

Sample Assessment Materials

September 2007

GCE Biology

Edexcel Advanced Subsidiary GCE in Biology (8BI01)

First examination 2009

Edexcel Advanced GCE in Biology (9BI01)

First examination 2010



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A Introduction

These sample assessment materials have been prepared to support the specification.

Their aim is to provide the candidates and centres with a general impression and flavour of the actual question papers and mark schemes in advance of the first operational examinations.

B Sample question papers

Unit 1: Lifestyle, Transport, Genes & Health.....	7
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1. Carbohydrates are compounds that include monosaccharides, disaccharides and polysaccharides.

(a) (i) The table below lists some features of four carbohydrates.
Put a cross in the box to indicate that the feature is present in the carbohydrate.
The first row has been done for you.

Feature	Glucose	Glycogen	Maltose	Starch
1-4 glycosidic bonds present	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
1-6 glycosidic bonds present	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Made up of many monomers	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

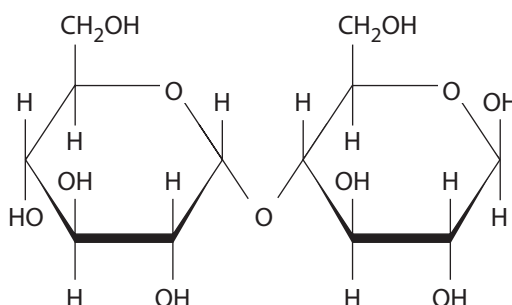
(4)

(ii) Name the disaccharide made up of α -glucose and galactose.

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(1)

(iii) The diagram below shows a disaccharide molecule.



Draw the molecules resulting when this disaccharide molecule is split into its two component monosaccharides.

(2)

(iv) Name this type of reaction.

..... (1)

(b) Explain the advantages of glycogen as an energy storage molecule in the human body.

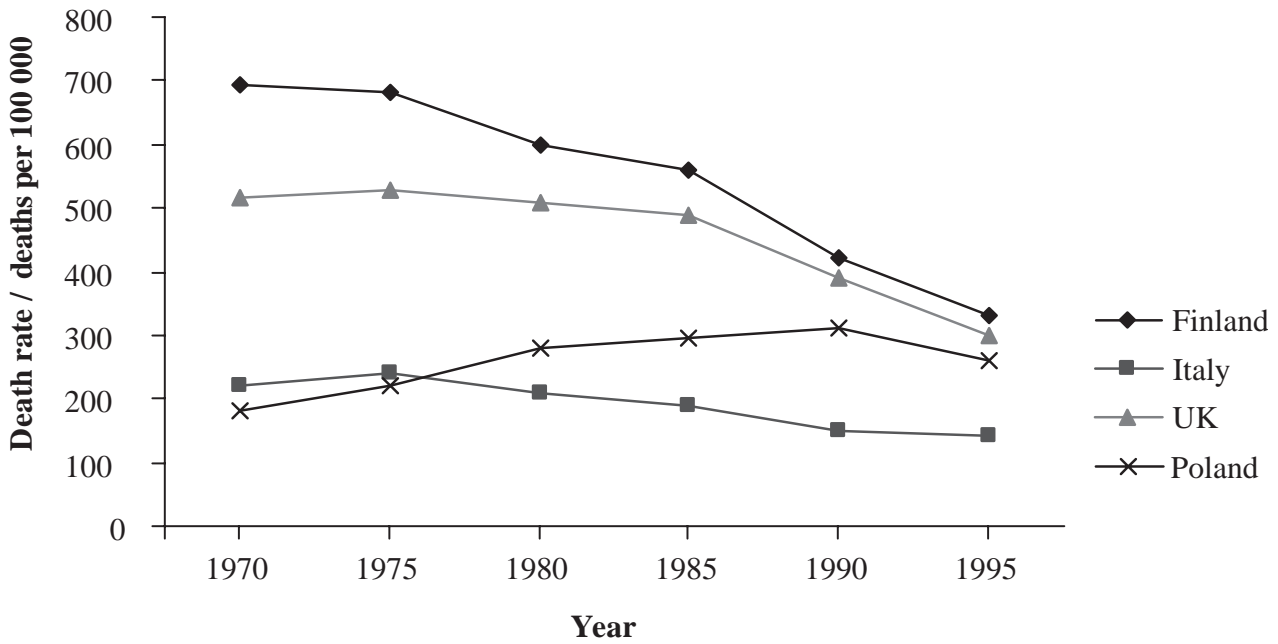
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(3)

Q1

(Total 11 marks)

2. The graph below shows death rates from coronary heart disease (CHD) in men from 1970 to 1995 in four countries.



(a) Describe the changes in death rates shown on the graph.

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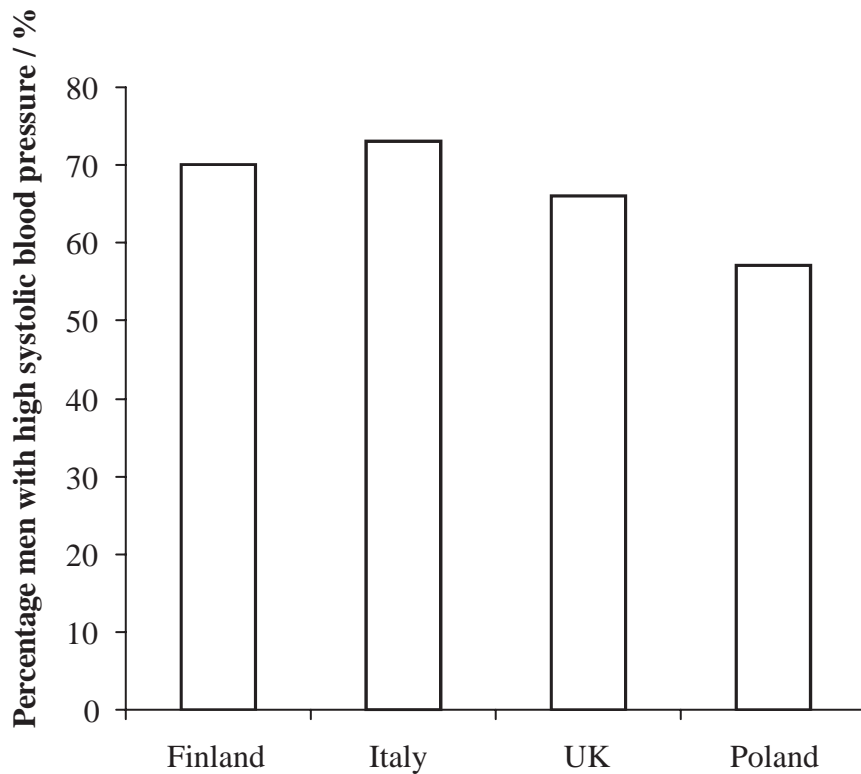
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(3)

(b) The graph below shows the percentage of men from these countries **in 1980** with high systolic blood pressure.



It has been suggested that there is a link between high blood pressure and deaths from CHD.

(i) Using both graphs, give **two** pieces of evidence to support this hypothesis.

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(ii) Suggest how the data shown in the graphs do not fully support this hypothesis.

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(c) Suggest how high blood pressure can result in less oxygen reaching heart muscle.

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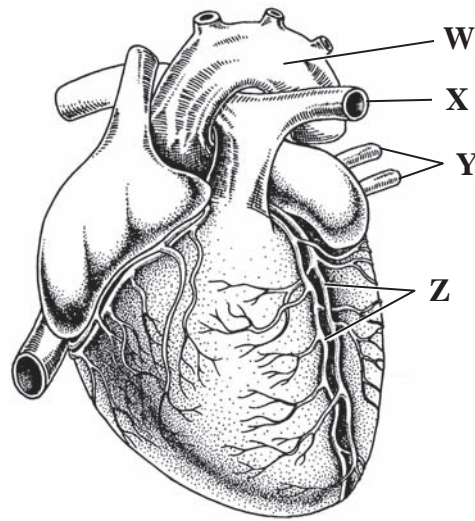
(3)

(Total 10 marks)

Q2

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3. The diagram below shows an external view of the heart.



(a) Name the blood vessels labelled **W**, **X**, **Y** and **Z**.

W

X

Y

Z

(2)

(b) Describe and explain the events that occur during ventricular systole in the cardiac cycle.

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(4)

(c) The hypothesis that higher concentrations of caffeine will increase heart rate can be investigated practically using *Daphnia* (water fleas).

Describe a reliable procedure that could be used to test this hypothesis.

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(6)

(Total 12 marks)

Q3

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4. (a) Blood vessels can be distinguished by their structure. The table shows some structural features for three blood vessels **P**, **Q** and **R**.

Structural feature	P	Q	R
Endothelium present	✓	✓	✓
Small lumen relative to the thickness of the walls	✓	✗	✗
Many elastic fibres present	✓	✗	✗
Valves present	✓	✓	✗

Identify the blood vessels **P**, **Q** and **R**.

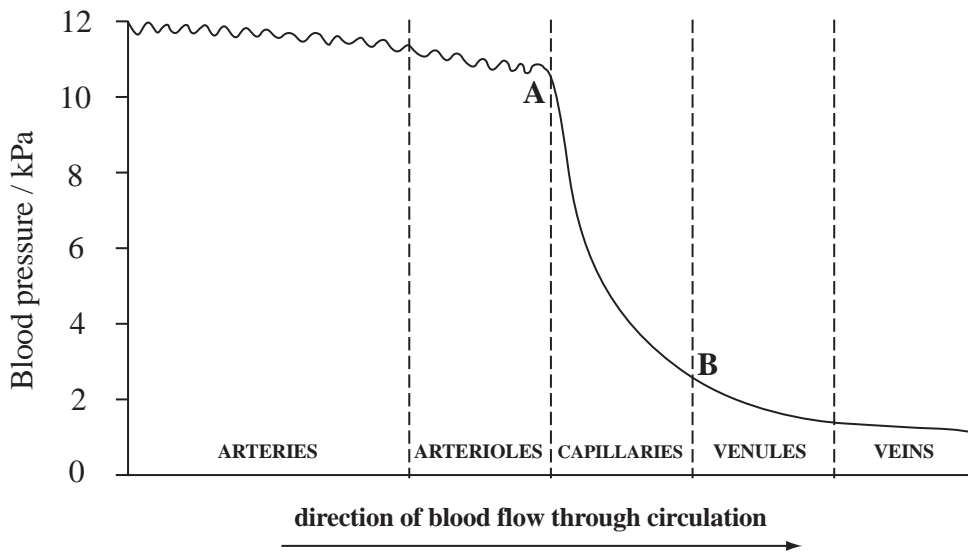
P

Q

R

(3)

(b) The diagram below shows changes in blood pressure as blood flows from the arteries to the veins.



The blood pressure at point A is 10.5 kPa and the blood pressure at point B is 2.5 kPa. Calculate the percentage decrease in the pressure as blood flows from A to B.

Answer kPa
(2)

(c) Explain the changes in blood pressure

(i) in the arteries

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(ii) in the capillaries.

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(2)

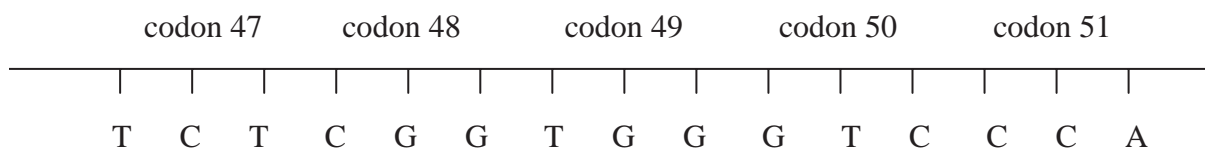
(Total 7 marks)

Q4

5. Amino acids are coded for by one or more DNA triplet codons. The table below shows some amino acids found in human proteins and their corresponding DNA triplet codons. A DNA triplet codon for the stop signal is also shown.

Amino acid	Triplet codons
Threonine	TGA TGG TGT
Glutamine	GTT GTC
Glycine	CCA CCG CCT CCC
Arginine	TCT
Alanine	CGG CGC
Stop signal	ACT

The diagram below shows part of a DNA molecule. This part of the DNA molecule is located near the end of a gene.



- (a) Give the sequence of amino acids found in the polypeptide chain that is coded for by this part of the DNA strand.

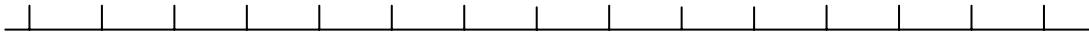
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(2)

- (b) Give the next triplet codon that you would expect to see on this DNA strand if codon 51 coded for the last amino acid in the polypeptide chain.

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(1)

(c) Complete the diagram below to show the sequence of bases on a molecule of messenger RNA synthesised from this part of the DNA strand.



(2)

(d) Mutations can occur during DNA replication.

(i) Suggest what would happen to the structure of the protein coded for by this DNA molecule if thymine in **codon 49** were replaced by cytosine.

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(2)

(ii) Suggest what would happen to the structure of the protein coded for by this DNA molecule if adenine replaced the first thymine in **codon 47**.

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(2)

(Total 9 marks)

Q5

6. (a) The table below refers to three transport mechanisms. If the statement is true, put a cross in the appropriate box.

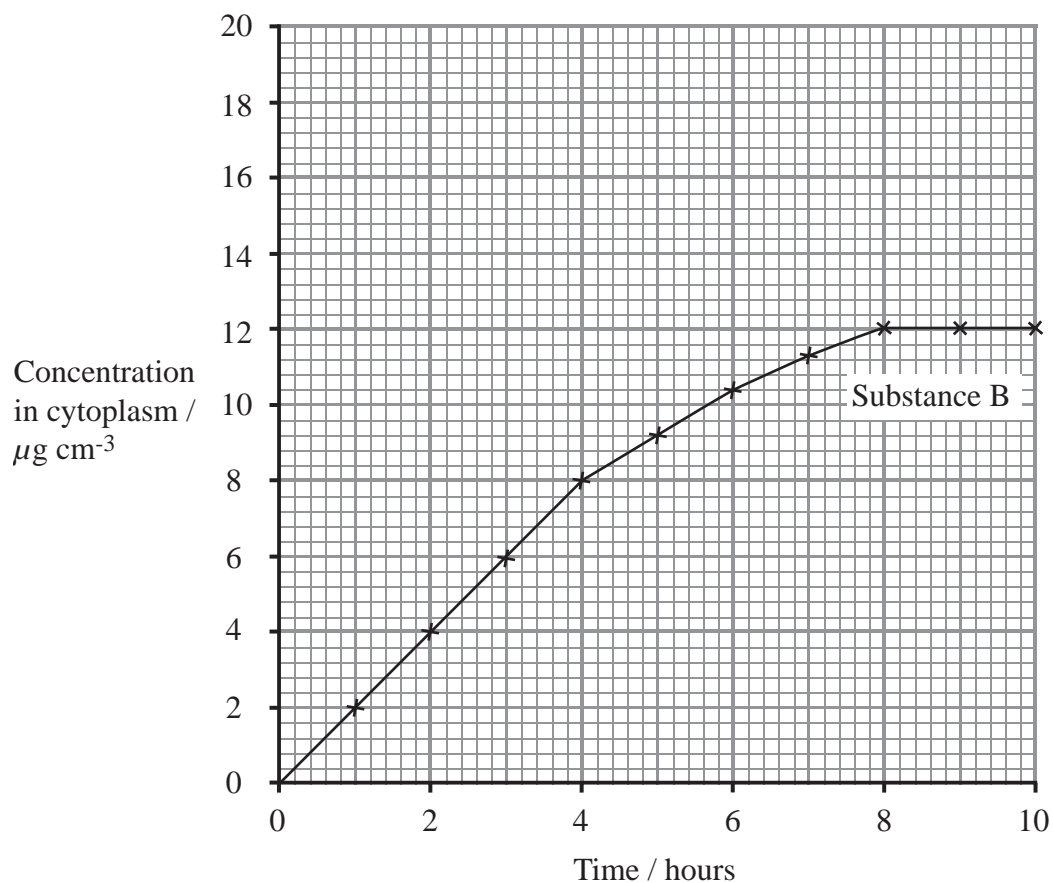
Statement	Osmosis	Facilitated diffusion	Active transport
Movement of water	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Requires ATP	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Molecules move down their concentration gradient	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Carrier proteins are needed	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

(6)

- (b) An experiment was carried out to measure the uptake of substance B by some red blood cells.

The red blood cells were placed in a solution containing substance B and kept at 25 °C. The concentration of substance B in the cytoplasm of the cells was measured every hour over a period of 10 hours.

The results of this experiment are shown in the graph below.



- (i) Describe the changes in cytoplasm concentration of substance B shown in the graph and explain how these changes support the statement that substance B enters the cells by diffusion.

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(4)

- (ii) Suggest how the shape of the graph would change if the temperature in the experiment was decreased to 10 °C. Give an explanation for your answer.

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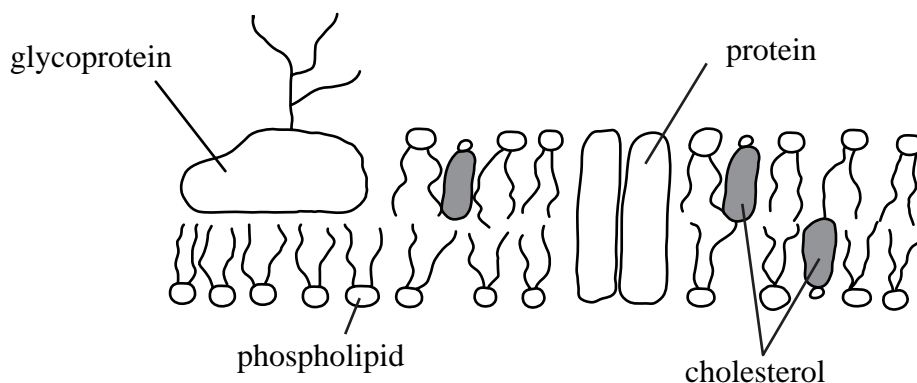
(2)

(Total 12 marks)

Q6

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7. The diagram below shows a model of the structure of the cell surface (plasma) membrane.



(a) Explain why the model used to describe the structure of this cell membrane is called the fluid mosaic model.

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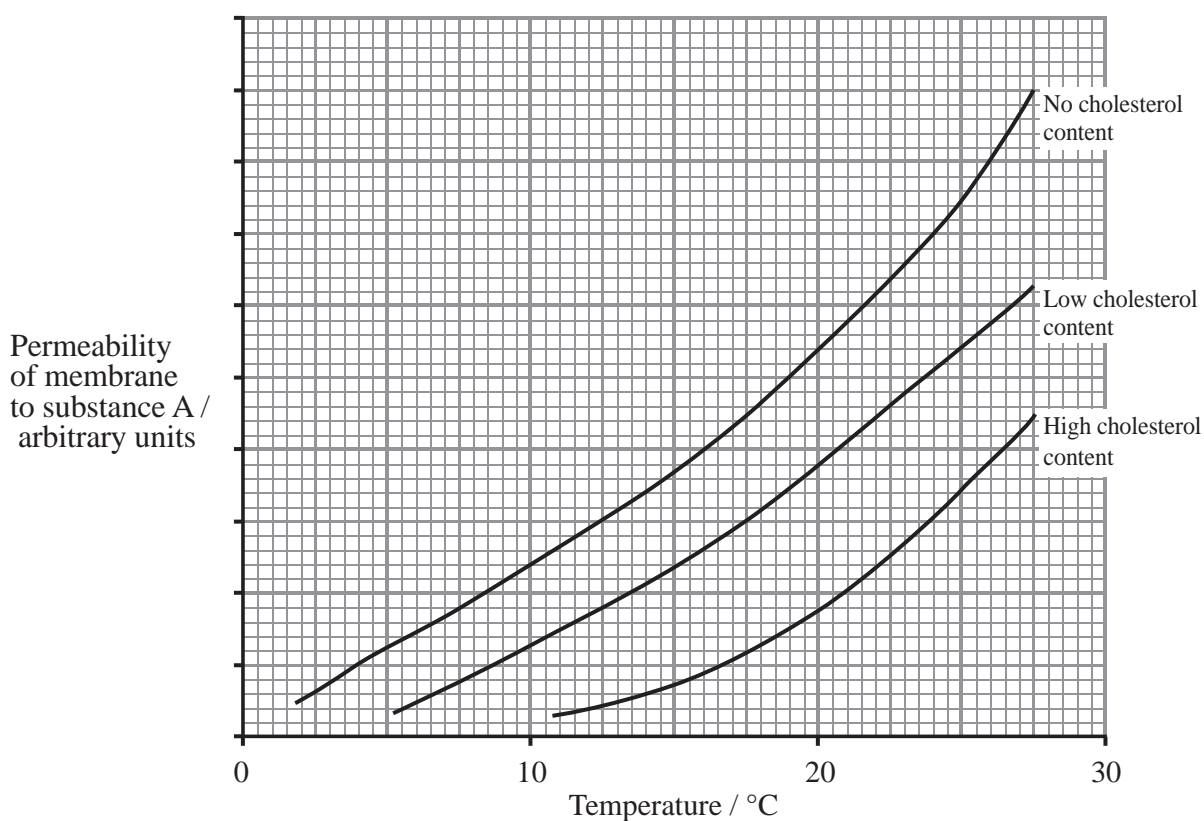
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(2)

(b) The graph below shows how the permeability of three different membranes to substance A changes with temperature. One of the membranes contains no cholesterol, one of the membranes has a low cholesterol content and the third membrane has a high cholesterol content.



(i) Describe the effects of the presence of cholesterol and of an increase in temperature on the permeability of the three membranes to substance A.

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(3)

(ii) When cholesterol is present it binds weakly to the phospholipids in the membrane.

Substance A moves across the membrane between the phospholipid molecules.

Suggest an explanation for the effect cholesterol has on the permeability of the membranes to substance A.

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(2)

(Total 7 marks)

Q7

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8. The rate of diffusion of gases across an exchange surface is greatest if the surface is thin and a concentration gradient is maintained across it.

(a) Describe how each of these factors is involved in efficient gas exchange in the alveoli of a mammalian lung.

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(3)

(b) Describe and explain the effect of cystic fibrosis on gas exchange.

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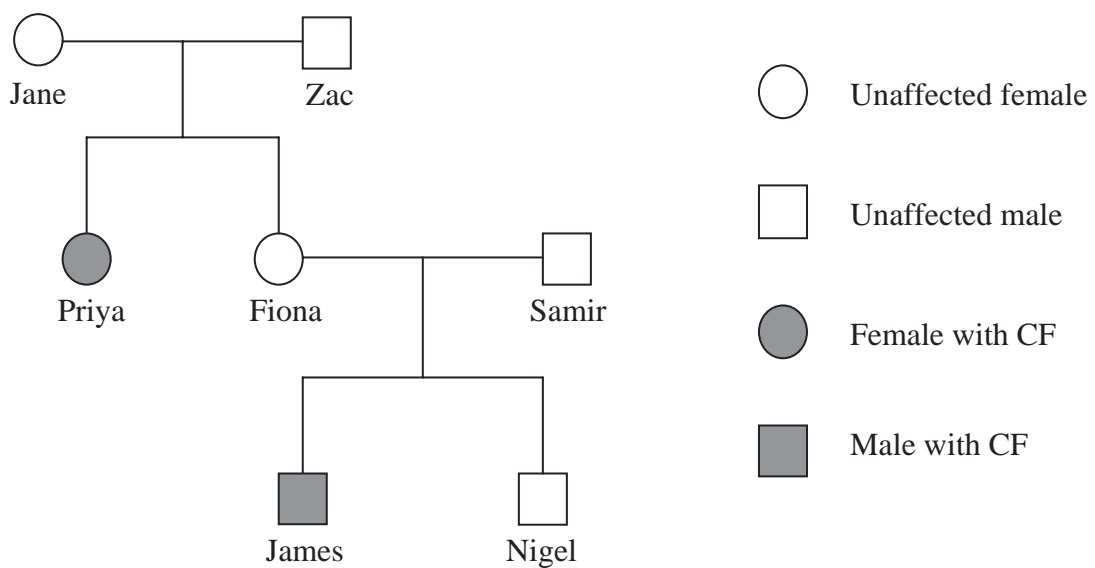
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(2)

(c) The pedigree below shows the inheritance of cystic fibrosis (CF) in one family.



With reference to the information in the pedigree, answer the following questions.

(i) Give the name of a female who is homozygous for the CF gene.

..... (1)

(ii) Give the name of a male who is heterozygous for the CF gene.

..... (1)

(iii) If Fiona and Samir had a third child, state the probability that this child would have cystic fibrosis.

..... (1)

(d) Genetic screening can be used to identify the cystic fibrosis allele. By considering contrasting ethical viewpoints, discuss **one** reason in favour and **one** reason against genetic screening for cystic fibrosis.

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(4)

Q8

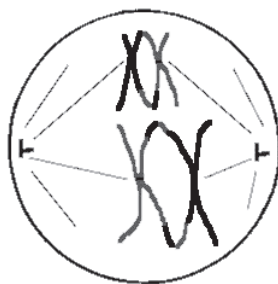
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TOTAL FOR PAPER: 80 MARKS

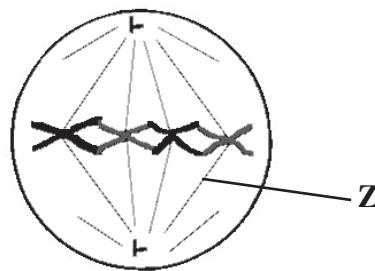
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1. (a) The diagrams **A** and **B** below show cells from the same organism. Both cells are in the same stage of nuclear division. One cell is undergoing mitosis and the other cell is undergoing meiosis.



A



B

- (i) Which cell is undergoing mitosis? Put a cross in the correct box.

A

B

(1)

- (ii) Give the name of the structure labelled **Z**.

.....

(1)

- (iii) Name the stage of mitosis shown.

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(1)

- (b) Describe how you would prepare cells in order to observe mitosis.

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(4)

(Total 7 marks)

Q1

2. (a) Independent assortment and crossing over both result in genetic variation.

(i) Explain how independent assortment leads to genetic variation.

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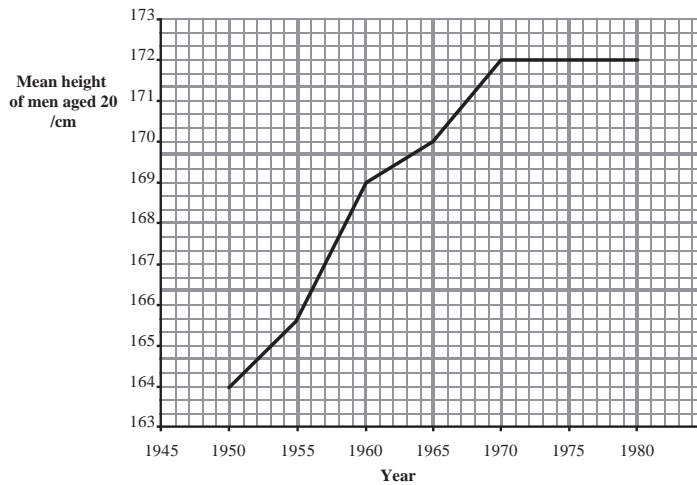
(2)

(ii) Describe how crossing over further increases genetic variation.

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(2)

(b) The graph below shows changes in mean height of men in Japan from 1950 to 1980.

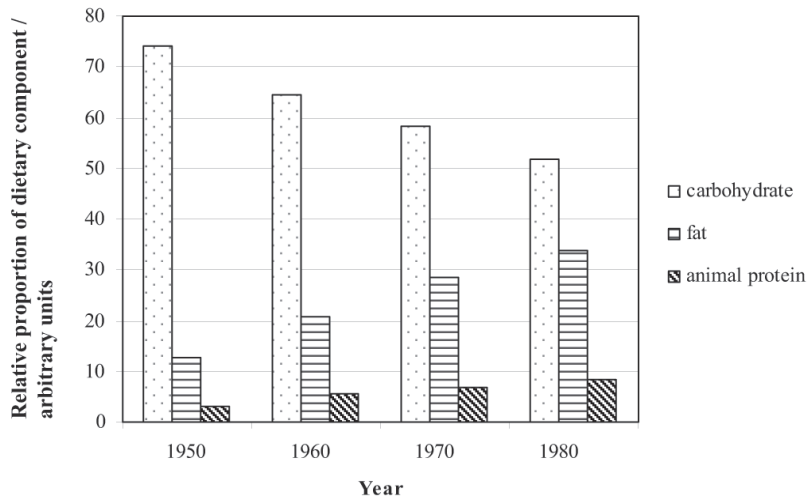


Describe the changes in height between 1950 and 1980.

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(2)

(c) The graph below shows changes in the major components of the diet of men in Japan over the same period.



The evidence from both graphs suggests that a combination of genetic and environmental factors influence the height of men in Japan. Give an explanation for this.

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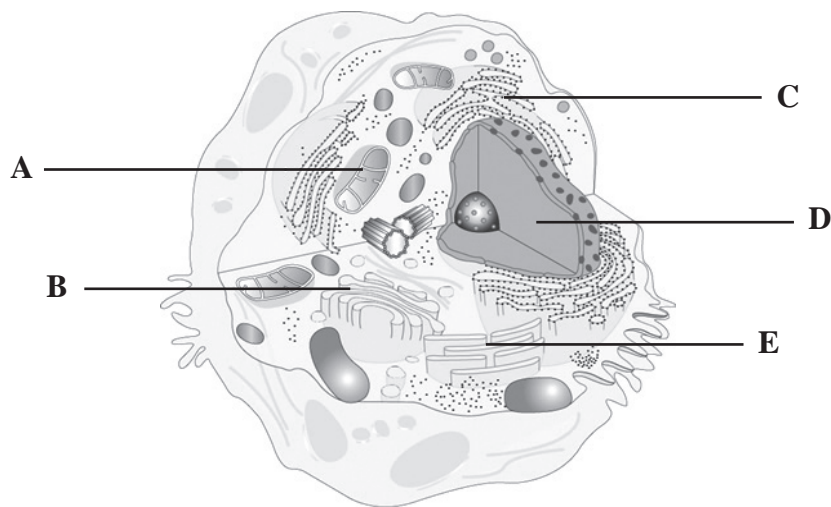
(4)

(Total 10 marks)

Q2

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3. (a) The diagram below shows a view through a typical animal cell.



The table below lists three organelles. Put a cross in the box to match each organelle with the correct letter shown on the diagram.

Organelle	A	B	C	D	E
Rough endoplasmic reticulum	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mitochondrion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Golgi apparatus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(3)

(b) For some time after the Golgi apparatus was identified, there was doubt as to whether it was a new and separate organelle. Explain how the Golgi apparatus could be confused with other organelles within a cell.

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(3)

(c) In an experiment to investigate the role of organelles in protein transport, cells were given radioactively-labelled amino acids for a fixed period of time. The percentage of the radioactivity found in four different organelles was then measured at different time intervals. The table below shows the results.

Time after adding radioactively-labelled amino acid / min	Radioactivity present / %			
	Rough endoplasmic reticulum	Golgi apparatus	Secretory vesicles	Mitochondria
4	67	27	1	3
6	53	39	2	1
20	11	73	10	3
240	11	10	73	2

(i) The data provide evidence that the Golgi apparatus is a separate organelle. Suggest an explanation for this.

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(2)

(ii) Explain how the data provide evidence for the sequence of events in the process of protein transport in these cells.

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(4)

(iii) Suggest **one** reason for the presence of some radioactivity detected in the mitochondria.

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(1)

Q3

(Total 13 marks)

4. (a) Three structures found in mammalian sperm cells are described in the table below. Give the name of each structure being described.

Description	Structure
Releases digestive enzymes to penetrate egg	
Allows the sperm to swim to the egg cell	
Provides the energy required for swimming	

(3)

- (b) Give the term that describes the ability of a stem cell from an embryo to produce **all** cell types.

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(1)

- (c) Describe how a cell loses the ability to produce other cell types and becomes specialised.

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(3)

(d) Embryos have been produced from human egg cells which have not been fertilised by sperm. These embryos never survive past a few days. This is because some of the genes needed for development are only active in chromosomes from the sperm.

It has been suggested that there will be less opposition to the medical use of stem cells from these embryos than from normal embryos. Suggest reasons for this.

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(3)

Q4

(Total 10 marks)

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5. Taxonomy is the branch of biology concerned with the classification of organisms. In the taxonomic system first developed by Linnaeus, organisms are given a two-part Latin name.

(a) State **one** advantage of the binomial system developed by Linnaeus.

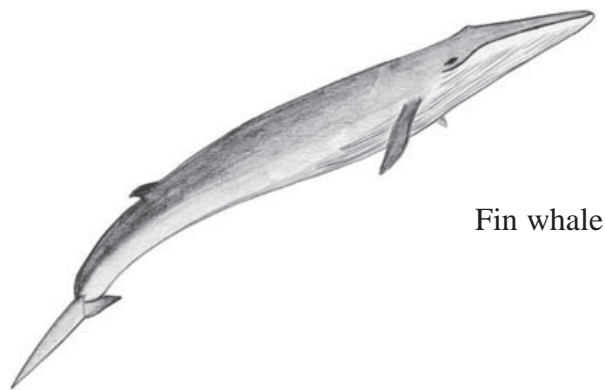
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(1)

(b) The table below shows the classification of the blue whale, *Balaenoptera musculus* together with some of the classification of the fin whale, *Balaenoptera physalus*.



Fin whale

Complete the table by suggesting appropriate names for the class, order and family of the fin whale.

Classification taxon	Blue whale	Fin whale
Kingdom	Animalia	Animalia
Phylum	Chordata	Chordata
Class	Mammalia	
Order	Cetacea	
Family	Balaenopteridae	
Genus	<i>Balaenoptera</i>	<i>Balaenoptera</i>
Species	<i>Balaenoptera musculus</i>	<i>Balaenoptera physalus</i>

(1)

(c) Below are four features, **A**, **B**, **C** and **D**, used in the classification of organisms. Put a cross in the box or boxes next to the features which are shared by both blue whales and fin whales.

- A** – feed by heterotrophism on organic material
- B** – multicellular
- C** – cells surrounded by cell wall
- D** – cytoplasm of cells contain circular DNA

(2)

(d) Suggest reasons for the classification of the blue whale and the fin whale within the same genus, *Balaenoptera*, but as different species.

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(3)

(Total 7 marks)

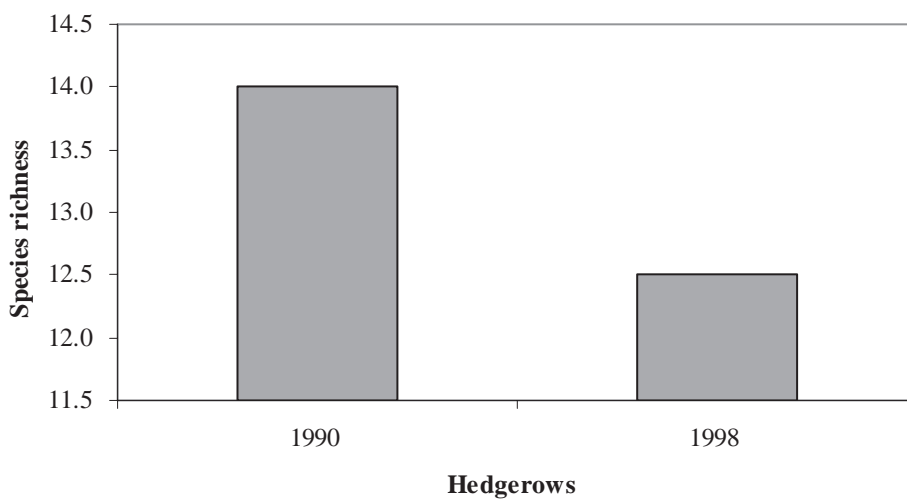
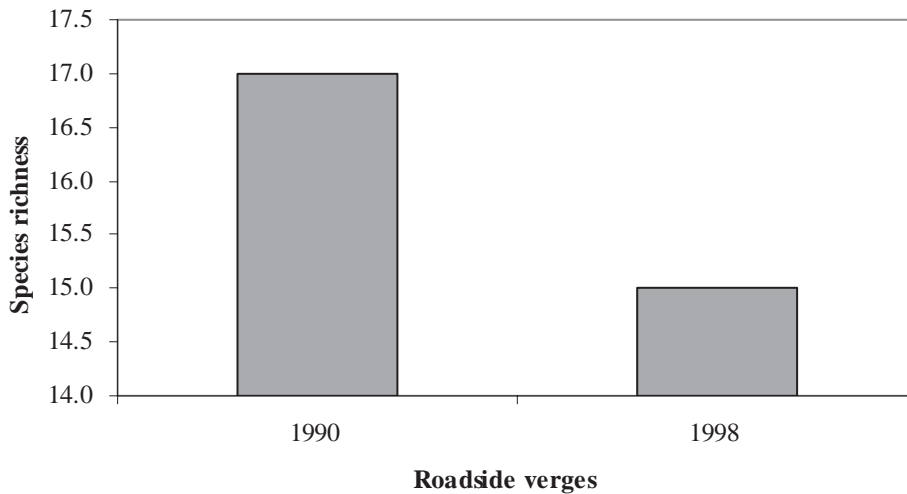
Q5

6. (a) State what is meant by the term **species richness**.

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(1)

(b) In a survey, the mean species richness for the vegetation found in roadside verges and hedgerows in England and Wales was measured in 1990 and again in 1998. The results of this survey are shown in the graphs below.



Compare the species richness shown by the survey for the vegetation in the roadside verges with that of the hedgerows over this study period.

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(3)

(c) Other information would be needed, in addition to species richness, to measure the biodiversity of the vegetation in the two types of habitat. Give an explanation for this.

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(3)

(d) Seed banks, such as the Millennium Seed Bank Project (MSBP), are an effective means of conserving plant species.

Write a short briefing, intended for a government committee, describing how seed banks work and why their funding should be continued.

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(5)

(Total 12 marks)

Q6

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7. Sisal is a material used to make rope. It is made from the sclerenchyma fibres found in the leaves of the plant, *Agave sisalana*.

After extraction of the fibres, the waste leaf material can be used in the production of organic fertiliser.

The four countries that produce most of the world's sisal are Brazil, Kenya, Tanzania and Madagascar. The table below shows the annual harvest of freshly-cut *Agave sisalana* leaves together with the total annual production of sisal.

Country	Annual harvest of freshly-cut leaves / tonnes x 10 ³	Annual production of sisal / tonnes x 10 ³
Brazil	995	199
Kenya	196	40
Tanzania	145	28
Madagascar	96	20
TOTAL	1432	

- (a) (i) Complete the table to show the total annual production of sisal. (1)
- (ii) Calculate the total percentage of sisal produced from freshly-cut leaves. Show your working.

Answer %
(2)

(b) Nylon is a synthetic (man-made) fibre which can be used to make ropes. Nylon ropes are lighter and stronger than those made using sisal. Suggest **two** advantages of using sisal rather than nylon to make ropes.

1

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2

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(2)

(c) (i) Explain what is meant by the term **tensile strength** of a fibre.

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(1)

(ii) Suggest how you could carry out a practical investigation to compare the tensile strength of sisal and nylon fibres.

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(4)

(d) Describe **two** ways in which the structure of xylem vessels is similar to that of sclerenchyma fibres.

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2

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(2)

Q7

(Total 12 marks)

8. (a) Below are four cell structures **A**, **B**, **C** and **D**. Place a cross in the box next to each structure found **only in plant cells**.

- A** plasmodesmata
- B** ribosome
- C** tonoplast
- D** chromosome

(2)

(b) The list below shows some organelles found in eukaryotic cells.

- amyloplast** **centriole** **chloroplast**
lysosome **mitochondrion** **nucleus** **ribosome**

Complete the table by choosing the correct organelle to match each description.

Organelle	Description
	Has a smooth outer membrane and a folded inner membrane
	Contains a starch granule enclosed by a membrane
	Spherical sac formed from a single membrane and containing enzymes

(3)

(c) Describe the structure of a cellulose microfibril.

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(4)

Q8

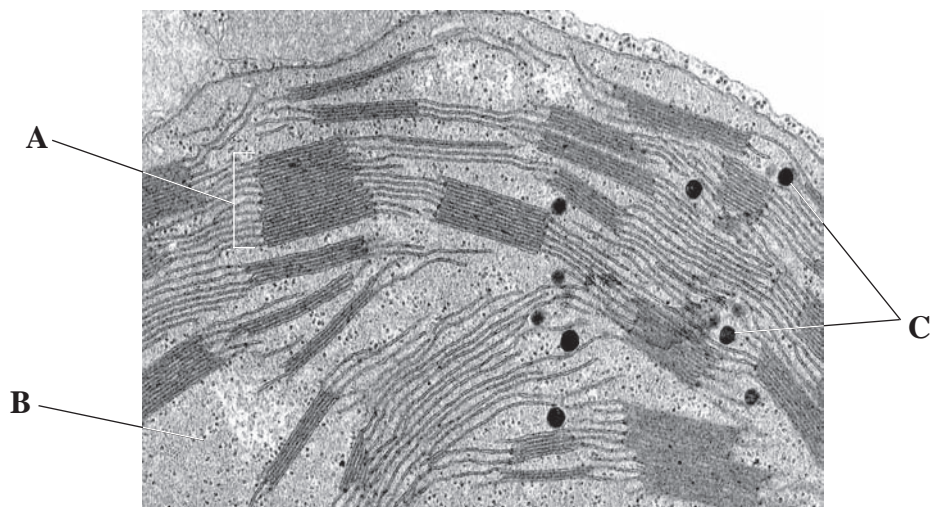
(Total 9 marks)

TOTAL FOR PAPER: 80 MARKS

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1. (a) The electron microscope image below shows part of a chloroplast.



The table below gives one function of each of the three structures labelled **A**, **B** and **C** on the electron microscope image. Complete the table below by writing in the appropriate letter and the name of each structure.

Function	Label letter	Name of structure
Photophosphorylation		
Stores non-carbohydrate organic material		
Carbon fixation		

(3)

(b) The equation below summarises the process of photolysis of water.



(i) Explain what happens to the electrons released by photolysis.

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(2)

(ii) The electrons are later involved in the reduction of NADP. Explain the importance of reduced NADP in the light-independent reactions of photosynthesis.

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(3)

(c) The rate at which plants produce carbohydrate by photosynthesis is known as gross primary productivity.

Put a cross in the box next to the equation that shows the relationship between gross primary productivity (GPP), net primary productivity (NPP) and respiration (R).

- $GPP + R = NPP$
- $GPP + NPP = R$
- $GPP = NPP + R$
- $GPP = NPP - R$

(1)

(d) The table below shows the net primary productivity in four different ecosystems. The ecosystems in the table are listed in order of increasing distance from the equator, starting with tropical rainforest.

Ecosystem	Net primary productivity / $\text{kJ m}^{-2} \text{ year}^{-1}$
Tropical rainforest	37 800
Temperate forest	25 200
Boreal forest	14 700
Polar tundra	2 400

(i) It is estimated that 85% of the energy available to primary consumers will not be available to secondary consumers. Calculate the energy that will be available to the secondary consumers in the **tropical rainforest**. Show your working.

Answer $\text{kJ m}^{-2} \text{ year}^{-1}$
(2)

(ii) Suggest **two** reasons for the differences in the net primary productivity as the distance from the equator increases.

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(2)

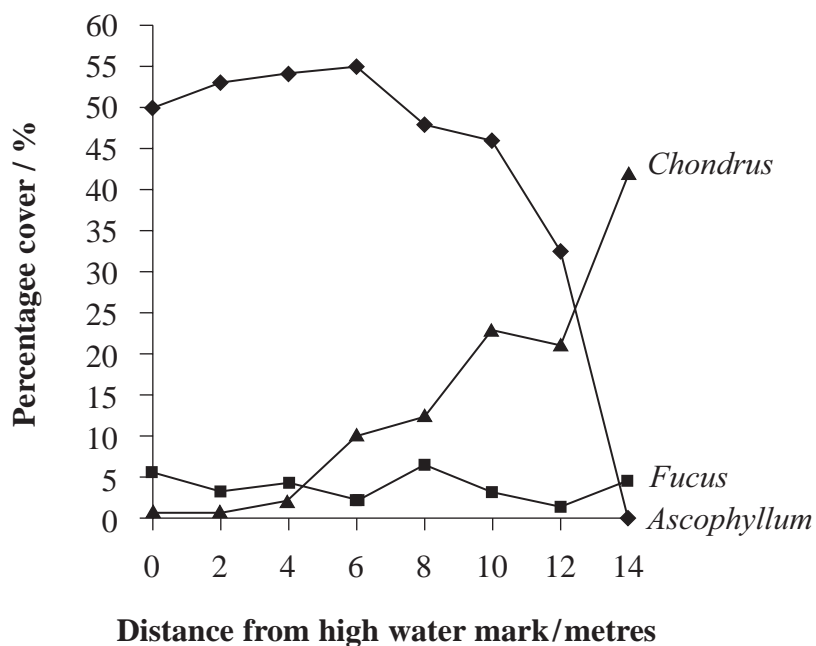
Q1

(Total 13 marks)

2. A study of the distribution and abundance of three different seaweeds was carried out in the intertidal region of a gently sloping rocky shore. The intertidal region is the area that will be covered by water as the tide comes in and uncovered by water as the tide goes out.

The abundance of each seaweed was found by estimating its percentage cover at regular intervals from the high water mark at the top of the shore to the low water mark lower down the shore.

The results of this study are shown on the graph below.



- (a) (i) Put a cross in the box next to the statement that could form part of a valid conclusion from the data shown in the graph.

- A – *Ascophyllum* grows only in regions that are uncovered by water for long periods of time
- B – *Fucus* grows better in regions that are never uncovered by water
- C – *Chondrus* may not be able to compete with *Ascophyllum*

(1)

(ii) With reference to the graph discuss the validity of statements **A**, **B** and **C**.

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(3)

(b) Suggest **two** abiotic factors, other than the length of time the seaweeds are out of water, that could affect the distribution of the seaweeds on this shore.

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(2)

(c) Describe a technique that you have used to study the distribution of a named organism within its habitat.

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(4)

Q2

(Total 10 marks)

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3. A study of tree pollen grains in a peat bog in Finland was carried out. The number of pollen grains of different tree species was recorded at different depths in the peat.

The data for four of these trees are given as a percentage of the total tree pollen sample, in the table below. An estimate of the age of the sample at each depth was also made.

Depth of sample / m	Age / years	Tree pollen grain / %			
		Larch	Spruce	Pine	Beech
0.5	2 850	0	0	53	43
1.0	3 770	0	0	55	40
1.5	5 600	0	0	31	47
2.0	6 390	0	12	15	53
2.5	8 170	5	36	4	48
3.0	8 700	38	36	6	35
3.5	8 780	27	40	3	32
4.0	10 000	10	22	2	40

The diagram below shows the present-day distribution of the four tree species found in the main climatic zones of the northern hemisphere.

Climatic zone	Distribution of trees
Arctic	
Boreal	
Temperate	
Sub-tropical	

(a) Suggest how pollen grains can provide evidence about which species of tree were growing successfully in Finland as the peat bog was forming.

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(2)

(b) (i) Put a cross in the box next to the species of tree that does not provide evidence about the changes in climate in Finland during the last 10 000 years.

- A Larch
- B Spruce
- C Pine
- D Beech

(1)

(ii) Explain your answer to (b)(i).

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(2)

(c) With reference to the present-day distribution of the four tree species and the results of the pollen grain study, suggest in what way the climate in Finland has changed during the last 10 000 years. Give reasons for your answer.

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(5)

(d) Describe how dendrochronology can be used to provide evidence for climate change.

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(2)

(Total 12 marks)

Q3

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4. In 1937, a population of sockeye salmon was released into Lake Washington in the USA. Since then, the original stock appears to have split into two different populations which do not interbreed. One group of salmon breeds in the shallow waters of the lake. The other group breeds in a fast-flowing river that flows into the lake.



These two populations of salmon have developed very different physical features. In the river, the male fish are more streamlined than those in the lake. This is thought to enable them to deal with the river's strong current. The females in the river are larger and more muscular than those in the lake population. This allows them to bury their eggs deep into the gravel, which is necessary to stop the eggs being dislodged by the fast water flow.

In addition, scientists have found evidence that the two populations appear to have developed differences between their gene pools. It is suggested that the Lake Washington salmon populations may eventually evolve into two separate species.

(a) State the term used to describe

- (i) the separation of one species into two populations that do not interbreed

..... (1)

- (ii) the formation of two new species from one species

..... (1)

- (iii) the relative proportion of different forms of a particular gene within a gene pool.

..... (1)

(b) Suggest how the two populations of salmon developed differences in their gene pools.

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(5)

(c) Explain how new alleles might appear in the gene pool of a species.

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(2)

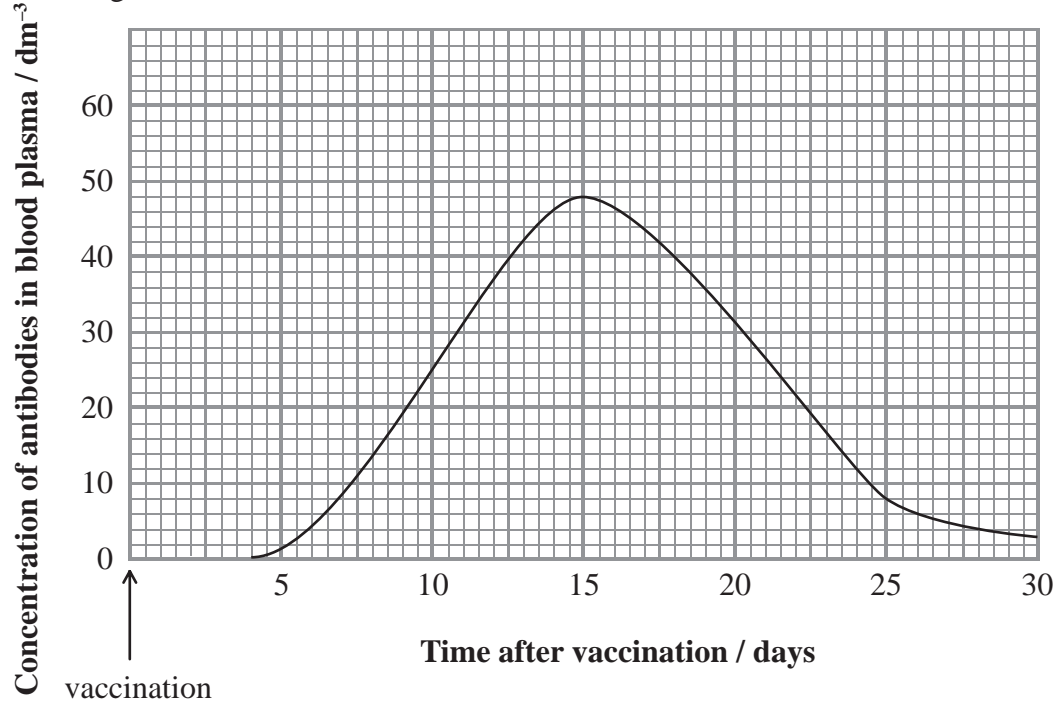
Q4

(Total 10 marks)

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5. Vaccines are widely used to protect individuals from developing the symptoms of a range of bacterial and viral infections. The vaccine contains one or more of the antigens found on the pathogen. One such example is a vaccine for influenza (flu) that contains a cocktail of antigens from viruses that cause this disease.

The graph below shows the changes in concentration of antibody in the blood plasma following vaccination of an individual.



- (a) Describe and explain the changes that occur in the concentration of antibodies in the blood plasma following vaccination.

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(6)

(b) Mutations frequently occur in the flu virus resulting in a change in the antigens present on its surface.

(i) Explain the meaning of the term **mutation**.

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(2)

(ii) Suggest why the vaccine contains a cocktail of antigens.

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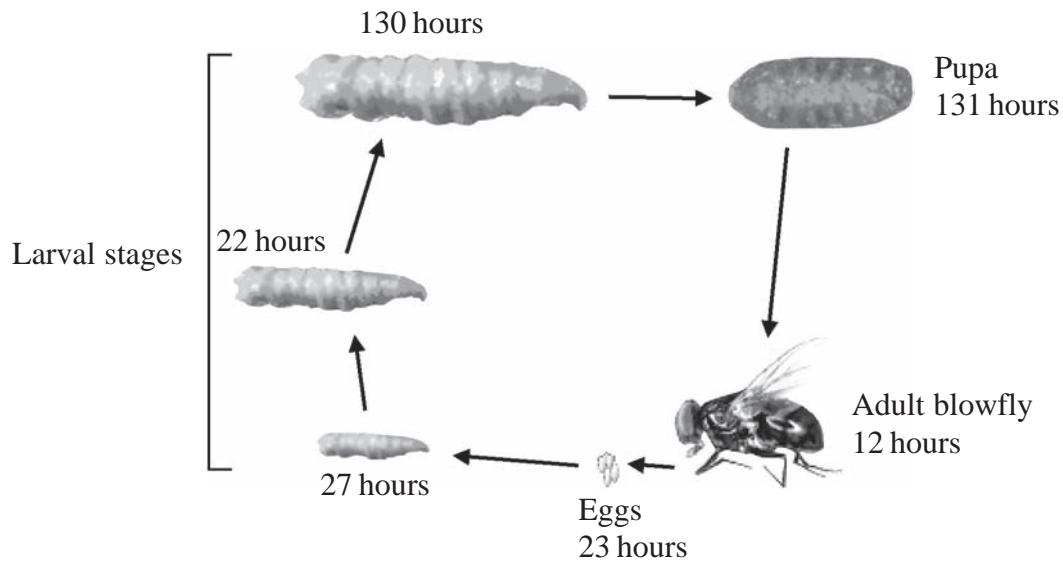
(2)

(Total 10 marks)

Q5

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6. (a) Forensic entomology can be used to estimate the time of death of a mammal. Adult female blowflies soon arrive to lay their eggs on the body and the blowfly life cycle follows a precise sequence. The diagram below shows the sequence and times (in hours) for each stage when the surrounding temperature is 21 °C.



- (i) Using information in the diagram, calculate the total percentage of the life cycle that a blowfly spends as a larva when the surrounding temperature is 21°C.

Answer %
(2)

- (ii) Temperature has an effect on the length of the blowfly lifecycle. Suggest an explanation for the effect of temperature on the length of the blowfly lifecycle.

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(2)

(iii) Suggest **two** factors, other than temperature, that may affect the timing of the blowfly lifecycle and lead to an incorrect estimate of the time of death.

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(3)

(b) Time of death can also be estimated by studying the degree of rigor mortis in muscles. Describe how rigor mortis in muscles occurs.

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(3)

(c) The process of succession occurs in plant communities as well as in a dead body. Compare these two forms of succession.

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(3)

(Total 13 marks)

Q6

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7. Tuberculosis (TB) is caused by the bacterium, *Mycobacterium tuberculosis*.

(a) The table below lists **five** structural features that may be found in bacteria and viruses. Put a cross in the box if the structural feature is present.

Structural feature	Bacteria	Viruses
Mesosome	<input type="checkbox"/>	<input type="checkbox"/>
Capsid	<input type="checkbox"/>	<input type="checkbox"/>
Nucleic acid	<input type="checkbox"/>	<input type="checkbox"/>
Cytoplasm	<input type="checkbox"/>	<input type="checkbox"/>
Ribosome	<input type="checkbox"/>	<input type="checkbox"/>

(5)

(b) The table below shows the number of new TB cases recorded in 1994 and in 2004 from four different geographical regions. These data exclude people who are HIV positive.

Year	Number of new TB cases per 100 000 of the population			
	Africa	Asia	South America	Europe
1994	148	629	98	48
2004	281	535	59	104

(i) Describe the trends shown by the data.

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(2)

(ii) HIV positive people were excluded from the data. If they had been included suggest how the data would differ. Give an explanation for your answer.

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(3)

(c) TB is increasing in some countries which have well-funded health services. Suggest **two** reasons for this.

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(2)

(Total 12 marks)

Q7

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8. Bacteriostatic and bactericidal antibiotics are effective against bacterial cells but leave mammalian cells unharmed.

(a) (i) Distinguish between bacteriostatic and bactericidal antibiotics.

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(1)

(ii) Suggest why mammalian cells are unharmed by antibiotics.

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(2)

(b) Resistance to antibiotics is an increasingly severe problem around the world. More hospital patients are contracting diseases which cannot be cured using available antibiotics.

Suggest ways by which doctors and patients can help to prevent the further spread of antibiotic resistance in bacteria.

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(3)

(c) Describe a procedure that you have used to investigate the effect of different antibiotics on bacterial growth.

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(4)

Q8

(Total 10 marks)

TOTAL FOR PAPER: 90 MARKS

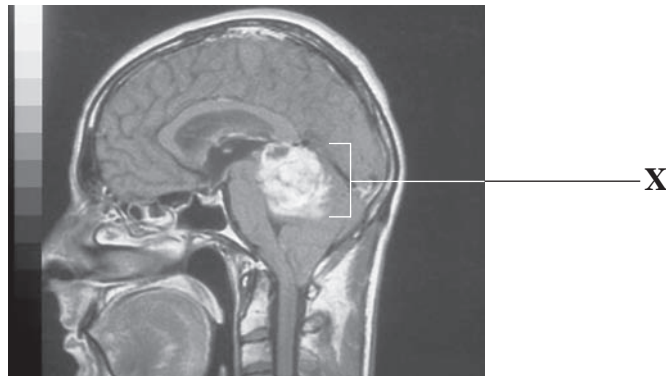
END

1. (a) The table below refers to three functions of the human brain. Complete the table to show which region of the brain is responsible for each function.

Function	Region of the brain
Ability to learn	
Thermoregulation	
Control of heartbeat	

(3)

(b) The diagram below shows an image produced by an MRI (magnetic resonance imaging) scan. The region labelled **X** is a tumour.



Source: www.medicalprogress.org

Suggest **two** pieces of information this scan could give to a surgeon about this tumour.

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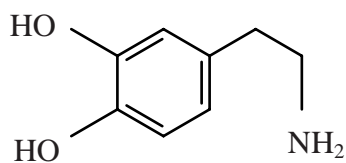
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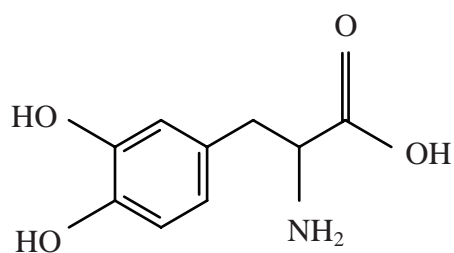
(Total 5 marks)

Q1

2. The diagram below shows the structures of the neurotransmitter, dopamine, and the drug, L-dopa, used in the treatment of Parkinson's disease.



Dopamine



L-Dopa

- (a) With reference to the structures of dopamine and L-dopa, suggest why the drug L-dopa is effective in the treatment of Parkinson's disease.

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(4)

(b) Scientists believe that the release of dopamine from the presynaptic membrane is triggered by certain emotional responses. Describe how the release of this neurotransmitter generates action potentials in the postsynaptic neurone.

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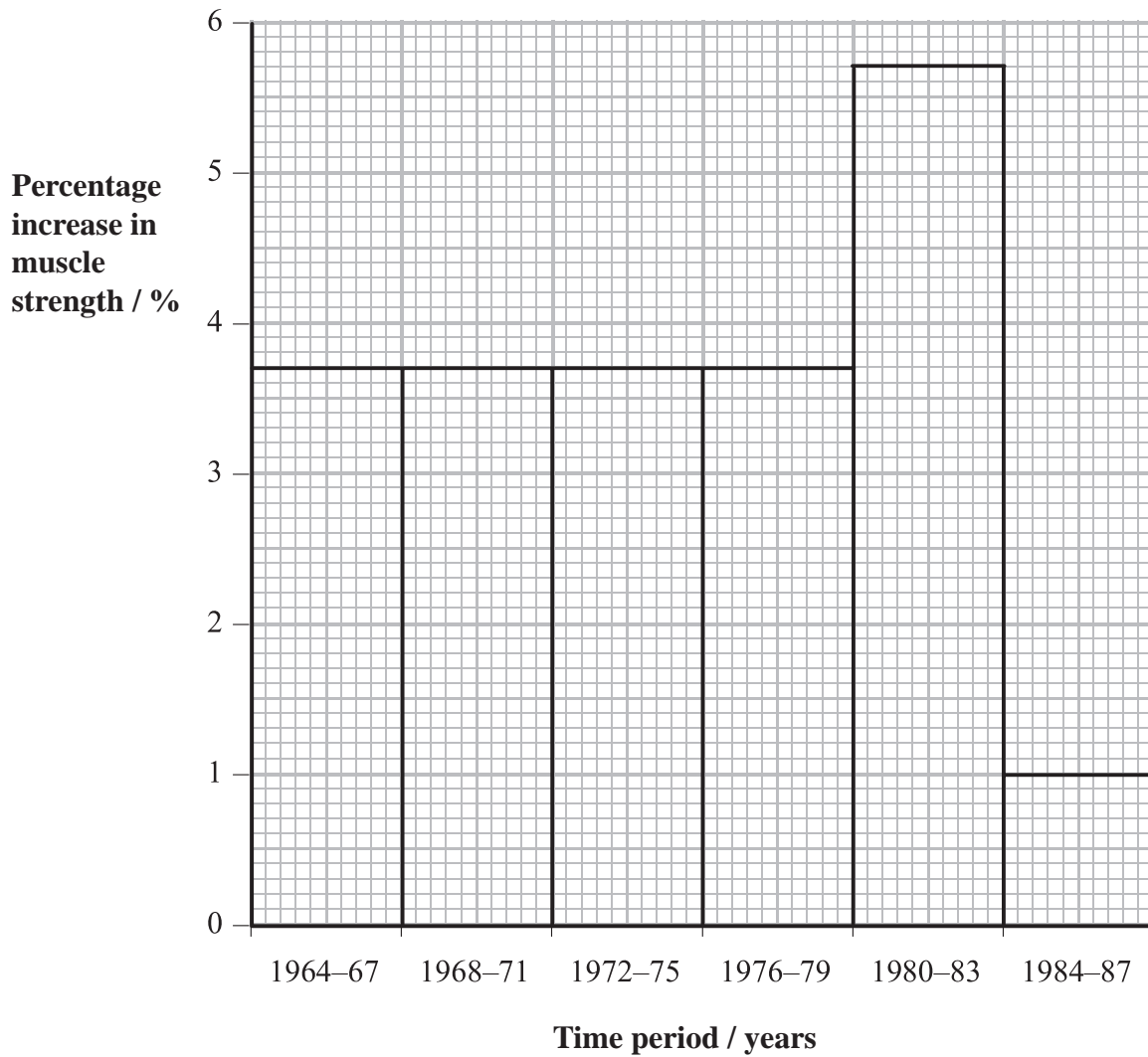
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(5)

(Total 9 marks)

Q2

3. Olympic weight-lifters carry out intense training to increase their muscle strength. The muscle strength of weight-lifters increased over the period 1964 to 1987. The graph below shows the **percentage increase** in muscle strength in each four-year period, between 1964 and 1987.



- (a) Describe the changes that have occurred in the muscle strength of these weight-lifters over this time period.

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(2)

- (b) It has been suggested that changes in muscle strength could be a result of performance-enhancing drugs.

Suggest possible reasons for the changes that occurred in the muscle strength of weight-lifters during the period 1980–1987.

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(3)

- (c) Many people feel that the use of performance-enhancing drugs in sport is unethical. State whether you consider the use of performance-enhancing drugs in sport to be unethical. Give **two** ethical arguments to support your opinion.

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(2)

(d) It is sometimes claimed that outstanding athletes are born and not made. Explain whether you agree with this view.

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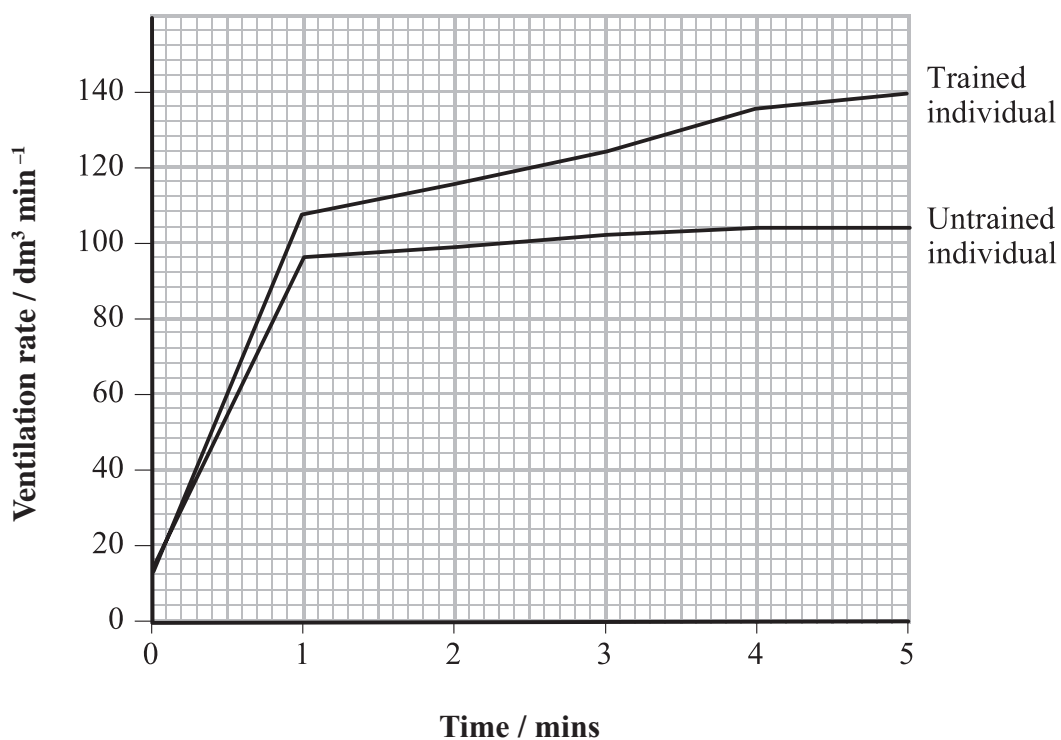
(3)

Q3

(Total 10 marks)

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4. (a) A study was carried out to investigate the effects of training on the ventilation rate of the lungs during exercise. The graph below shows the effect of a five minute period of exercise on the ventilation rate of two individuals. One individual has followed a training programme and the other individual has not.



- (i) Compare the effects of this exercise on the ventilation rate of the two individuals.

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(2)

(ii) Suggest what other information would be needed to allow a valid comparison to be made of the effect of a training programme on ventilation rate.

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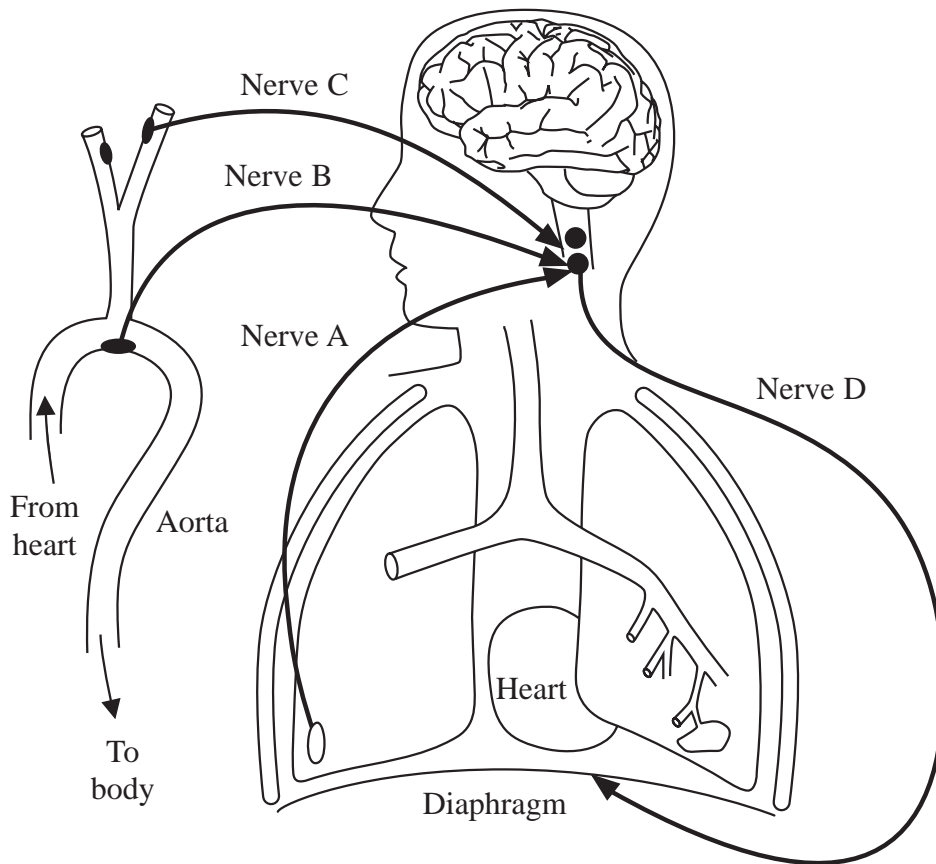
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(3)

- (b) An athlete was having difficulties with the control of his ventilation rate. The diagram below shows four nerves labelled **A**, **B**, **C** and **D** involved in the control of ventilation.



Damage to any of these four nerves would affect the control of ventilation. For each of the descriptions below, state which of the nerves labelled **A**, **B**, **C** or **D** would have been damaged. Put a cross in the box corresponding to the correct letter.

(i) Nerve impulses from the aortic body would not reach the respiratory centre.

A **B** **C** **D**

(ii) Nerve impulses from the respiratory centre would not reach the diaphragm.

A **B** **C** **D**

(iii) Nerve impulses would not reach the respiratory centre from the stretch receptors.

A **B** **C** **D**

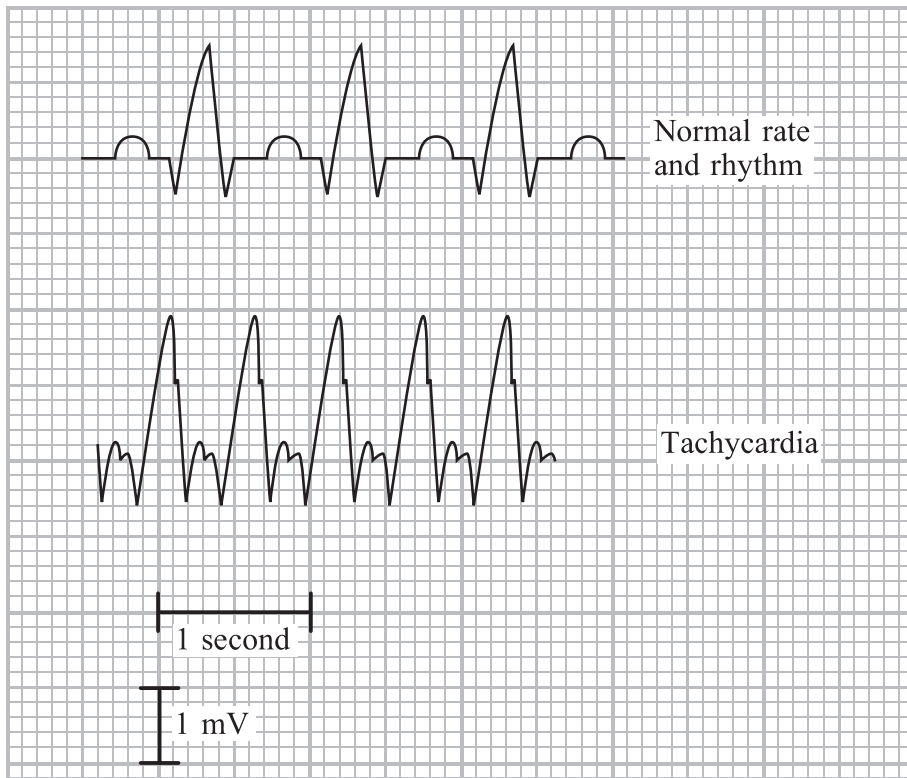
(iv) Nerve impulses from the carotid body would not reach the respiratory centre.

A **B** **C** **D**

(4) **Q4**

(Total 9 marks)

5. Tachycardia is a heart condition in which the heart beats very rapidly, even when the patient is at rest. The diagram below shows part of two electrocardiograms (ECGs), one from a person with a normal heart beat and one from a patient with tachycardia.



- (a) Describe the normal electrical activity that occurs in the heart during one complete heart beat.

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(4)

(b) Calculate the heart rate of the person with a normal heart beat, using the information in the ECG. Show your working.

Answer
(2)

(c) Compare the ECG of the person with a normal heartbeat with the ECG of the patient with tachycardia.

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(2)

(d) Suggest what effects tachycardia could have on cardiac output. Explain your answer.

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(3)

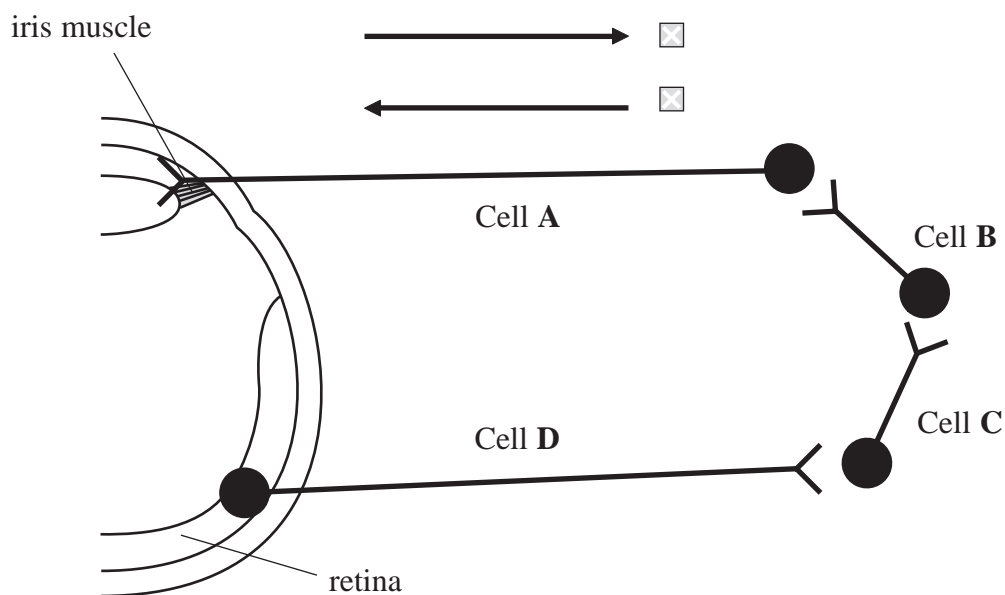
(Total 11 marks)

Q5

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6. The retina of a mammal's eye contains millions of receptor cells which are highly sensitive to light. These receptor cells are protected from excessively bright light by the iris. The diagram below shows part of a nerve cell pathway involved in the reflex controlling the size of the pupil by the iris.

(a) (i) Put a cross in the box next to the arrow that correctly shows the direction of impulse travel in cell A.



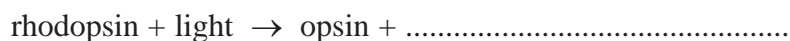
(1)

(ii) Identify the type of neurone for cell A and cell B by putting a cross in the correct box in the table below.

	Relay neurone	Motor neurone	Sensory neurone
Cell A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cell B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(2)

(b) (i) Complete the equation below to show the chemical changes in rhodopsin in the presence of light.



(1)

(ii) Describe the movement of sodium ions across the rod cell membrane, in the presence of opsin.

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(3)

(iii) State the term that describes the electrochemical state of a rod cell in light.

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(1)

(Total 8 marks)

Q6

7. Sea slugs are marine invertebrates with gills for gas exchange on their body surface. A sea slug is able to withdraw its gill when touched. In an investigation into this response, the gill was touched and the time taken for the gill to be exposed again after withdrawal was measured. This was repeated at half-minute intervals. The table below shows the results of this investigation.

Touch	Time taken for gill to be exposed again / seconds
First	23.0
Second	9.0
Third	16.0
Fourth	4.5
Fifth	7.5
Sixth	6.5
Seventh	6.0
Eighth	4.5
Ninth	5.5
Tenth	6.5

(a) Describe the effect of repeated touching on the time taken for the gill to be exposed again.

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(3)

(b) Name the type of learning shown by a sea slug in this investigation.

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(1)

(c) Explain how this learned response may be of benefit to the sea slug in its natural environment.

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(4)

(Total 8 marks)

Q7

8. The scientific document you have studied is adapted from articles on disease and epidemics in New Scientist, Biological Sciences Review and the website of AVERT, an international HIV and AIDS charity. Use the information from the document and your own knowledge to answer the following questions.

(a) Describe, using specific examples, evidence that the Black Death was caused by a virus.

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(3)

(b) Suggest reasons why it is likely that a vaccine for bird flu can be produced fairly easily, whereas no effective vaccine for malaria has yet been produced.

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(c) Explain how small samples of DNA from a burial site can be amplified and how such samples might be used to find the identity of an unknown virus.

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(4)

(d) Describe the risks of using genetically modified organisms.

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(2)

(e) A hybrid virus with a mixture of genes from the H5N1 flu virus and the human flu virus could be produced in cells infected with both. Explain how a hybrid virus could be

(i) particularly dangerous to humans

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(ii) useful in producing a vaccine.

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(4)

(f) Explain what is meant by a ‘breathtaking selection pressure’, and how this might have led to very high frequency of the mutant form of CCR5.

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(3)

(g) The South African government decided not to allow the use of ARV drugs for the treatment of HIV infected people. Suggest possible reasons for their decision.

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(5)

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C Sample mark schemes

General marking guidance	93
Unit 1: Lifestyle, Transport, Genes & Health.....	95
Unit 2: Development, Plants & the Environment	109
Unit 4: The Natural Environment & Species Survival	123
Unit 5: Energy, Exercise & Coordination	141

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:
 - i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
 - ii) select and use a form and style of writing appropriate to purpose and to complex subject matter
 - iii) organise information clearly and coherently, using specialist vocabulary when appropriate

Symbol	Meaning of symbol
; semi colon	Indicates the end of a marking point.
eq	Indicates that credit should be given for other correct alternatives to a word or statement, as discussed in the Standardisation meeting. It is used because it is not always possible to list every alternative answer that a candidate may write that is worthy of credit.
/ oblique	Words or phrases separated by an oblique are alternatives to each other.
{ } curly brackets	Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion.
() round brackets	Words inside round brackets are to aid understanding of the marking point but are not required to award the point.
[] square brackets	Words inside square brackets are instructions or guidance for examiners.

Spelling and clarity

In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

No marks are awarded specifically for quality of language in the written papers, except for the essays in the synoptic paper. Use of English is however taken into account as follows:

- the spelling of technical terms must be sufficiently correct for the answer to be unambiguous
 - e.g. for amylase, 'ammalase' is acceptable whereas 'amylose' is not
 - e.g. for glycogen, 'glicojen' is acceptable whereas 'glucagen' is not
 - e.g. for ileum, 'illeum' is acceptable whereas 'ilium' is not
 - e.g. for mitosis, 'mytosis' is acceptable whereas 'meitosis' is not
- candidates must make their meaning clear to the examiner to gain the mark
- a correct statement that is contradicted by an incorrect statement in the same part of an answer gains no mark - irrelevant material should be ignored.

Unit 1: Lifestyle, Transport, Genes & Health

Question Number	Question																					
1.(a)(i)	The table below lists some features of four carbohydrates. Put a cross in the box to indicate that the feature is present in the carbohydrate. The first row has been done for you.																					
	<table border="1"> <thead> <tr> <th>Correct Answer</th> <th>Mark</th> </tr> </thead> <tbody> <tr> <td> <table border="1"> <thead> <tr> <th>Feature</th> <th>Glucose</th> <th>Glycogen</th> <th>Maltose</th> <th>Starch</th> </tr> </thead> <tbody> <tr> <td>1-6 glycosidic bonds present</td> <td></td> <td><input checked="" type="checkbox"/></td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Made up of many monomers</td> <td></td> <td><input checked="" type="checkbox"/></td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> </tbody> </table> </td> <td>4</td> </tr> <tr> <td colspan="2">One mark per correct column.</td> </tr> </tbody> </table>	Correct Answer	Mark	<table border="1"> <thead> <tr> <th>Feature</th> <th>Glucose</th> <th>Glycogen</th> <th>Maltose</th> <th>Starch</th> </tr> </thead> <tbody> <tr> <td>1-6 glycosidic bonds present</td> <td></td> <td><input checked="" type="checkbox"/></td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Made up of many monomers</td> <td></td> <td><input checked="" type="checkbox"/></td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> </tbody> </table>	Feature	Glucose	Glycogen	Maltose	Starch	1-6 glycosidic bonds present		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	Made up of many monomers		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	4	One mark per correct column.	
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Made up of many monomers		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>																		
One mark per correct column.																						

Question Number	Question								
1.(a)(ii)	Name the disaccharide made up of α -glucose and galactose.								
	<table border="1"> <thead> <tr> <th>Correct Answer</th> <th>Acceptable Answers</th> <th>Reject</th> <th>Mark</th> </tr> </thead> <tbody> <tr> <td>lactose;</td> <td></td> <td></td> <td>1</td> </tr> </tbody> </table>	Correct Answer	Acceptable Answers	Reject	Mark	lactose;			1
Correct Answer	Acceptable Answers	Reject	Mark						
lactose;			1						

Question Number	Question										
1.(a)(iii)	Draw the molecules resulting when this disaccharide molecule is split into its two component monosaccharides.										
	<table border="1"> <thead> <tr> <th>Answer</th> <th>Mark</th> </tr> </thead> <tbody> <tr> <td>Award one mark for each of the following points in context to a maximum of two.</td> <td></td> </tr> <tr> <td>1. one unit of glucose correctly drawn;</td> <td>1</td> </tr> <tr> <td>2. second identical unit;</td> <td>1</td> </tr> <tr> <td></td> <td>Max 2</td> </tr> </tbody> </table>	Answer	Mark	Award one mark for each of the following points in context to a maximum of two.		1. one unit of glucose correctly drawn;	1	2. second identical unit;	1		Max 2
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2. second identical unit;	1										
	Max 2										

Question Number	Question								
1.(a)(iv)	Name this type of reaction.								
	<table border="1"> <thead> <tr> <th>Correct Answer</th> <th>Acceptable Answers</th> <th>Reject</th> <th>Mark</th> </tr> </thead> <tbody> <tr> <td>hydrolysis;</td> <td></td> <td></td> <td>1</td> </tr> </tbody> </table>	Correct Answer	Acceptable Answers	Reject	Mark	hydrolysis;			1
Correct Answer	Acceptable Answers	Reject	Mark						
hydrolysis;			1						

Question Number	Question	
1.(b)	Explain the advantages of glycogen as an energy storage molecule in the human body.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of three.	
	1. large molecule/made up of many monomers allows storage of large amounts of energy;	1
	2. compact therefore large amounts can be stored in a cell;	1
	3. insoluble therefore does not have an osmotic effect/eq;	1
	4. inert so not affected by other reactions in cells;	1
	5. large molecule therefore cannot pass out of cells;	1
	6. can be hydrolysed to release large amounts of energy / glucose when required;	1
		Max 3

Question Number	Question	
2.(a)	Describe the changes in death rates shown on the graph.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of three	
	1. {during first 5 years / initially} there is little change in death rates;	1
	2. from late 70's/early 80's in most countries there is a lowering of death rates;	1
	3. Poland is an exception when death rates have increased;	1
	4. any quantitative manipulation of data e.g. death rate in Finland has halved over period;	1
		Max 3

Question Number	Question	
2.(b)(i)	Using both graphs, give two pieces of evidence to support this hypothesis.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of two.	
	1. Finland has high rates of CHD and high B.P.;	1
	2. UK has high rates of CHD and high B.P.;	1
		Max 2

Question Number	Question	
2.(b)(ii)	Suggest how the data shown in the graphs do not fully support this hypothesis.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of two.	
	1. there is conflicting evidence;	1
	2. Italy has high b.p. but low death rates;	1
		Max 2

Question Number	Question	
2.(c)	Suggest how high blood pressure can result in less oxygen reaching heart muscle.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of three.	
	1. damage to artery walls;	1
	2. ref. to blood clot;	1
	3. blood clot can block arteries;	1
	4. ref. to coronary arteries;	1
	5. lack of (oxygenated) blood flow to heart muscle;	1
		Max 3

Question Number	Question	
3.(a)	Name the blood vessels labelled W, X, Y and Z.	
	Answer	Mark
	W = coronary arteries X = aorta Y = (left) pulmonary artery Z = pulmonary vein 4 correct = 2 marks 2 or 3 correct = 1 mark 0 or 1 correct = 0 marks	2

Question Number	Question	
3.(b)	Describe and explain the events that occur during ventricular systole in the cardiac cycle.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of four. <ol style="list-style-type: none"> 1. ventricle (muscle) contracts; 2. higher pressure in ventricles relative to atria; 3. (pressure) closes atrioventricular valve; 4. higher pressure in ventricles relative to the {aorta / pulmonary artery / arteries}; 5. (pressure) opens the semilunar valve; 6. blood forced into the {aorta / pulmonary artery / arteries}; 	 1 1 1 1 1 1 Max 4

Question Number	Question	
3.(c)	Describe a reliable procedure that could be used to test this hypothesis.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of three.	
	1. place <i>Daphnia</i> on {cavity slide / eq} with caffeine;	1
	2. (focus on heart) using microscope;	1
	3. ref. to range of caffeine concentrations;	1
	4. ref. to repeats;	1
	5. ref. to {water as control / zero caffeine concentration};	1
	Award one mark for each of the following points in context to a maximum of three.	Max 3
	1. control temperature;	1
	2. reference to similar organisms used;	1
	3. accurate measurement of DV;	1
	4. reference to pretreatment;	1
		Max 3

Question Number	Question			
4.(a)	Identify the blood vessels P, Q and R.			
	Correct Answer	Acceptable Answers	Reject	Mark
	P aorta	pulmonary artery		1
	Q vena cava	any named vein		1
	R capillary			1

Question Number	Question	
4.(b)	The blood pressure at point A is 10.5 kPa and the blood pressure at point B is 2.5 kPa. Calculate the percentage decrease in the pressure as blood flows from A to B.	
	Answer	Mark
	Correct answer (with or without working) = 2 marks Answer: 76(.2)%;	2
	Correct working with incorrect answer = 1 mark 10.5 - 2.5 or 8 seen;	

Question Number	Question	
4.(c)(i)	Explain the changes in blood pressure in the arteries.	
	Answer	Mark
	(pulses) due to {elastic recoil/eq} / general drop due to {friction / dividing into more vessels};	1

Question Number	Question	
4.(c)(ii)	Explain the changes in blood pressure in the capillaries.	
	Answer	Mark
	(pressure drop) due to large volume of capillary network / friction between blood cells and walls of capillary;	1

Question Number	Question			
5.(a)	Give the sequence of amino acids found in the polypeptide chain that is coded for by this part of the DNA strand.			
	Correct Answer	Acceptable Answers	Reject	Mark
	Arginine alanine threonine glutamine glycine [All correct = 2 marks, one mistake = 1 mark, more mistakes = no marks]	arg ala thr glu gly		2

Question Number	Question			
5.(b)	Give the next triplet codon that you would expect to see on this DNA strand if codon 51 coded for the last amino acid in the polypeptide chain.			
	Correct Answer	Acceptable Answers	Reject	Mark
	ACT	adenine cytosine thymine	thiamine	1

Question Number	Question			
5.(c)	Complete the diagram below to show the sequence of bases on a molecule of messenger RNA synthesised from this part of the DNA strand.			
	Correct Answer	Acceptable Answers	Reject	Mark
	AGA GCC ACC CAG GGU [All correct = 2 marks, one mistake = 1 mark, more than one mistake = no marks]			2

Question Number	Question	
5.(d)(i)	Suggest what would happen to the structure of the protein coded for by this DNA molecule if thymine in codon 49 was replaced by cytosine.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of two marks.	
	1. alanine would replace threonine;	1
	2. {primary/secondary} structure would be altered;	1
	3. 3D shape would not be correct / eq;	1
		Max 2

Question Number	Question	
5.(d)(ii)	Suggest what would happen to the structure of the protein coded for by this DNA molecule if adenine replaced the first thymine in codon 47 .	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of two marks.</p> <ol style="list-style-type: none"> 1. a stop signal would be inserted; 2. the protein would be shorter/eq; 3. protein would be 46 amino acids long/eq; 	<p>1 1 1 Max 2</p>

Question Number	Question			Mark																			
6.(a)	The table below refers to three transport mechanisms. If the statement is true, put a cross in the appropriate box.																						
	Correct Answer			6																			
	<table border="1"> <thead> <tr> <th>Statement</th> <th>Osmosis</th> <th>Facilitated diffusion</th> <th>Active transport</th> </tr> </thead> <tbody> <tr> <td>Movement of water</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td></td> <td></td> </tr> <tr> <td>Requires ATP</td> <td></td> <td></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Molecules move down a concentration gradient</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>Carrier proteins are needed</td> <td></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </tbody> </table>	Statement	Osmosis	Facilitated diffusion	Active transport	Movement of water	<input checked="" type="checkbox"/>			Requires ATP			<input checked="" type="checkbox"/>	Molecules move down a concentration gradient	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Carrier proteins are needed		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
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	One mark for each two correct boxes.																						

Question Number	Question	Answer	Mark
6.(b)(i)	Describe the changes in cytoplasm concentration of substance B shown in the graph and explain how these changes support the statement that substance B enters the cells by diffusion.		
	Award up to four marks for any of the following in context.		
	1. Rapid rate of uptake {in first 4 hours / initially};		1
	2. Substance A passes down concentration gradient (into the cell) / eq;		1
	3. {Between 4 and 8 hours / gradually} the rate of uptake decreases;		1
	4. Due to smaller diffusion gradient / eq;		1
	5. Rate of uptake is proportional to diffusion gradient /eq;		1
	6. After 8 hours there is no further uptake;		1
	7. Concentrations inside cell equal concentration outside cell/eq;		1
			Max 4

Question Number	Question	Answer	Mark
6.(b)(ii)	Suggest how the shape of the graph would change if the temperature in the experiment was decreased to 10 °C. Give an explanation for your answer.		
	Award one mark for each of the following points in context to a maximum of two marks.		
	1. Substance B has less kinetic energy;		1
	2. Movement through membrane is slower/eq;		1
			Max 2

Question Number	Question												
7.(a)	Explain why the model used to describe the structure of this cell membrane is called the fluid mosaic model.												
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Question Number	Question														
7.(b)(i)	Describe the effects of the presence of cholesterol and of an increase in temperature on the permeability of the three membranes to substance A.														
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Question Number	Question																
7.(b)(ii)	Suggest an explanation for the effect cholesterol has on the permeability of the membranes to substance A.																
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5. ref to some effect on polarity of membrane;	1																
	Max 2																

Question Number	Question	
8.(a)	Describe how each of these factors is involved in efficient gas exchange in the alveoli of a mammalian lung.	
	Answer	Mark
	Award up to three marks for the following in context	
	1. (thin wall) of {squamous/flattened} (epithelial cells);	1
	2. small diffusion distance;	1
	3. ref to blood flow in capillaries;	1
	4. ref to ventilation;	1
	5. maintains {concentration/diffusion} gradient of {gases/carbon dioxide/oxygen};	1
		Max 3

Question Number	Question	
8.(b)	Describe and explain the effect of cystic fibrosis on gas exchange.	
	Answer	Mark
	Award up to two marks for the following in context	
	1. mucus builds up in airways;	1
	2. cilia cannot move it because it is thick/eq;	1
	3. reducing ventilation (below blockage);	1
	4. gas exchange occurs over {fewer alveoli / smaller surface area};	1
		Max 2

Question Number	Question			
8.(c)(i)	Give the name of a female who is homozygous for the CF gene.			
	Correct Answer	Acceptable Answers	Reject	Mark
	Priya			1

Question Number	Question			
8.(c)(ii)	Give the name of a male who is heterozygous for the CF gene.			
	Correct Answer	Acceptable Answers	Reject	Mark
	Zac / Samir			1

Question Number	Question			
8.(c)(iii)	If Fiona and Samir had a third child, state the probability that this child would have cystic fibrosis.			
	Correct Answer	Acceptable Answers	Reject	Mark
	0.25;	$\frac{1}{4}$ 1 in 4 25%	1:3 1 to 3	1

Question Number	Question	
8.(d)	Genetic screening can be used to identify the cystic fibrosis allele. By considering contrasting ethical viewpoints, discuss one reason in favour and one reason against genetic screening for cystic fibrosis.	
	Answer	Mark
	<p>Award one mark for identifying a potential benefit and a further mark for an explanation of the benefit.</p> <p>For example</p> <ol style="list-style-type: none"> to determine whether or not a parent is a carrier; therefore can make informed decision about having children; <p>or</p> <ol style="list-style-type: none"> determine whether or not embryo has disease; informed decisions can be made about {future care for child / termination of pregnancy} / treatment could start immediately; <p>Award one mark for identifying a potential disadvantage and a further mark for an explanation of the disadvantage.</p> <p>For example</p> <ol style="list-style-type: none"> ref to false positives / negatives; decisions on whether to terminate a pregnancy or not are based on wrong information; <p>or</p> <ol style="list-style-type: none"> other abnormalities may be found; some social implication e.g. life insurance, finding {partner / job}, depression; 	4

Unit 2: Development, Plants & the Environment

Question Number	Question			
1.(a)(i)	Which cell is undergoing mitosis? Put a cross in the correct box.			
	Correct Answer	Acceptable Answers	Reject	Mark
	<input checked="" type="checkbox"/> B;			1

Question Number	Question			
1.(a)(ii)	Give the name of the structure labelled Z.			
	Correct Answer	Acceptable Answers	Reject	Mark
	Spindle fibre;	Spindle		1

Question Number	Question			
1.(a)(iii)	Name the stage of mitosis shown.			
	Correct Answer	Acceptable Answers	Reject	Mark
	Metaphase;	Metaphase I		1

Question Number	Question	
1.(b)	Describe how you would prepare cells in order to observe mitosis.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of four marks.</p> <ol style="list-style-type: none"> 1. Ref. to use of root tip; 2. Add {acid / named acid / acetic alcohol}; 3. Add appropriate named stain e.g. toluidine blue, acetic orcein, Schiff's reagent, Feulgen's reagent; 4. Break open tip with {(mounted) needle/eq}; 5. Mount in {stain / acid / water}; 6. (Gently) squash under coverslip; 7. Warm (to intensify staining); 	4

Question Number	Question	
2.(a)(i)	Explain how independent assortment leads to genetic variation.	
	Answer	Mark
	Award one mark for each of the following points in context. 1. ref. to random aligning of chromosomes/eq; 2. idea of new combinations of {(parental) chromosomes / alleles};	2

Question Number	Question	
2.(a)(ii)	Describe how crossing over further increases genetic variation.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of two marks. 1. breaking and rejoining of {chromatids / DNA /eq}; 2. on same chromosome pair; 3. recombines {genes / alleles} / produces recombinants /eq;	2

Question Number	Question	
2.(b)	Describe the changes in height between 1950 and 1980.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of two marks. 1. Height increased (from 1950) until 1970; 2. Plateau /eq (after 1970); 3. Relevant correct manipulation of data from graph;	2

Question Number	Question	
2.(c)	The evidence from both graphs suggests that a combination of genetic and environmental factors influence the height of men in Japan. Give an explanation for this.	
	Answer	Mark
	<p data-bbox="443 450 1197 533">Award one mark for each of the following points in context to a maximum of three marks for each section, and a maximum of four marks overall.</p> <p data-bbox="443 568 619 595">Environmental</p> <ol data-bbox="443 602 1007 815" style="list-style-type: none"> 1. Diet is an environmental factor; 2. Protein content increases; 3. Protein required for growth; 4. This leads to increase in height up to 1970; <p data-bbox="443 848 539 875">Genetic</p> <ol data-bbox="443 882 1193 1122" style="list-style-type: none"> 1. {Plateau / level off} in height (after 1970); 2. indicates a (potential) maximum height/eq; 3. this is a genetic factor; 4. no change in height despite further protein increase (after 1970); 	4

Question Number	Question	Mark																								
3.(a)	The table below lists three organelles. Put a cross in the box to match each organelle with the correct letter shown on the diagram.																									
	Correct Answer	Mark																								
	<table border="1"> <thead> <tr> <th>Organelle</th> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>E</th> </tr> </thead> <tbody> <tr> <td>Rough endoplasmic reticulum</td> <td></td> <td></td> <td><input checked="" type="checkbox"/></td> <td></td> <td></td> </tr> <tr> <td>Mitochondrion</td> <td><input checked="" type="checkbox"/></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Golgi apparatus</td> <td></td> <td><input checked="" type="checkbox"/></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Organelle	A	B	C	D	E	Rough endoplasmic reticulum			<input checked="" type="checkbox"/>			Mitochondrion	<input checked="" type="checkbox"/>					Golgi apparatus		<input checked="" type="checkbox"/>				3
Organelle	A	B	C	D	E																					
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Golgi apparatus		<input checked="" type="checkbox"/>																								

Question Number	Question	Mark
3.(b)	For some time after the Golgi apparatus was identified, there was doubt as to whether it was a new and separate organelle. Explain how the Golgi apparatus could be confused with other organelles within a cell.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of three marks.</p> <ol style="list-style-type: none"> {layers / stacks} of {membrane / cisternae}; single membrane; similar to endoplasmic reticulum; difficulty interpreting electron micrographs; reference to {limited microscope techniques / artefacts / resolution}; 	3

Question Number	Question	
3.(c)(i)	The data provide evidence that the Golgi apparatus is a separate organelle. Suggest an explanation for this.	
	Answer	Mark
	Award one mark for each of the following points in context. 1. idea of different levels of radioactivity from other organelles; 2. peak at different time;	2

Question Number	Question	
3.(c)(ii)	Explain how the data provide evidence for the sequence of events in the process of protein transport in these cells.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of four marks. 1. radioactivity peaks first in RER; 2. protein synthesised (in RER); 3. vesicles containing protein formed by RER; 4. vesicles migrate and fuse to Golgi; 5. which is where the second peak; 6. protein modified in Golgi; 7. vesicles (containing protein) formed from Golgi; 8. third peak in secretoty vesicles; 9. (vesicles contain protein) for secretion;	4

Question Number	Question	
3.(c)(iii)	Suggest one reason for the presence of some radioactivity in the mitochondria.	
	Answer	Mark
	Award one mark for one of the following points only. 1. Background/eq; 2. Amino acids diffuse in mitochondria; 3. Radioactive protein {used by / found in} mitochondria;	1

Question Number	Question			
4.(a)	Three structures found in mammalian sperm cells are described in the table below. Give the name of each structure being described.			
	Correct Answer	Acceptable Answers	Reject	Mark
	Acrosome Flagellum Mitochondria	Tail	Midpiece	1 1 1

Question Number	Question			
4.(b)	Give the term that describes the ability of a stem cell from an embryo to produce all cell types.			
	Correct Answer	Acceptable Answers	Reject	Mark
	Totipotent	Totipotency	Pluripotent	1

Question Number	Question	
4.(c)	Describe how a cell loses the ability to produce other cell types and becomes specialised.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of three marks.</p> <ol style="list-style-type: none"> 1. some genes active / some genes inactivated; 2. only get mRNA from active genes; 3. active mRNA translated to specific protein; 4. proteins modify cell; 5. changes permanent/difficult to reverse; 6. ref. to differentiation; 	3

Question Number	Question	
4.(d)	It has been suggested that there will be less opposition to the medical use of stem cells from these embryos than from normal embryos. Suggest reasons for this.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of three marks.</p> <ol style="list-style-type: none"> 1. {these / unfertilised} embryos not viable; 2. objections to discarding viable embryos / no objection to discarding non-viable embryos; 3. rights from moment of fertilization; as they are genetically unique/eq; 	3

Question Number	Question	
5.(a)	State one advantage of the binomial system developed by Linnaeus.	
	Answer	Mark
	Award one mark for one of the following points only. 1. binomial name is unique; 2. more precise / less confusion than simple names;	1

Question Number	Question		
5.(b)	Complete the table by suggesting appropriate names for the class, order and family of the fin whale.		
	Correct Answers	Reject	Mark
	Class = Mammalia Order = Cetacea Family = Balaenopteridae All three correct = 1 mark	Any mis-spelt answers	1

Question Number	Question	
5.(c)	Below are four features, A , B , C and D , used in the classification of organisms. Put a cross in the box or boxes next to the features which are shared by both blue whales and fin whales.	
	Correct Answer	Mark
	<input checked="" type="checkbox"/> A ; <input checked="" type="checkbox"/> B ; <input checked="" type="checkbox"/> in A , B and C / D = 1 mark <input checked="" type="checkbox"/> in A / B and C and D = 0 marks <input checked="" type="checkbox"/> in A , B , C and D = 0 marks	2

Question Number	Question	
5.(d)	Suggest reasons for the classification of the blue whale and the fin whale within the same genus, <i>Balaenoptera</i> , but as different species.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of three marks. 1. idea that they are very similar / share many {features/eq}; 2. reference to homologous features; 3. in structure / behaviour/eq; 4. idea that they cannot breed together; 5. to produce {fertile / sexually viable} offspring;	3

Question Number	Question	Mark
6.(a)	State what is meant by the term species richness .	
	The number of (different) <u>species</u> in a {habitat / environment / ecosystem/eq};	1

Question Number	Question	Mark
6.(b)	Compare the species richness shown by the survey for the vegetation in the roadside verges with that of the hedgerows over this study period.	
	Award one mark for each of the following points in context to a maximum of three marks.	3
	<ol style="list-style-type: none"> 1. both have decreased; 2. decrease in roadside verges greater than in hedgerows; 3. {percentage / proportional} decrease greater in roadside verges greater than in hedgerows; 4. roadside verges greater species richness in 1990 and in 1998; 5. correct manipulation of figures to quantify any comparison; 	

Question Number	Question	Mark
6.(c)	Other information would be needed, in addition to species richness, to show changes in the biodiversity of the vegetation in the two types of habitat. Give an explanation for this.	
	Award one mark for each of the following points in context to a maximum of three marks.	3
	<ol style="list-style-type: none"> 1. idea that species richness gives no indication of abundance of each species; 2. idea that biodiversity refers to {variety/eq} of organisms; 3. ref to use of a calculated biodiversity index eg Simpson's; 4. using species richness value / number of different species; 5. number of individuals in each species recorded; 6. ref to genetic diversity; 	

Question Number	Question	
6.(d)	<p>Seed banks, such as the Millennium Seed Bank Project (MSBP), are an effective means of conserving plant species.</p> <p>Write a short briefing, intended for a government committee, describing how seed banks work and why their funding should be continued.</p>	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of five marks.</p> <ol style="list-style-type: none"> 1. reference to seeds stored in cool, dry conditions; 2. seeds can be stored for {long time/eq}; 3. {viability tests/eq} carried out at regular intervals; 4. {more economic / less costly / less labour involved} than conserving {living plants/eq}; 5. less space needed/eq; 6. {large numbers/eq} of plants can be stored; 7. seeds do not need be stored in original {habitat/eq}; 8. less likely to be damaged by {vandalism / natural disaster/eq}; 9. less likely to be damaged by {disease / herbivores/eq}; 10. ref to any other valid comment about the value of conserving plant species; 	5

Question Number	Question	
7.(a)(i)	Complete the table to show the total annual production of sisal.	
	Answer	Mark
	287;	1

Question Number	Question	
7.(a)(ii)	Calculate the percentage of sisal produced from freshly-cut leaves. Show your working.	
	Answer	Mark
	287 / 1432 or relevant working; 20 / 20.0;	2
	[Allow consequential error from part (i)]	

Question Number	Question	
7.(b)	Nylon is a synthetic (man-made) fibre which can be used to make ropes. Nylon ropes are lighter and stronger than those made using sisal. Suggest two advantages of using sisal rather than nylon to make ropes.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of two marks. 1. biodegradable; 2. use renewable material; 3. sisal {obtainable / grown} {easily / locally / similar idea}; 4. fibres extraction more suited to {developing countries / small scale}; 5. cheaper; 6. less use of fossil fuel/eq; Assume idea relates to sisal unless stated otherwise, but accept converse arguments for nylon.	2

Question Number	Question	
7.(c)(i)	Explain what is meant by the term tensile strength of a fibre.	
	Answer	Mark
	Ability to resist {stretching / being broken when pulled} / maximum {load / force} which can be applied before breaking;	1

Question Number	Question	Answer	Mark
7.(c)(ii)	Suggest how you would carry out a practical investigation to compare the tensile strength of sisal and nylon fibres.		
	Award one mark for each of the following points in context to a maximum of four marks.		4
	1. idea of suspending {fibres / bundles of fibres} with weights on / pulling them with a forcemeter/eq;		
	2. { fibres / bundles of fibres} of same diameter used / different diameters accounted for;		
	3. { fibres / bundles of fibres} of same initial length used;		
	4. detail of how {weights added / forcemeter pulled};		
	5. description of measurable endpoint eg {breaking point / stretched to standard length};		
	6. repeated readings taken at each {weight / forcemeter reading} (using different fibre NOT just checking the reading with same fibre);		
	7. reference to a safety procedure eg {goggles in case fibre snaps / precaution against falling weights};		
	8. ref to control of {temperature / humidity / other relevant factor};		

Question Number	Question	Answer	Mark
7.(d)	Describe two ways in which the structure of xylem vessels is similar to that of sclerenchyma fibres.		
	Award one mark for each of the following points in context to a maximum of two marks.		2
	1. lignin in wall / lignified walls;		
	2. reference to {thick / thickened} walls;		
	3. dead / no living contents / hollow lumen;		
	4. elongated / much longer than they are wide;		

Question Number	Question	
8.(a)	Below are four cell structures A, B, C and D. Put a cross in the box next to each structure found only in plant cells .	
	Correct Answer	Mark
	<input checked="" type="checkbox"/> A; <input checked="" type="checkbox"/> C; <input checked="" type="checkbox"/> in A, B and C / D = 1 mark <input checked="" type="checkbox"/> in A / B and C and D = 0 marks <input checked="" type="checkbox"/> in A, B, C and D = 0 marks	2

Question Number	Question		
8.(b)	The list below shows some of the organelles that could be found in eukaryotic cells. <p style="text-align: center;">amyloplast centriole chloroplast</p> <p style="text-align: center;">lysosome mitochondrion nucleus ribosome</p> Complete the table by choosing the correct name from the list to match each description.		
	Acceptable Answers	Reject	Mark
	1 = mitochondrion; 2 = amyloplast; 3 = lysosome;	Any other answers	3

Question Number	Question	
8.(c)	Describe the structure of a cellulose microfibril.	
	Answer	Mark
	<p data-bbox="440 387 1206 443">Award one mark for each of the following points in context to a maximum of four marks.</p> <ol data-bbox="440 477 1155 902" style="list-style-type: none"> <li data-bbox="440 477 1155 510">1. cellulose molecule is an unbranched {polymer/chain}; <li data-bbox="440 539 663 573">2. of β-glucose; <li data-bbox="440 602 831 636">3. joined by glycosidic bonds; <li data-bbox="440 665 1150 698">4. microfibril formed from 50 to 80 cellulose molecules; <li data-bbox="440 728 1090 784">5. reference to hydrogen bonds (between adjacent cellulose molecules); <li data-bbox="440 813 874 846">6. between adjacent -OH groups; <li data-bbox="440 875 903 909">7. large number of hydrogen bonds; 	4

Unit 4: The Natural Environment & Species Survival

Question Number	Question															
1.(a)	The table below gives one function of each of the three structures labelled A, B and C on the electron microscope image. Complete the table below by writing in the appropriate letter and the name of each structure.															
	Answer															
	<table border="1"> <thead> <tr> <th>Function</th> <th>Label letter</th> <th>Name of structure</th> </tr> </thead> <tbody> <tr> <td>Photophosphorylation</td> <td>A</td> <td>granum</td> </tr> <tr> <td>Stores non-carbohydrate organic material</td> <td>C</td> <td>oil droplet</td> </tr> <tr> <td>Carbon fixation</td> <td>B</td> <td>stroma</td> </tr> </tbody> </table>			Function	Label letter	Name of structure	Photophosphorylation	A	granum	Stores non-carbohydrate organic material	C	oil droplet	Carbon fixation	B	stroma	
Function	Label letter	Name of structure														
Photophosphorylation	A	granum														
Stores non-carbohydrate organic material	C	oil droplet														
Carbon fixation	B	stroma														
	Correct Answer	Acceptable Answers	Reject	Mark												
	Award 1 mark per correct row as in the table above. A granum C oil droplet B stroma	grana (stack) / thylakoids / thylakoid membrane lipid {droplet / drop}	grain fat stoma	3												

Question Number	Question
1.(b)(i)	Explain what happens to the electrons released by photolysis.
	Answer
	Award one mark for each of the following points in context to a maximum of two marks.
	<ol style="list-style-type: none"> 1. {enter / used in} {Photosystem II / PSII}; 2. replace electrons lost by chlorophyll; 3. after {excitation by light / absorption of light}; 4. which were used in production of reduced NADP;
	Mark
	2

Question Number	Question
1.(b)(ii)	The electrons are later involved in the reduction of NADP. Explain the importance of reduced NADP in the light-independent reactions of photosynthesis.
	Answer
	Award one mark for each of the following points in context to a maximum of three marks.
	<ol style="list-style-type: none"> 1. ref to reduction of CO₂; 2. (reduced NADP / eq) used to reduce {GP / G3P/eq}; 3. in Calvin cycle; 4. after fixation of CO₂ by RuBP (to produce GP / G3P/eq); 5. leads to formation of carbohydrate; 6. {GALP / TP/eq} is the carbohydrate;
	Mark
	3

Question Number	Question
1.(c)	Put a cross in the box next to the equation that shows the relationship between gross primary productivity (GPP), net primary productivity (NPP) and respiration (R).
	Correct Answer
	<input checked="" type="checkbox"/> GPP = NPP + R
	Mark
	1

Question Number	Question	
1.(d)(i)	It is estimated that 85% of the energy available to primary consumers will not be available to secondary consumers. Calculate the energy that will be available to the secondary consumers in the tropical rainforest . Show your working.	
	Answer	Mark
	<p>Correct answer (with or without working) = 2 marks</p> <p>Answer: 5 670;;</p> <p>Correct working with incorrect answer = 1 mark</p> <p>Accept any working that would give correct answer</p> <p>eg $(37\ 800 / 100) \times 85 = 32\ 130$</p> <p>$37\ 800 - 32\ 130 =$</p> <p>or</p> <p>$(37\ 800 / 100) \times 15 =$</p>	2

Question Number	Question	
1.(d)(ii)	Suggest two reasons for the differences in the net primary productivity as the distance from the equator increases.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of two marks.</p> <ol style="list-style-type: none"> 1. less light available farther from equator; 2. lower temperatures farther from equator; 3. {less water available / lower rainfall} farther from equator; 4. less minerals available farther from equator; <p>Statements must use comparative terms. Accept converse statements.</p>	2

Question Number	Question	Mark
2.(a)(i)	Put a cross in the box next to the statement that could form part of a valid conclusion from the data shown in the graph.	
	Correct Answer	Mark
	<input checked="" type="checkbox"/> C	1

Question Number	Question	Mark
2.(a)(ii)	With reference to the graph, discuss the validity of statements A, B and C.	
	Answer	
	<p>Award one mark for each of the following points in context of whether or not statement was chosen to a maximum of three marks.</p> <ol style="list-style-type: none"> 1. as <i>Ascophyllum</i> decreases, <i>Chondrus</i> increases / <i>Chondrus</i> has low percentage where <i>Ascophyllum</i> has high percentage/eq; 2. no data to say how <i>Fucus</i> grows when not covered by water; 3. <i>Ascophyllum</i> still present in low tidal regions; 	

Question Number	Question	Mark
2.(b)	Suggest two abiotic factors, other than the length of time the seaweeds are out of water, that could affect the distribution of the seaweeds on this shore.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of two marks.</p> <ol style="list-style-type: none"> 1. temperature; 2. light intensity; 3. nature of rock / substratum/eq; 4. slope/eq; 5. aspect/eq; 6. salinity/eq; 7. ref to pollution; 	2

Question Number	Question	
2.(c)	Describe a technique that you have used to study the distribution of a named organism within its habitat.	
	Answer	Mark
	<p data-bbox="440 418 1217 479">Award one mark for each of the following points in context to a maximum of four marks.</p> <ol data-bbox="440 508 1086 972" style="list-style-type: none"> <li data-bbox="440 508 1034 539">1. suitable named organism linked with habitat; <li data-bbox="440 568 1086 600">2. reference to suitable technique for the organism; <li data-bbox="440 629 826 660">3. eg use of quadrat, transect; <li data-bbox="440 689 895 721">4. reference to systematic sampling; <li data-bbox="440 750 699 781">5. detail of method; <li data-bbox="440 810 746 842">6. stated measurement; <li data-bbox="440 871 975 902">7. reference to two abiotic measurements; <li data-bbox="440 931 879 963">8. reference to a safety procedure; 	4

Question Number	Question	
3.(a)	Suggest how pollen grains can provide evidence about which types of tree were growing successfully in Finland as the peat bog was forming.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of two marks. <ol style="list-style-type: none"> 1. tree types can be identified from their pollen; 2. pollen only produced by {fully-grown / mature/eq} trees; 3. trees need to {grow/eq} for a long time before maturity/eq; 	2

Question Number	Question	
3.(b)(i)	Put a cross in the box next to the type of tree that does not provide evidence about the changes in climate in Finland during the last 10 000 years.	
	Correct Answer	Mark
	<input checked="" type="checkbox"/> D	1

Question Number	Question	
3.(b)(ii)	Explain your answer to (b)(i).	
	Answer	Mark
	Award one mark for each of the following points in context. <ol style="list-style-type: none"> 1. reference to distributed across several climatic zones; 2. reference to little fluctuation in the pollen data from different ages; 	2

Question Number	Question				
3.(c)	With reference to the present-day distribution of the four tree types and the results of the pollen grain study, suggest in what way the climate in Finland has changed during the last 10 000 years. Give reasons for your answer.				
	<table border="1"> <thead> <tr> <th>Answer</th> <th>Mark</th> </tr> </thead> <tbody> <tr> <td> <p>Award one mark for each of the following points in context to a maximum of five marks.</p> <ol style="list-style-type: none"> 1. climate has become warmer/eq; 2. reference to a change between 8 700 and 6 390 years ago; 3. {larch / spruce} were growing but died out/eq; 4. (larch / spruce) are only found in boreal and northern temperature regions (in present day); 5. (boreal and temperate regions) are cold climates; 6. pine was not growing but has become established more recently; 7. pine is only found in southern boreal and temperate regions (in present day); 8. (southern boreal and temperate regions) are warmer climates; </td> <td>5</td> </tr> </tbody> </table>	Answer	Mark	<p>Award one mark for each of the following points in context to a maximum of five marks.</p> <ol style="list-style-type: none"> 1. climate has become warmer/eq; 2. reference to a change between 8 700 and 6 390 years ago; 3. {larch / spruce} were growing but died out/eq; 4. (larch / spruce) are only found in boreal and northern temperature regions (in present day); 5. (boreal and temperate regions) are cold climates; 6. pine was not growing but has become established more recently; 7. pine is only found in southern boreal and temperate regions (in present day); 8. (southern boreal and temperate regions) are warmer climates; 	5
Answer	Mark				
<p>Award one mark for each of the following points in context to a maximum of five marks.</p> <ol style="list-style-type: none"> 1. climate has become warmer/eq; 2. reference to a change between 8 700 and 6 390 years ago; 3. {larch / spruce} were growing but died out/eq; 4. (larch / spruce) are only found in boreal and northern temperature regions (in present day); 5. (boreal and temperate regions) are cold climates; 6. pine was not growing but has become established more recently; 7. pine is only found in southern boreal and temperate regions (in present day); 8. (southern boreal and temperate regions) are warmer climates; 	5				

Question Number	Question				
3.(d)	Describe how dendrochronology can be used to provide evidence for climate change.				
	<table border="1"> <thead> <tr> <th>Answer</th> <th>Mark</th> </tr> </thead> <tbody> <tr> <td> <p>Award one mark for each of the following points.</p> <ol style="list-style-type: none"> 1. idea that dendrochronology uses evidence from {tree / annual} rings; 2. {density / thickness/eq} of rings changes with climatic conditions / thicker ring indicates warmer year; </td> <td>2</td> </tr> </tbody> </table>	Answer	Mark	<p>Award one mark for each of the following points.</p> <ol style="list-style-type: none"> 1. idea that dendrochronology uses evidence from {tree / annual} rings; 2. {density / thickness/eq} of rings changes with climatic conditions / thicker ring indicates warmer year; 	2
Answer	Mark				
<p>Award one mark for each of the following points.</p> <ol style="list-style-type: none"> 1. idea that dendrochronology uses evidence from {tree / annual} rings; 2. {density / thickness/eq} of rings changes with climatic conditions / thicker ring indicates warmer year; 	2				

Question Number	Question			
4.(a)(i)	State the term used to describe the separation into two populations that do not interbreed.			
	Correct Answer	Acceptable Answers	Reject	Mark
	reproductive isolation	reproductively isolated		1

Question Number	Question			
4.(a)(ii)	State the term used to describe the formation of two new species from one species.			
	Correct Answer	Acceptable Answers	Reject	Mark
	speciation			1

Question Number	Question			
4.(a)(iii)	State the term used to describe the relative proportion of different forms of a particular gene within a gene pool.			
	Correct Answer	Acceptable Answers	Reject	Mark
	allele frequency	% allele frequency	gene frequency % gene frequency	1

Question Number	Question	
4.(b)	Suggest how the two populations of salmon developed differences in their gene pools.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of five marks.</p> <ol style="list-style-type: none"> 1. different (environmental) conditions in the different areas; 2. different selective pressures; 3. some fish better adapted than others (in each population); 4. use of example of an adaptation from information; 5. these more likely to survive to breed; 6. and pass on their {alleles / genes} (to next generation); 7. process of selection continues {in each generation / over many generations}; 8. allele frequencies of {favourable/eq} increases; 9. correct use of term natural selection; 	5

Question Number	Question	
4.(c)	Explain how new alleles might appear in the gene pool of a species.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of two marks.</p> <ol style="list-style-type: none"> 1. reference to mutation; 2. change in {base / eq} sequences in DNA; 3. can occur during {DNA replication / cell division}; 4. can be caused by named example of a mutagen; 	2

Question Number	Question	
5.(a)	Describe and explain the changes that occur in the concentration of antibodies in the blood plasma following vaccination.	
	Answer	Mark
	<p data-bbox="427 421 1182 481">Award one mark for each of the following points in context to a maximum of six marks.</p> <ol data-bbox="427 510 1182 1099" style="list-style-type: none"> <li data-bbox="427 510 1007 544">1. No antibody in blood plasma in first 5 days; <li data-bbox="427 573 1102 633">2. Because lymphocytes need to come in contact with antigens; <li data-bbox="427 663 1134 723">3. Time needed for {lymphocyte activation/ lymphocyte cloning/ B cell differentiation}; <li data-bbox="427 752 1145 786">4. Rise in antibody concentration between 5 and 15 days; <li data-bbox="427 815 884 848">5. As plasma cells release antibody; <li data-bbox="427 878 1086 911">6. Decrease in antibody concentration after 15 days; <li data-bbox="427 940 852 974">7. Infection has been cleared up; <li data-bbox="427 1003 1098 1037">8. Antibodies removed from blood stream by kidneys; <li data-bbox="427 1066 1070 1099">9. Residual level of antibodies in blood (at 30 days) 	6

Question Number	Question	
5.(b)(i)	Explain the meaning of the term mutation .	
	Answer	Mark
	<ol style="list-style-type: none"> 1. Change in sequence of DNA; 2. Change in {mass of DNA / number of chromosomes}; 	2

Question Number	Question	
5.(b)(ii)	Suggest why the vaccine contains a cocktail of antigens.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of two marks.</p> <ol style="list-style-type: none"> 1. mutation causes change in gene product/eq; 2. idea that structure of antigen may change (as result of mutation); 3. idea that individual will not be protected if flu virus does not have same antigens present in vaccine; 4. idea that a cocktail of antigens will increase the chance of matching antigens; 	2

Question Number	Question
6.(a)(i)	Using information in the diagram, calculate the total percentage of the life cycle that a blowfly spends as a larva when the surrounding temperature is 21 °C.
	Correct Answer
	Correct answer (with or without working) = 2 marks Answer: 51.9% (accept 52% or 51.88%) Correct working with incorrect answer = 1 mark Accept any working that would give correct answer eg $179 / 345 \times 100 = 52\%$
	Mark
	2

Question Number	Question
6.(a)(ii)	Temperature has an effect on the length of the blowfly lifecycle. Suggest an explanation for the effect of temperature on the length of the blowfly lifecycle.
	Correct Answer
	Award one mark for each of the following points in context to a maximum of two marks. 1. idea that length of life cycle is dependant on metabolic rate of blow fly; 2. metabolic rate is determined by enzyme activity/eq; 3. as temperature increases (up to an optimum) enzyme activity increases; 4. idea that as a result of temperature increase (to a max) length of lifecycle decreases;
	Mark
	2

Question Number	Question	
6.(a)(iii)	Suggest two factors, other than temperature, that may affect the timing of the blowfly life cycle and lead to an incorrect estimate of the time of death.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of two marks. 1. humidity; 2. drugs; 3. oxygen; 4. ref. to genetic differences;	2

Question Number	Question	
Q6(b)	Describe how rigor mortis in muscles occurs.	
	Answer	Mark
	Award three marks for the following in context. 1. Muscle cells deprived of oxygen 2. Respiration becomes anaerobic/reference to lactic acid 3. Fall in pH 4. Inhibits enzymes 5. ATP no longer produced 6. Bonds between muscle proteins become fixed	3

Question Number	Question	
6.(c)	The process of succession occurs in plant communities as well as in a dead body. Compare these two forms of succession.	
	Answer	Mark
	<p data-bbox="432 418 1222 479">Award one mark for each of the following points in context to a maximum of three marks.</p> <ol data-bbox="432 508 1222 1032" style="list-style-type: none"> <li data-bbox="432 508 1222 568">1. as each organism feeds it changes the body / environment <li data-bbox="432 598 1222 658">2. this allows conditions suitable for colonisation/growth of other species <li data-bbox="432 687 1222 725">3. ref to other organisms eg microbes <li data-bbox="432 754 1222 815">4. in plant succession many early species are replaced over time <li data-bbox="432 844 1222 904">5. in this case most of the early insects remain as others colonise <li data-bbox="432 934 1222 972">6. suitable reference to climax community in plants <li data-bbox="432 1001 1222 1032">7. {longer timescale / larger area} in plants 	3

Question Number	Question																			
7.(a)	The table below lists five structural features that may be found in bacteria and viruses. Put a cross in the box if the structural feature is present.																			
	Answer	Mark																		
	Award 1 mark for each correct row in the following table. <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Structural feature</th> <th>Bacteria</th> <th>Viruses</th> </tr> </thead> <tbody> <tr> <td>Mesosomes</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>Capsid</td> <td></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Nucleic acid</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Cytoplasm</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>Ribosomes</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td></td> </tr> </tbody> </table>	Structural feature	Bacteria	Viruses	Mesosomes	<input checked="" type="checkbox"/>		Capsid		<input checked="" type="checkbox"/>	Nucleic acid	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Cytoplasm	<input checked="" type="checkbox"/>		Ribosomes	<input checked="" type="checkbox"/>		5
Structural feature	Bacteria	Viruses																		
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Ribosomes	<input checked="" type="checkbox"/>																			

Question Number	Question	
7.(b)(i)	Describe the trends shown by the data.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of two marks. <ol style="list-style-type: none"> 1. Increase in number of new cases in Africa and Europe 2. Decrease in number of new cases in Asia and South America 3. Any relevant manipulation of data 	2

Question Number	Question	
7.(b)(ii)	HIV positive people were excluded from the data. If they had been included suggest how the data would differ. Give an explanation for your answer.	
	Answer	Mark
	<p>Explanation:</p> <ul style="list-style-type: none"> • More incidence of TB in the population/eq <p>Award one mark for each of the following points in context to a maximum of two marks.</p> <ol style="list-style-type: none"> 1. Ref to opportunistic infection 2. HIV positive people have weakened immune system 3. A higher proportion of HIV positive people are infected by TB 	3

Question Number	Question	
7.(c)	TB is increasing in some countries which have well-funded health services. Suggest two reasons for this.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of two marks.</p> <ol style="list-style-type: none"> 1. TB bacteria {mutate / become resistant to antibiotics} 2. immigration from countries with high incidence of TB 3. increased travel 4. increase in HIV infection 5. lower rates of immunisation against TB 	2

Question Number	Question	
8.(a)(i)	Distinguish between bacteriostatic and bacteriocidal antibiotics.	
	Correct Answer	Mark
	Bacteriostatic prevent bacteria multiplying and bacteriocidal kill bacteria	1

Question Number	Question	
8.(a)(ii)	Suggest why mammalian cells are unharmed by antibiotics.	
	Correct Answer	Mark
	Award one mark for each of the following points up to a maximum of two marks. Mammalian cells: 1. are eukaryotic 2. have different enzymes 3. do not have cell walls 4. have {80s / larger/eq} ribosomes / different protein synthesis	2

Question Number	Question	
8.(b)	Suggest ways by which doctors and patients can help to prevent the further spread of antibiotic resistance in bacteria.	
	Answer	Mark
	Award one mark for each of the following points up to a maximum of three marks. 1. do not prescribe antibiotics for minor infections /viral infections 2. do not prescribe antibiotics to prevent infections 3. reference to narrow spectrum antibiotics 4. ref to rotation in the use of different antibiotics 5. {advise / take} the full course of antibiotics 6. ref to hand-washing (between patients / by visitors of hospitals) 7. use of isolation wards	3

Question Number	Question	
8.(c)	Describe a procedure that you have used to investigate the effect of different antibiotics on bacterial growth.	
	Answer	Mark
	<p data-bbox="432 416 1206 479">Award one mark for each of the following points up to a maximum of four marks.</p> <ol data-bbox="432 506 1206 878" style="list-style-type: none"> <li data-bbox="432 506 1206 546">1. Ref. to a specific aseptic technique <li data-bbox="432 566 1206 607">2. Bacterial lawn/pour plate <li data-bbox="432 627 1206 689">3. Use of antibiotic discs / antibiotics incorporated into agar /eq <li data-bbox="432 710 1206 750">4. Incubate for 24-36 hours <li data-bbox="432 770 1206 810">5. At 25-30 °C <li data-bbox="432 831 1206 871">6. Record bacterial growth/eq 	<p data-bbox="1211 443 1356 483">4</p>

Unit 5: Energy, Exercise & Coordination

Question Number	Question			
1.(a)	The table below refers to four functions of the human brain. Complete the table to show which region of the brain is responsible for each function.			
	Correct Answer	Acceptable Answers	Reject	Mark
	Cerebral hemispheres; Hypothalamus; Medulla oblongata	Cerebrum Medulla	Hemispheres Cerebellum	3

Question Number	Question	
1.(b)	Suggest two pieces of information this scan could give to a surgeon about this tumour.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of two marks. 1. Locality 2. Size 3. What brain functions might be affected	2

Question Number	Question	
2.(a)	With reference to the structures of dopamine and L-dopa, suggest why the drug L-dopa is effective in the treatment of Parkinson's disease.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of four marks.</p> <ol style="list-style-type: none"> 1. PD results from low levels of dopamine; 2. structure of L-Dopa similar to dopamine / credit details of similarities; 3. therefore can bind to the dopamine receptor {protein/molecule}; 4. initiating action potential; 5. idea that L-Dopa can be converted to dopamine; 6. credit details of mechanism; 7. ref to ability to cross the blood brain barrier; 8. (possibly) due to COOH grouping; 	4

Question Number	Question	
2.(b)	Scientists believe that the release of dopamine from the presynaptic membrane is triggered by certain emotional responses. Describe how the release of this neurotransmitter generates an action potential in the postsynaptic neurone.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of five marks.</p> <ol style="list-style-type: none"> 1. neurotransmitter diffuses across cleft; 2. binds to receptor {molecules/proteins} on postsynaptic membrane; ligand-gated ion channels; 3. sodium gates open/ increase in permeability to sodium ions; 4. diffusion of sodium ions into postsynaptic neurone; 5. depolarisation of membrane; 6. idea of more (sodium) channels opening; 7. summation of postsynaptic potential to form action potentials; 	5

Question Number	Question	
3.(a)	Describe the changes that have occurred in the muscle strength of these weight-lifters over this time period.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of three marks 1. the % increase is the same for the first 16 years/eq; 2. the % increase is greatest in period 1980-1983/eq; 3. smallest increase in strength during 1984-1987/eq;	2

Question Number	Question	
3.(b)	Suggest possible reasons for the changes that occurred in the muscle strength of weight-lifters during the period 1980-1987.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of three marks. 1. Use of testosterone/anabolic steroids/eq 2. Idea of higher dose 3. Stronger drugs were taken 4. Use of more effective training routines 5. More suitable lifestyles/eq 6. Idea that strength had reached a maximum / genetic maximum 7. Weight-lifters choosing not to use drugs 8. More effective screening methods	3

Question Number	Question	
3.(c)	Many people feel that the use of performance-enhancing drugs in sport is unethical. State whether you consider the use of performance-enhancing drugs in sport is unethical. Give two ethical arguments to support your opinion.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of two marks.</p> <p>Marks must both be from either agree or disagree</p> <p>Agree:</p> <ol style="list-style-type: none"> 1. can no longer compare weight-lifters/competition is no longer fair; 2. illegal; 3. uninformed decision taking; 4. possibility of death; 5. health risks; <p>Disagree:</p> <ol style="list-style-type: none"> 6. individual has right to make own decision re health risks; 7. drug free sport is not fair anyway; 8. due to differences in training resources; 9. pressures from coach / sponsors / public; 10. financial rewards; 	2

Question Number	Question	
3.(d)	It is sometimes claimed that outstanding athletes are born and not made. Explain whether you agree with this view.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of three marks.</p> <ol style="list-style-type: none"> 1. Phenotype (athleticism) is a result of an interaction between genes/genotype and the environment/eq; 2. Muscle development could be improved by diet/drugs/training (environment)/eq; 3. But the extent of muscle development will also be influenced by the person's genetic makeup/genotype; 4. Ref to (inherited) proportion of fast/slow twitch muscle fibres; 5. Ref to polygeneric inheritance and continuous variation in context 	3

Question Number	Question	
4.(a)(i)	Compare the effects of this exercise on the ventilation rate of the two individuals.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of two marks.</p> <ol style="list-style-type: none"> 1. Ventilation rates at rest are similar; 2. Ventilation rate of trained individual rises higher than that of the untrained individual during the 5 minute exercise period; 3. After 1 minute ventilation rate of trained individual continues to rise rapidly whereas untrained rises gently/becomes constant; 	2

Question Number	Question	
4.(a)(ii)	Suggest what other information would be needed to allow a valid comparison to be made of the effect of a training programme on ventilation rate.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of three marks</p> <ol style="list-style-type: none"> 1. gender; 2. age; 3. level of rest; 4. drugs; 5. were the exercises the same; 6. repeat the study with these two individuals; 7. repeat the study with more individuals; 8. allow other valid factors; 	3

Question Number	Question	Correct Answer	Mark
4.(b)(i)	Nerve impulses from the aortic body would not reach the respiratory centre.		
	<input checked="" type="checkbox"/> B		1

Question Number	Question	Correct Answer	Mark
4.(b)(ii)	Nerve impulses from the respiratory centre would not reach the diaphragm.		
	<input checked="" type="checkbox"/> D		1

Question Number	Question	Correct Answer	Mark
4.(b)(iii)	Nerve impulses from the respiratory centre would not reach the stretch receptors.		
	<input checked="" type="checkbox"/> A		1


Question Number	Question	Correct Answer	Mark
4.(b)(iv)	Nerve impulses from the carotid body would not reach the respiratory centre.		
	<input checked="" type="checkbox"/> C		1

Question Number	Question	
5.(a)	Describe the electrical activity that occurs in the heart during one complete heart beat.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of four marks. <ol style="list-style-type: none"> 1. wave of excitation sent from SAN; 2. spreads over atria walls; 3. delayed at atrioventricular septum; 4. wave of excitation sent from AVN; 5. passes along bundles of His/purkinje fibres; 6. spreading over walls of ventricles; 	4

Question Number	Question	
5.(b)	Calculate the heart rate of the individual with a normal heart beat, using the information in the ECG. Show your working.	
	Answer	Mark
	Duration of 1 beat OR 60 / duration; Correct answer, 50 Beats min ⁻¹ / bpm;	2

Question Number	Question	
5.(c)	Compare the ECG of the normal individual with that of the individual with tachycardia.	
	Answer	Mark
	Award one mark for each of the following points in context to a maximum of two marks. <ol style="list-style-type: none"> 1. Interval between QRS phases longer (in normal rhythm); 2. Credit correctly manipulated figures; 3. Lower voltage during QRS phase in normal rhythm; 	2

Question Number	Question	
5.(d)	Suggest what effect tachycardia would have on cardiac output. Explain your answer.	
	Answer	Mark
	<p data-bbox="443 416 1198 477">Award one mark for each of the following points in context to a maximum of three marks.</p> <ol data-bbox="443 506 1198 757" style="list-style-type: none"> <li data-bbox="443 506 1198 566">1. Cardiac output could decrease if there was insufficient time to fill the ventricles (between contractions); <li data-bbox="443 595 1198 633">2. Cardiac output could increase if ventricles fill sufficiently; <li data-bbox="443 663 1198 757">3. The change in cardiac output will depend on whether the decrease in stroke volume is compensated by the increase in heart rate/eq; 	3

Question Number	Question	Mark
6.(a)(i)	Put a cross in the box next to the arrow that correctly shows the direction of impulse travel in cell A.	
	Correct answer	Mark
		1

Question Number	Question	Mark												
6.(a)(ii)	Identify the type of neurone for cell A and cell B by putting a cross in the correct box in the table below.													
	Correct answer	Mark												
	<table border="1" data-bbox="475 801 1139 1012"> <thead> <tr> <th></th> <th>Relay neurone</th> <th>Motor neurone</th> <th>Sensory neurone</th> </tr> </thead> <tbody> <tr> <td>Cell A</td> <td></td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>Cell B</td> <td><input checked="" type="checkbox"/></td> <td></td> <td></td> </tr> </tbody> </table> <p>1 mark for each row. Do not award the mark if there is more than one cross in the row.</p>		Relay neurone	Motor neurone	Sensory neurone	Cell A		<input checked="" type="checkbox"/>		Cell B	<input checked="" type="checkbox"/>			2
	Relay neurone	Motor neurone	Sensory neurone											
Cell A		<input checked="" type="checkbox"/>												
Cell B	<input checked="" type="checkbox"/>													

Question Number	Question	Correct answer	Acceptable answers	Reject	Mark
6.(b)(i)	Complete the equation below to show the chemical changes in rhodopsin in the presence of light.	Retinal	Transretinal Retinine	Cis retinal retinol	1

Question Number	Question	Answer	Mark
6.(b)(ii)	Describe the movement of sodium ions across the rod cell membrane, in the presence of opsin.		
	Award one mark for each of the following points in context to a maximum of three marks.		3
	1. opsin binding to membrane/eq		
	2. cation channels closed		
	3. sodium ions cannot enter cell by diffusion		
	4. active pumping		
	5. of sodium ions is unaffected		
	6. net loss of sodium ions		

Question Number	Question	Correct answer	Acceptable answers	Reject	Mark
6.(b)(iii)	State the term that describes the electrochemical state of a rod cell in light.				
		hyperpolarised	hyperpolarisation	Bleached depolarised	1

Question Number	Question				
7.(a)	Describe the effect of repeated touching on the time taken for the gill to be exposed again.				
	<table border="1"> <thead> <tr> <th>Answer</th> <th>Mark</th> </tr> </thead> <tbody> <tr> <td> Award one mark for each of the following points in context to a maximum of three marks. <ol style="list-style-type: none"> 1. Recovery time falls steeply initially 2. Stays low 3. Fluctuations 4. ref to reinforcement 5. credit appropriate manipulation of data ref to anomalous point 3 </td> <td>3</td> </tr> </tbody> </table>	Answer	Mark	Award one mark for each of the following points in context to a maximum of three marks. <ol style="list-style-type: none"> 1. Recovery time falls steeply initially 2. Stays low 3. Fluctuations 4. ref to reinforcement 5. credit appropriate manipulation of data ref to anomalous point 3 	3
Answer	Mark				
Award one mark for each of the following points in context to a maximum of three marks. <ol style="list-style-type: none"> 1. Recovery time falls steeply initially 2. Stays low 3. Fluctuations 4. ref to reinforcement 5. credit appropriate manipulation of data ref to anomalous point 3 	3				

Question Number	Question								
7.(b)	Name the type of learning shown by a sea slug in this investigation.								
	<table border="1"> <thead> <tr> <th>Correct answer</th> <th>Acceptable answers</th> <th>Reject</th> <th>Mark</th> </tr> </thead> <tbody> <tr> <td>habituation</td> <td></td> <td></td> <td>1</td> </tr> </tbody> </table>	Correct answer	Acceptable answers	Reject	Mark	habituation			1
Correct answer	Acceptable answers	Reject	Mark						
habituation			1						

Question Number	Question				
7.(c)	Explain how this learned response may be of benefit to the sea slug in its natural environment.				
	<table border="1"> <thead> <tr> <th>Answer</th> <th>Mark</th> </tr> </thead> <tbody> <tr> <td> Award one mark for each of the following points in context to a maximum of four marks. <ol style="list-style-type: none"> 1. Ignore unimportant stimuli 2. More receptive to important stimuli 3. Less time wasted with gill covered 4. More time for oxygen uptake 5. Can remain active when being touched 6. Such as by wave action </td> <td>4</td> </tr> </tbody> </table>	Answer	Mark	Award one mark for each of the following points in context to a maximum of four marks. <ol style="list-style-type: none"> 1. Ignore unimportant stimuli 2. More receptive to important stimuli 3. Less time wasted with gill covered 4. More time for oxygen uptake 5. Can remain active when being touched 6. Such as by wave action 	4
Answer	Mark				
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Question Number	Question	
8.(a)	Describe, using specific examples, the evidence that the Black Death was caused by a virus.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of three marks.</p> <ol style="list-style-type: none"> 1. Increased frequency of mutant CCR5 allele; 2. Pattern of disease similar to flu; 3. Symptoms eg bleeding consistent with known effect of virus; 4. Incubation period matches known viruses; 5. Contagion matches known viruses; 6. Other valid point; 	3

Question Number	Question	
8.(b)	Suggest reasons why it is likely that a vaccine for bird flu can be produced fairly easily, whereas no effective vaccine for malaria has yet been produced.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of two marks.</p> <ol style="list-style-type: none"> 1. Methods for flu vaccine production already exist; 2. Harmless version of virus can be produced; 3. Can't use whole <i>Plasmodium</i> since too complex; 4. Antigens continually changing / mutations; 5. Several stages to life cycle; 	2

Question Number	Question	
8.(c)	Explain how small samples of DNA from a burial site can be amplified and how such samples might be used to find the identity of an unknown virus.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of four marks.</p> <ol style="list-style-type: none"> 1. Polymerase chain reaction / PCR; 2. Replication of DNA; 3. Many copies of same sequence of bases / nucleotides; 4. DNA / base sequence of unknown matched to sequence of known virus; 5. Ref. to gene probe; 	4

Question Number	Question	
8.(d)	Describe the risks of using genetically modified organisms.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of two marks.</p> <ol style="list-style-type: none"> 1. unforeseen consequences; 2. danger of transmission of genetic material; 3. release of resistance markers/eq; 	2

Question Number	Question	
8.(e)(i)	Explain how a hybrid virus could be particularly dangerous to humans.	
	Answer	Mark
	<p>Award one mark for each of the following points in context to a maximum of two marks</p> <ol style="list-style-type: none"> 1. have genes for replicating in human cells; 2. can infect human cells; 3. and genes for damaging humans / haemagglutinin; 4. passed directly from human to human / more easily passed from human to human; 	2

Question Number	Question	Mark
8.(e)(ii)	Explain how a hybrid virus could be useful in producing a vaccine.	
	Answer	
	<p>Award one mark for each of the following points in context to a maximum of two marks.</p> <ol style="list-style-type: none"> 1. have H5N1 surface genes (producing antigens for immune system to recognise); 2. antigens stimulate immune system/eq; 3. but less dangerous human flu genes; 	2

Question Number	Question	Mark
8.(f)	Explain what is meant by a 'breathhtaking selection pressure', and how this might have led to very high frequency of the mutant form of CCR5.	
	Answer	
	<p>Award one mark for each of the following points in context to a maximum of three marks.</p> <ol style="list-style-type: none"> 1. Likelihood of surviving <u>much</u> greater with mutation / converse/eq; 2. To reach reproductive age; 3. Mutant allele much more likely to be passed to offspring; 4. Higher proportion of offspring have mutated allele; 5. In future generations; 	3

Question Number	Question	
8.(g)	The South African government decided not to allow the use of ARV drugs for the treatment of HIV infected people. Suggest possible reasons for their decision.	
	<p data-bbox="419 418 1227 450">Answer</p> <p data-bbox="419 450 1227 510">Award one mark for each of the following points in context to a maximum of five marks.</p> <ol data-bbox="419 539 1227 1256" style="list-style-type: none"> 1. High cost; 2. Drug companies profiteering; 3. Campaign for generic, cheap drugs; 4. Not necessarily best treatment; 5. Other methods such as diet control may be effective; 6. Traditional methods may be effective; 7. Drugs may be unsafe; 8. Patients receiving drugs fall ill; 9. AIDS not caused by HIV alone; 10. Other factors affecting immune system important; 11. AVRs may cause AIDS; 12. People taking drugs get AIDS; 	<p data-bbox="1267 418 1369 450">Mark</p> <p data-bbox="1238 479 1257 510">5</p>

Question Number	Question	
8.(h)	Use information from the two studies of HIV infection in South Africa to describe the current pattern of infection. You should include reference to changes in infection rates between 2000 and 2005 and the effect of gender. Suggest reasons for the trends you observe, including reasons for the different findings of the two studies for infection of women with HIV in 2005.	
Answer		Mark
<p data-bbox="421 539 1187 600">Award one mark for each valid points in context to a maximum of seven marks. Possible points include:</p> <ol data-bbox="421 629 1086 1464" style="list-style-type: none"> 1. Infection rate stable under 24; 2. Fewer infected from birth due to drugs; 3. Better education; 4. Still rising over 24; 5. Sexually active; 6. Must be unprotected sex if pregnant; 7. Lower over 35; 8. Higher death rate of infected individuals; 9. Fewer males infected under 35; 10. Young males less likely to take the test; 11. DOH study shows higher infection rate; 12. Not all of National study having unprotected sex; 13. Those at risk might be more likely to refuse test; 14. Under 20 group includes children in National study; 		7

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Acknowledgements

This document has been produced by Edexcel on the basis of consultation with teachers, examiners, consultants and other interested parties. Edexcel acknowledges its indebtedness to all those who contributed their time and expertise to its development.

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Publications code UA018857

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Publications code UA018857 September 2007

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