beginning of the investigation.



(a) Suggest **two** factors, other than time, the gardener should control to make the investigation fair.

1. _____

2. _____

(b) Name **one** type of living thing that causes decay.

(1)

(c) The gardener's results are shown in the table.

Compost heap	Estimated amount of decay
A	A lot
B	Very little

(i) Why does turning over the material in heap **A** make the material decay more quickly?

(1)

(ii) The gardener puts decayed material around his plants to help them grow.

Suggest why the plants in a woodland grow well each year **without** material from compost heaps being added.

(2)

(2)

(Total 6 marks)

Make notes for Disrupting ecosystems (P. 90 - 91)

- Biodiversity
- Pollution
- Overexploitation
- Conserving biodiversity

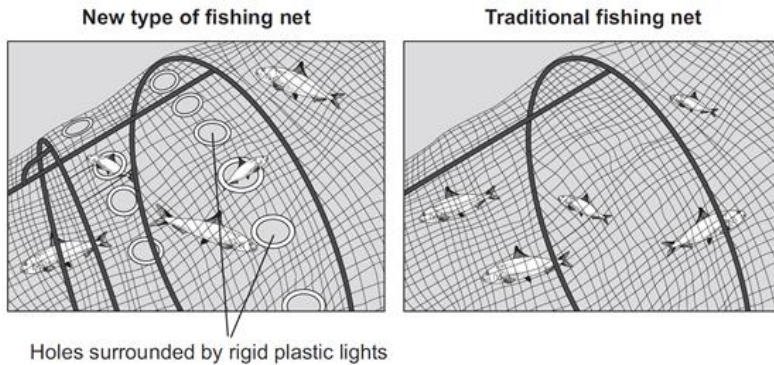
Disrupting ecosystems exam style question

Q3.

It is important to conserve fish stocks.

Figure 1 shows a new type of fishing net and a traditional fishing net.

Figure 1



(a) (i) Describe how the new type of fishing net helps to conserve fish stocks.

(ii) Give **one** way, other than controlling nets, to reduce overfishing.

(b) Another way to make sure there is food for an increasing human population is to make food production more efficient.

Figure 2 shows how some cows are farmed.

Figure 2



© Dageldog/iStock

(i) Use information from **Figure 2** to suggest **two** ways in which this type of farming reduces energy loss from the cows.

1. _____

2. _____

(2)

(ii) Give **two** reasons why some people disagree with farming cows in this way.

1. _____

2. _____

(3)

(1)

(2)

(Total 8 marks)

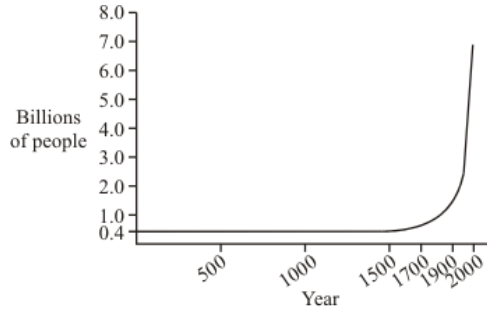
Make notes for feeding the world (P. 92 - 93)

- The need for more food
- Manipulating energy flow
- Biotechnology

Feeding the world exam style question

Q4.

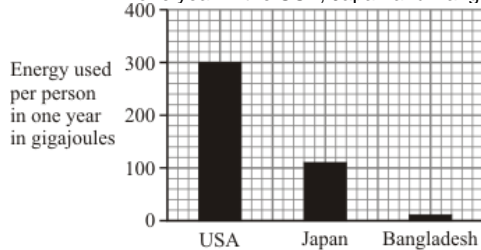
Improving the quality of life for everyone without damaging the planet for the future is known as sustainable development. One problem is the rapid growth in the Earth's population of humans during the last 500 years. This is shown by the graph.



(a) When the Earth's population was much smaller, the effects of human activities on forests were usually small and local. In the past 500 years there has been large-scale deforestation in some areas. Give **two** reasons for this.

1. _____
2. _____

(b) Look at the bar chart. It shows the average amount of energy used by each person in one year in the USA, Japan and Bangladesh.



(i) Suggest **one** reason why so much more energy is used per person in the USA than in Bangladesh.

(1)

(ii) Using a lot of resources for energy harms the Earth. Explain why.

(2)

(c) As we are using more resources, waste management is becoming more important. In the UK much of the solid waste is still being dumped in landfill sites. In 1996, the UK government introduced a landfill tax because landfill sites were being used up. However, the year after the landfill tax was introduced it was estimated that 18 million tonnes of landfill waste was not reported. The government was trying to encourage other forms of waste management, such as:

- reduce waste
- reuse waste
- recycle waste

(i) Explain the main problem caused by the landfill tax.

(2)

(2)

(ii) Describe **one** example of how each of the different forms of waste management can be put into practice.

Reduce waste _____

Reduce waste _____

Reduce waste _____

(3)

(Total 10 marks)

B7 Required Practical Notes

- Investigating the population size of a common species in a habitat (page 87 in revision guide)

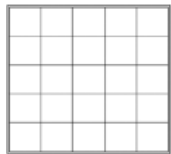
- Investigating the decay of milk (page 88 in revision guide)

Required practical exam style question

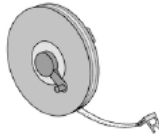
Q5.

A student was asked to estimate how many clover plants there are in the school field.

The image below shows the equipment used.



Quadrat



Tape



Identification key

Not drawn to scale

This is the method used.

1. Throw a quadrat over your shoulder.
2. Count the number of clover plants inside the quadrat.
3. Repeat step 1 and step 2 four more times.
4. Estimate the number of clover plants in the whole field.

(a) What is the tape in the image above used for in this investigation?

(b) The teacher told the student that throwing the quadrat over his shoulder was **not** random.

The method could be improved to make sure the quadrats were placed randomly.

Suggest **one** change the student could make to ensure the quadrats were placed randomly.

(c) How could the student improve the investigation so that a valid estimate can be made?

Tick **two** boxes.

Weigh the clover plants

Compare their results with another student's results

Count the leaves of the clover plants

Place more quadrats

Place the quadrats in a line across the field

(2)

(d) The table below shows the student's results.

Quadrat number	Number of clover plants counted
1	11
2	8
3	11
4	9
5	1
Total	40

The area of the school field was 500 m².

(1)

The quadrat used in the table above had an area of 0.25 m².

Calculate the estimated number of clover plants in the school field.

Estimated number of clover plants = _____

(1)

(3)

Required practical exam style question continued

(e) What was the mode for the results in the table above?

Tick **one** box.

1

8

11

40

(1)

(f) Suggest which quadrat could have been placed under the shade of a large tree.

Give **one** reason for your answer.

Quadrat number _____

Reason _____

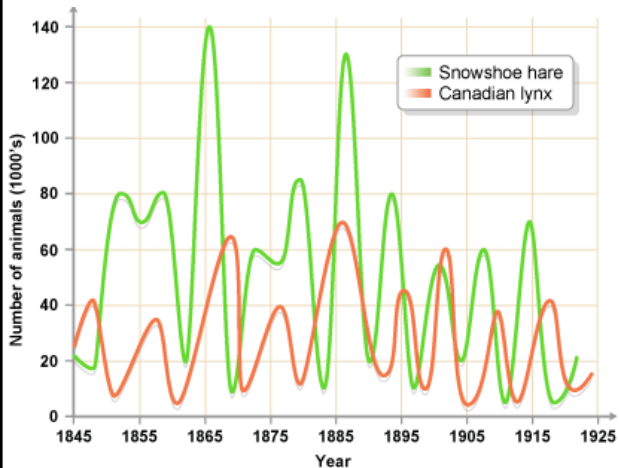
(1)

(Total 9 marks)

B7 - Ecology (page 86-93 in revision guide)

Draw the pyramid of biomass for this food chain next to it:

Pyramid of biomass



Why are predator cycles out of phase with prey cycles?

What is an ecosystem?

List 3 abiotic factors:

- 1.
- 2.
- 3.

What is a stable community?

What can we use to estimate population sizes of plants?

List one advantage and one disadvantage of battery farming:

Advantage:

Disadvantage:

Label the adaptations that a cactus has to help it survive in its environment:



Give an example of an extremophile and where it lives.

What is precipitation?

Give two ways that carbon is put back into the atmosphere:

- 1.
- 2.

KEY WORDS:

Biodiversity	Abiotic	Carbon
Community	Biotic	Water
Ecosystem	Apex predator	Decay
Habitat	Biomass	Global warming
Population	Quadrat	Precipitation
Predator	Adaptation	Deforestation
Prey	Extremophile	Fishing quota
Relationship	Sustainable	Mycoprotein

B5 Answers/Mark scheme

Mark schemes

Q1.

- (a) (i) The person started running a race. 1
- (ii) 2300 1
- (iii) drinking (water / sports drink)
or
through eating 1
- (b) (i) brain 1
- (ii) receptors 1
- (c) cools us down
allow evaporates 1
- Q2.**
- (a) releasing saliva when food enters the mouth 1
- withdrawing the hand from a sharp object 1
- (b) bright light
allow described method of increasing light
ignore light unqualified
allow correctly named drug e.g. morphine / heroin 1
- (c) iris 1
- (d) muscle contraction
allow muscles shorten
ignore radial / circular
ignore muscles relax / constrict
do not accept muscles expand
do not accept ciliary muscle contracts 1

- (e) **Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account. 4-6

Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear. 1-3

No relevant content 0

Indicative content

- receptor detects stimulus
- e.g. receptor detects pressure
- receptor generates impulses / electrical signals
- neurones conduct impulses / electrical signals
- neurone A conducts impulses to spinal cord
- neurone A = sensory neurone
- synapse between neurones
- chemical (/ neurotransmitter) crosses synapse
- chemical stimulates impulse(s) in neurone B
- neurone B = relay neurone
- neurone C = motor neurone
- effector carries out response
- e.g. muscles of the arm / leg contract
- muscles contract or gland secretes chemicals

to access **level 2**, candidates need to consider, in terms of the indicative content, the receptor, the neurones and the effector in the correct sequence

[11]

Q3.

- (a) pancreas 1
- (b) the diabetic should get more energy from fat 1
- the diabetic should get less energy from carbohydrate 1
- (c) (use) insulin
allow pancreas / stem cell transplant
do not allow injection / transplant / stem cells / tablets alone
ignore exercise 1

[4]

B5 Answers/Mark scheme continued

Q4.					
(a)	A	1			
(b)	E	1			
(c)	28	1			
	<i>allow 27–29</i>				
(d)	progesterone	1			
(e)	any two from:				
	• inhibits FSH production / release				
	• prevents egg maturation				
	<i>allow prevents egg growth</i>				
	• prevents ovulation				
	<i>allow prevents egg release</i>				
	<i>ignore prevents egg production</i>				
		2			
(f)	oestrogen	1			
	testosterone	1			
	<i>allow in this order only</i>				
		1			
		[8]			
Q5.					
(a)	(i) in the direction of the force of gravity	1			
	(ii) against the force of gravity	1			
(b)	(i) diagram completed to show stem bending / leaning towards the window				
	<i>the bend / lean can be at / from any point above pot level</i>				
	<i>ignore any leaves</i>				
		1			
	(ii) more light (for leaves)				
	<i>ignore heat</i>				
		1			
	more photosynthesis / biomass / glucose				
	<i>ref to 'more' needed once only, eg 'more light for photosynthesis' = 2 marks</i>				
	<i>if no other marks given allow 1 mark for 'to get light for photosynthesis'</i>				
		1			
Q6.					
(a)	any two from:				
	• drop the ruler from the same height each time				
	• let the ruler drop without using any force				
	• same type / weight of ruler				
	• thumb should be same distance from the ruler each time at the start				
	• use the same hand to catch the ruler each time				
	• carry out the experiment with the lower arm resting in the same way on the table				
	<i>allow description of holding bottom edge of ruler opposite the catcher's thumb</i>				
					2
(b)	117				1
(c)	$\sqrt[11.6]{490}$				1
	0.1539				
	<i>allow 01539 with no working shown for 2 marks</i>				1
	0.154				
	<i>allow 0.154 with no working shown for 3 marks</i>				1
	<i>allow ecf as appropriate</i>				1
(d)	no indication beforehand when the colour will change				
	or				
	you might be able to tell when the person is about to drop the ruler				1
	measurement of time is more precise (than reading from a ruler)				
	or				
	resolution (of computer timer) is higher				1
(e)	cerebral cortex				
	<i>allow cerebrum</i>				1
	<i>ignore identified lobes</i>				
(f)	cerebellum				1
					[10]

B6 Answers/Mark scheme

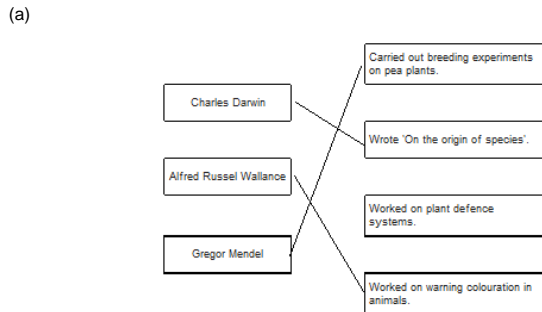
Mark schemes

Q1.

- (a) chromosomes
genes (reject alleles)
alleles
for 1 mark each 3
- (b) (i) sexual / sex
for one mark 1
- (ii) egg / gamete / sex cell / ovum (reject ovule)
for one mark 1
- (c) (i) information / genes / DNA passed from parents (reject chromosomes)
for one mark 1
- (ii) genes / genetic information / chromosomes from two parents
alleles may be different
environmental effect / named may have been mutation
any two for 1 mark each 2

[8]

Q2.



- (b) a gene
allow allele 1
- (c) 4 1
- (d) correct derivation of children's genotypes 1

Q3.

- (a) any **two** from:
accept other logical / reasonable ideas
- other scientists not aware of his work
 - chromosomes / DNA / genes not seen / discovered / known
do not accept there was no interest in genetics
 - other theories accepted at the time
 - not considered to be a scientist / not eminent / respected
allow 'he was just / only a monk'
- (b) (i) random selection
accept a method of achieving random selection
eg "take a handful"
if number given, minimum 20 1
- (ii) any **one** from:
- 1:1 / one to one
 - 19:21
accept any ratio to give correct answer, eg "50:50"
do not accept 21:19 unqualified
- (iii) A + a as gametes from 1st parent 1
- a + a as gametes from 2nd parent
allow a alone 1
- (offspring / 2nd generation) Aa aa
offspring must be derived from correct gametes
- correct identification of yellow (Aa)
other symbols correctly used can gain full marks 1
- or**
- green (aa) (if both given, both must be correct)
ignore references to previous generations
if no other marks awarded, both correct parental genotypes given gains 1 mark
- examples of award of first three marks

B6 Answers/Mark scheme continued

Q4.

- (a) (i) variation (in population) / mutation
1
- longer nosed individuals get more food / leaves
allow longer nosed individuals more likely to survive
- (these) survivors breed (more)
1
- pass on genes / alleles / DNA (for long nose)
allow pass on mutation
- (ii) Phiomia / ancestor stretched its nose (during its lifetime) to reach food / leaves
1
- passed on (stretched nose) to offspring
allow offspring inherit (stretched nose)
do not allow ref to genes
- (b) (i) insufficient evidence / no proof
ignore other theories, eg religion
do not allow no evidence
- mechanism of inheritance not known
allow genes / DNA not discovered
- (ii) God made all living things / them
allow creationism
ignore religion

Q5.

- (a) any **two** from:
1
- so that they do not have specific genetic defects
 - to produce docile cats or so they are not aggressive
allow descriptions of aggression such as biting and scratching
 - for aesthetic reasons
allow descriptions of suitable aesthetic reasons
- 1
- (b) (cats) are more likely to pass on (recessive) disorders
or
more likely to be susceptible to diseases
1
- (c) **Level 2 (3–4 marks):**
A detailed and coherent explanation is given, which logically links the process of selective breeding with explanations of how this produces cats that do not cause allergic reactions.
1
- Level 1 (1–2 marks):**
Simple statements are made relating to process of selective breeding, but no attempt to link to explanations.
1
- 0 marks:**
No relevant content.
- Indicative content**
- process:**
- parents with the desired characteristic are selected
 - the parents are bred together to produce offspring
 - offspring with the desired characteristics are selected and bred
 - this is repeated over many generations.
- explanations:**
- parents who produce the least Fel D1 are initially selected
 - in their offspring there will be individuals with differing amounts of Fel D1 produced
 - care is taken to ensure cats are healthy and avoid possible problems associated with selective breeding
 - over time the population of (selectively bred) cats will produce less Fel D1
- [9]

B6 Answers/Mark scheme continued

Q6.

(a)

Classification group	Name
Class	<i>Mammalia</i>
Order	<i>Primates</i>
Family	<i>Lemuroidea</i>
Species	<i>catta</i>

*all 4 correct = 2 marks
2 or 3 correct = 1 mark
0 or 1 correct = 0 marks*

2

(b) Lemur catta

ignore capitalisation / non-capitalisation of initial letters

ignore italics / non-italics

ignore underlining / non-underlining

1

(c) carried by (favourable) currents on masses of vegetation

allow description of currents from Figure 2

ignore swimming

1

(d) isolation of different populations

1

habitat variation between lemur populations

allow examples – biotic (e.g. food / predators) or abiotic (e.g. temperature)

1

genetic variation or mutation (in each population)

1

better adapted survive (reproduce) **and** pass on (favourable) allele(s) to offspring

*allow natural selection **or** survival of the fittest*

***and** pass on (favourable) allele(s) to offspring*

allow gene(s) / mutation as an alternative to allele(s)

1

(eventually) cannot produce fertile offspring with other populations

allow cannot reproduce 'successfully' with other populations

ignore cannot reproduce unqualified

1

B7 Answers/Mark scheme

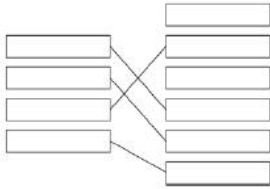
Mark schemes

Q1.

(a) Carl Linnaeus

(b) Lithops

*extras cancel
ignore capitalisation / non-capitalisation*



(c)

*1 mark per line
extra line from adaptation negates the mark for that adaptation*

(d) any **two** from:

- cooler underground / at night
or
- the jerboa can keep cool
loses less water
or
- sweats less
- less likely to be seen (by predators / prey)

(e) behavioural

Q2.

(a) any **two** from:

- amount of waste on each heap
allow size of heap
- (type of) materials on each heap
if neither marking points one or two awarded, allow 1 mark for same waste
- put heaps in same (environmental) conditions.
*e.g. keep at same (outside) temperature
allow put in same place*

(b) microorganisms / microbes / bacteria / fungi / decomposers

*ignore detritivores / examples (such as worms, maggots, insects)
ignore pathogens / germs
do **not** allow viruses*

(c) (i) oxygen / air added (when turning over)

*allow idea that decay will be aerobic
allow bacteria / microorganisms need oxygen / air
allow (microorganisms) respire faster*

(ii) any **two** from:

- dead leaves / fruit / plants (fall off / onto the ground)
- (fallen dead leaves / fruit / plants) decay
- minerals / ions / nutrients are recycled / released.
*ignore references to carbon dioxide
allow animal waste **or** dead animals*

1

1

1

1

1

1

2

1

[9]

2

1

1

2

[6]

B7 Answers/Mark scheme continued

Q3.

- (a) (i) any **three** from:
- lights to help guide / attract fish (to the holes)
 - (rigid so) holes stay open
 - (holes) allow small / young fish to escape
 - (so that) they can breed
- (ii) (fishing) quotas / legislation
- (b) (i) movement is restricted
- (in a building **or** close together so) heat is conserved
allow in heated buildings to reduce heat loss
- (ii) any **two** from:
- it is cruel
allow descriptions of 'cruelty'
 - disease spreads faster
 - (meat) often has antibiotics in it

Q4.

- (a) any two from:
- agriculture
*accept land to grow crops **or** graze cattle*
- 3
- buildings
- 1
- roads
- 1
- any 2 different uses for wood for 1
mark each
- accept wood for burning (energy)*
accept timber for wood
- 1
- (b) (i) (USA has) more wealth / technology /
devices / need for electricity
- 1
- (ii) damage done
- 2
- e.g. pollutant / mining / non-renewable / deforestation*
- [8]
- linked effect
- e.g. greenhouse effect / visual pollution / run out of
resources / flooding*
- 1
- (c) (i) **Problem** – because some people did not want to pay the (landfill) tax
- 1
- Waste dumped elsewhere
- 1
- (ii) named example of
- Reduce** – such as less packaging / repairing
- 1
- Reuse** – such as glass bottles / shopping bags / ink jet cartridges
- 1
- Recycle** – such as metals, glass, paper
- Mark as a whole*
- 1

B7 Answers/Mark scheme continued

Q5.

(a) measure the length / area of the field 1

(b) use (a) random number(s) (generator)
or
use coordinates method explained 1

(c) compare their results with another student's results 1

place more quadrats 1

(d) $0.25 \times 5 = 1.25$ 1

$500 / 1.25 = 400$ 1

$(40 \times 400 =) 16\ 000$
allow 16 000 with no working shown for 3 marks 1

(e) 11 1

(f) (quadrat) 5
both quadrat number and correct reason must be given for 1 mark 1

very few or only 2 growing (here)