SCOTTISH QUALIFICATIONS AUTHORITY

2003 Biology

Higher

Finalised Marking Instructions

2003 Biology Higher

Marking scheme

Section A

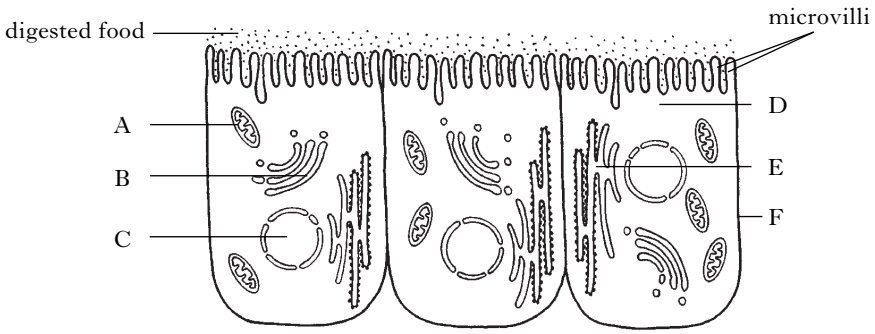
1.	C	11.	C	21.	B
2.	A	12.	B	22.	D
3.	A	13.	C	23.	A
4.	B	14.	B	24.	A
5.	D	15.	C	25.	B
6.	D	16.	B	26.	D
7.	C	17.	C	27.	D
8.	A	18.	B	28.	A
9.	A	19.	A	29.	C
10.	D	20.	C	30.	B

SECTION B

All questions in this section should be attempted.

Additional Notes

1. (*a*) The diagram below represents cells in the lining of the small intestine of a mammal. *Marks*



(i) The table below gives information about organelles shown in the diagram.

Complete the table by inserting the appropriate letters, names and functions.

Letter	*Name of organelle*	*Function*
E	Rough endoplasmic reticulum	**transport**
A	**Mitochondrion**	Site of aerobic respiration
B	Golgi apparatus	**Packaging/Processing/ Modifying/Adding carbohydrate to proteins/ secretions/enzymes OR Producing glycoproteins**
C	**Nucleus**	Site of mRNA synthesis

3

6 correct = 3, 4–5 correct = 2, 2–3 correct = 1

(ii) Suggest a reason for the presence of microvilli in this type of cell.

Increased/Large surface area = 1 mark

More rapid/Faster/More efficient diffusion/

uptake/absorption = 1 mark

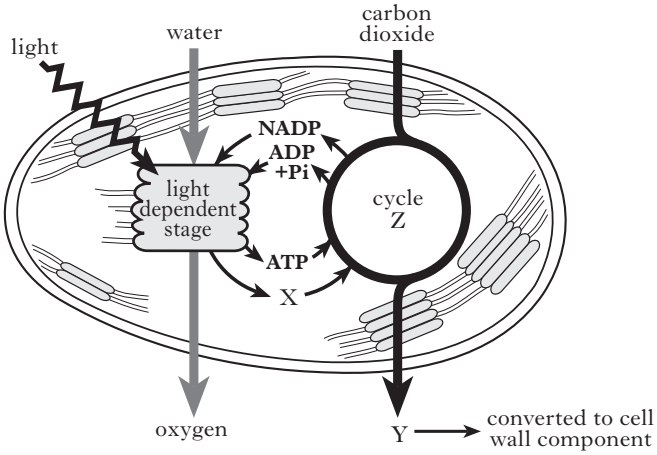
2

Marks

Additional Notes

1. (continued)

(*d*) The diagram below summarises the process of photosynthesis in a chloroplast.



(i) Name molecules X and Y.

X **NADPH/NADPH2/reduced NADP**

Y **glucose**

both needed **1**

(ii) State the exact location of the light dependent stage within a chloroplast.

Granum/grana **1**

(iii) Name cycle Z.

Calvin/carbon fixation **1**

(iv) Name the cell wall component referred to in the diagram.

Cellulose **1**

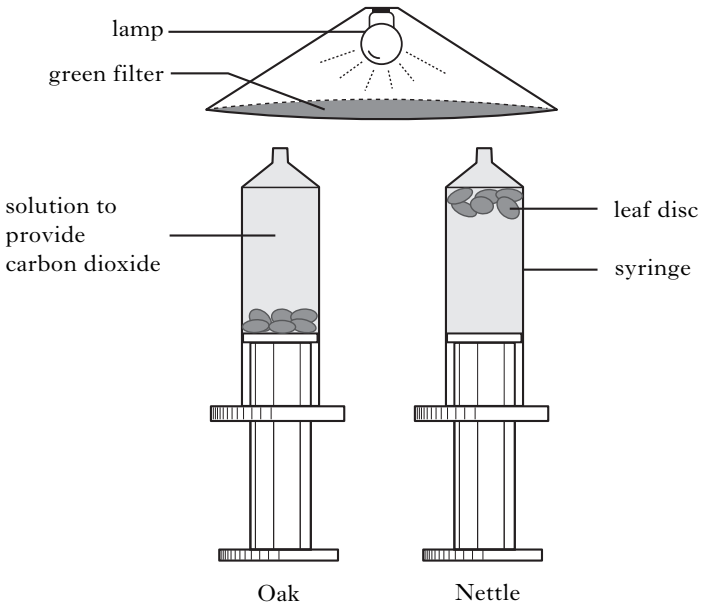
Marks

Additional Notes

2. An investigation was carried out to compare photosynthesis in oak and nettle leaves.

Six discs were cut from each type of leaf and placed in syringes containing a solution that provided carbon dioxide. A procedure was used to remove air from the leaf discs to make them sink. The apparatus was placed in a darkened room.
The discs were then illuminated with a lamp covered with a green filter. Leaf discs which carried out photosynthesis floated.

The positions of the discs one hour later are shown in the diagram below.



(*a*) Suggest a reason why the investigation was carried out in a darkened room.

To prevent entry of other light
OR So discs only receive green light/light from lamp **1**

(*b*) Explain why it was good experimental procedure to use six discs from each plant.

Increase reliability/Minimise error due to chance/ Reduce the effect of an atypical result **1**

(*c*) In setting up the investigation, precautions were taken to ensure that the results obtained would be valid.

Give **one** precaution relating to the preparation of the leaf discs and **one** precaution relating to the solution that provided carbon dioxide.

Leaf discs **same size/diameter/mass/weight/**
leaf used/thickness/surface area **1**

Solution that provided carbon dioxide
same concentration/temperature/volume **1**

2. (continued)

Marks

Additional Notes

(*d*) Suggest a reason why the leaf discs which carried out photosynthesis floated.

Gas/Oxygen made so discs are more buoyant/less dense/lighter **1**

(*e*) Nettles are shade plants which grow beneath sun plants such as oak trees.

Explain how the results show that nettles are well adapted as shade plants.

They/Nettles can use green light for photosynthesis = 1 mark

Shade plants/forest floor receives green light/Light not absorbed by sun plants/Light transmitted by canopy **2**

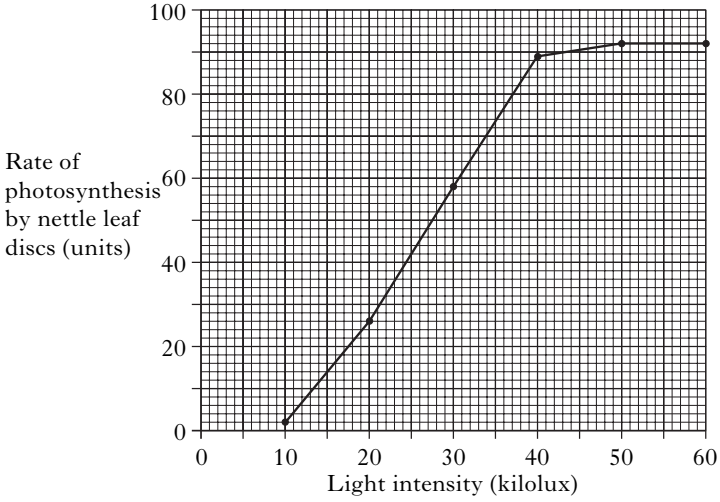
(*f*) What name is given to the light intensity at which the carbon dioxide uptake for photosynthesis is equal to the carbon dioxide output from respiration?

Compensation point **1**

(*g*) In another investigation, the rate of photosynthesis by nettle leaf discs was measured at different light intensities. The results are shown in the table.

Light intensity (kilolux)	*Rate of photosynthesis by nettle leaf discs* (units)
10	2
20	26
30	58
40	89
50	92
60	92

Plot a line graph to show the rate of photosynthesis by nettle leaf discs at different light intensities. Use appropriate scales to fill most of the graph paper.



Axes with appropriate scales plus labels with units (all of table headers) = 1 mark
Points correctly plotted and joined = 1 mark **2**

Marks

Additional Notes

2. (continued)

(*h*) From the table, predict how the rate of photosynthesis at a light intensity of 50 kilolux could be affected by an increase in carbon dioxide concentration. Justify your answer.

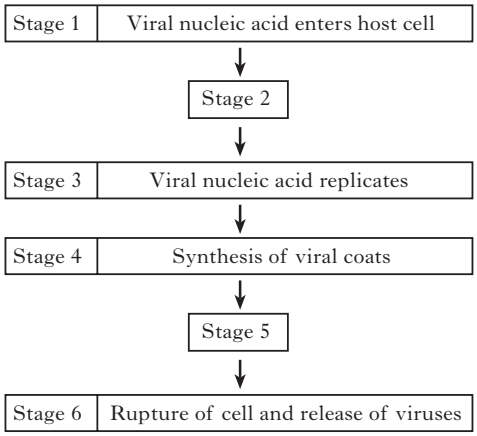
Effect **increase/rise** Justification **CO_2 limiting OR**

Effect **stay the same** Justification **temperature limiting/CO_2 not limiting** **1**

Marks

Additional Notes

3. The stages shown below take place when a human cell is invaded by an influenza virus.



(*a*) Describe the processes that occur during Stages 2 and 5.

Stage 2 **Viral nucleic acid/DNA/RNA takes over/ alters cell metabolism OR Viral DNA inactivates host DNA** **1**

Stage 5 **Nucleic acid/DNA/RNA enters/ joins with viral/protein coats OR Viruses assembled OR New viruses made** **1**

(*b*) Name the cell organelle at which the viral coats are synthesised during Stage 4.

Ribosome **1**

(*c*) During a viral infection, a type of white blood cell is stimulated to make antibodies which inactivate the viruses.

(i) Name this type of white blood cell.

Lymphocyte **1**

(ii) What feature of viruses stimulates these cells to make antibodies?

Surface protein/foreign protein/antigen **1**

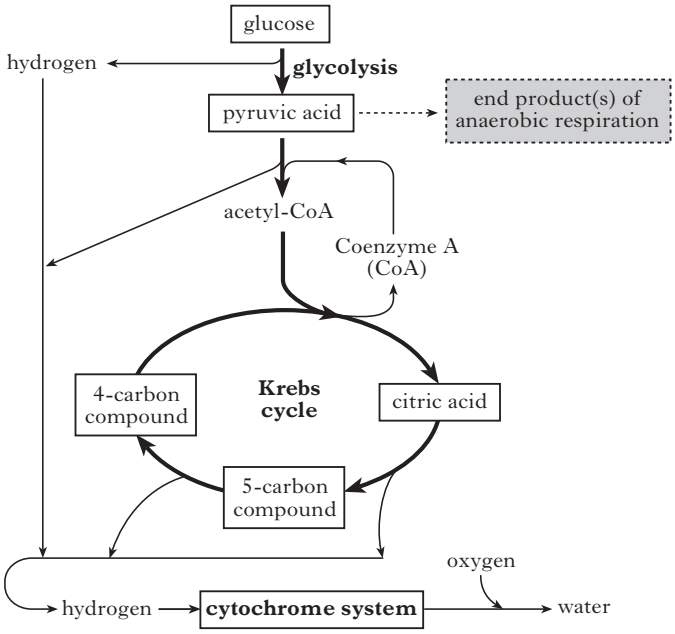
(iii) New strains of influenza virus appear regularly. Suggest why antibodies produced against one strain of virus are not effective against another strain.

Antibodies/They are specific OR Other viruses not recognised OR Antigen is different OR Antigen does not match antibody **1**

Marks

Additional Notes

4. An outline of the process of respiration is shown in the diagram below.



(*a*) Apart from glucose and enzymes, what chemical substance is essential for glycolysis to occur?

ATP **1**

(*b*) Name the end-product(s) of anaerobic respiration in an animal cell and a plant cell.

(i) Animal cell **Lactic acid** **1**

(ii) Plant cell **Ethanol/alcohol and carbon dioxide** **1**

(*c*) Name the carrier that transfers hydrogen to the cytochrome system.

NAD/NADH/$NADH_2$/Reduced NAD **1**

(*d*) Explain why the cytochrome system cannot function in anaerobic conditions.

No oxygen available as (final) hydrogen acceptor

OR Oxygen is needed to accept/ combine with/join to/receive hydrogen **1**

(*e*) The energy content of glucose is 2900 kJ mol^{-1} and during aerobic respiration 1178 kJ mol^{-1} of this energy is stored in ATP.

Calculate the percentage of the energy content of glucose that is stored in ATP.

Space for calculation

40·6 % **1**

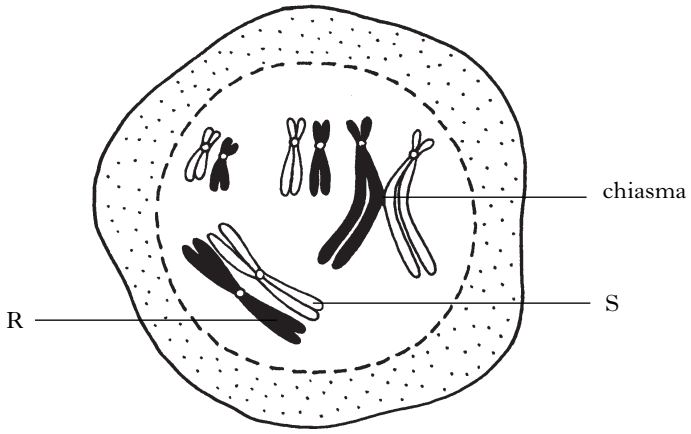
(*f*) Which stage of respiration releases **most** energy for use by the cell?

Cytochrome system/Hydrogen transfer system **1**

Marks

Additional Notes

5. The diagram below represents a stage of meiosis in a cell from a female fruit fly, *Drosophila*.



(*a*) Name the tissue from which this cell was taken.

Ovarian/Ovary **1**

(*b*) What is the haploid number of this species?

4 **1**

(*c*) Chromosomes R and S are homologous. Apart from their appearance, state **one** similarity between homologous chromosomes.

Same genes/Genes for same characteristics **1**

(*d*) Explain the importance of chiasmata formation.

Increases variation/Produces recombinants/Produces new allele combinations/Increases genetic diversity **1**

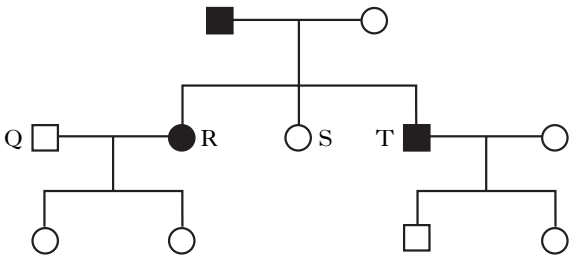
Marks

Additional Notes

6. In humans, the allele for red-green colour deficiency (b) is sex-linked and recessive to the normal allele (B).

The family tree diagram below shows how the condition was inherited.

- Male without the condition
- Male with the condition
- Female without the condition
- Female with the condition



(*a*) Give the genotypes of individuals S and T.

(i) S **X^BX^b** **1**

(ii) T **X^bY** **1**

(*b*) If individuals Q and R have a son, what is the chance that he will inherit the condition?

Space for calculation

Chance **100%/1 in 1/certainty/ He will have it** **1**

(*c*) Explain why individual R has the condition although her mother was unaffected.

R received X^b/the recessive allele from <u>both</u> parents and mother is a carrier **1**

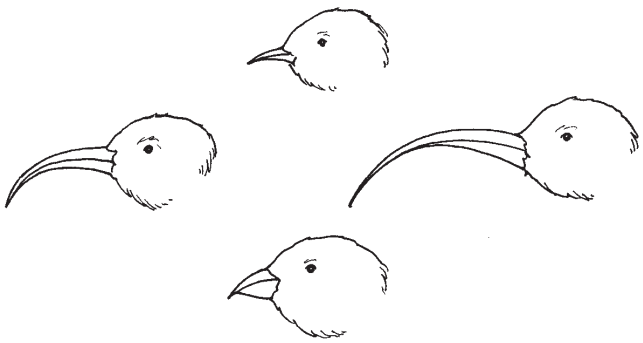
Marks

Additional Notes

7. Hawaii is a group of islands isolated in the Pacific Ocean.

Different species of Honeycreeper birds live on these islands.

The heads of four species of Honeycreeper are shown below.



(*a*) (i) Explain how the information given about Honeycreeper species supports the statement that they occupy different niches.

Beaks different so birds eat different foods/ have different feeding methods — **1**

(ii) What further information would be needed about the four species of Honeycreeper to conclude that they had evolved by adaptive radiation?

Descended from/Fossil evidence of/Share a common ancestor — **1**

(*b*) The Honeycreeper species have evolved in geographical isolation.

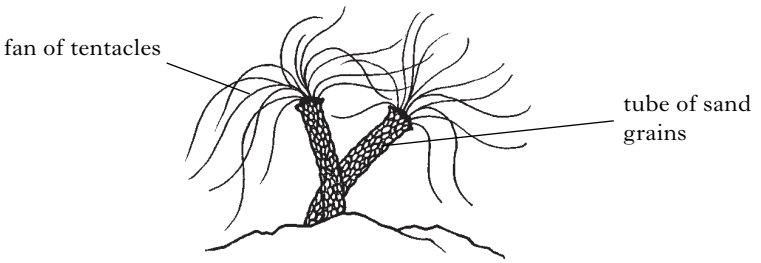
Name **one** other type of isolating barrier involved in the evolution of new species.

Reproductive OR Ecological — **1**

Marks

Additional Notes

8. The marine worm *Sabella* lives in a tube made out of sand grains from which it projects a fan of tentacles for feeding.



(*a*) If the worm is disturbed, the fan is immediately withdrawn into the tube.
The fan re-emerges a few minutes later.

(i) Name the type of behaviour illustrated by the withdrawal response.

Avoidance/escape **1**

(ii) What is the advantage to the worm of withdrawing its tentacles in response to a disturbance?

Defence against predators/protection/avoid

injury/less likely to be eaten **1**

(*b*) If a harmless stimulus occurs repeatedly, the withdrawal response eventually ceases.

(i) Name the type of behaviour illustrated by this modified response.

Habituation **1**

(ii) What is the advantage to the worm of this modified response?

Saves/Conserves/Uses less/Does not waste energy

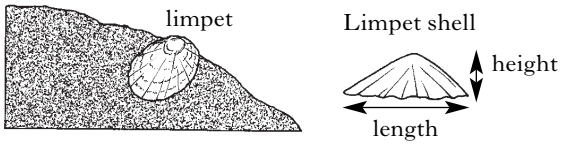
OR Does not use energy responding to a harmless stimulus **1**

OR Can continue feeding

Marks

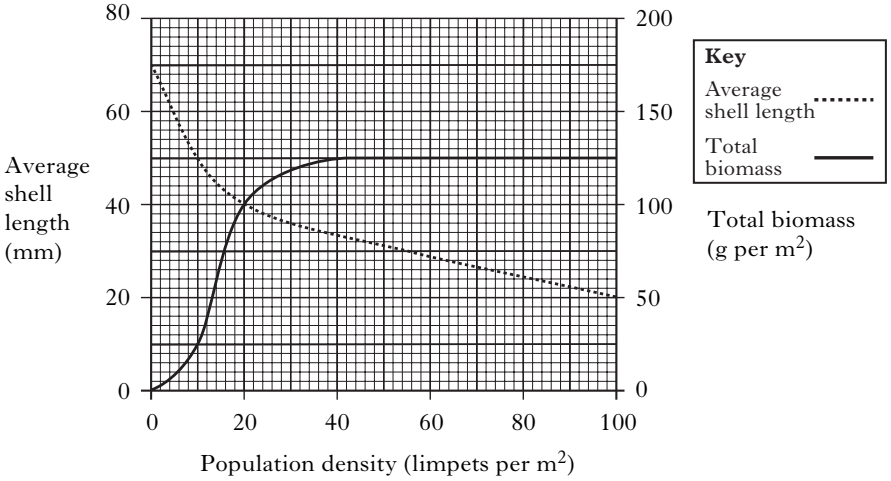
Additional Notes

9. Limpets (*Patella*) feed by grazing on algae growing on rocks at the seashore.



Graph 1 below shows the effects of limpet population density on the average shell length and total biomass.

Graph 1



(*a*) What is the total biomass at a population density of 10 limpets per m^2?

25 g per m^2 **1**

(*b*) Identify the population density range (limpets per m^2) in which the total biomass increases most rapidly.

Tick the correct box.

0–10 ☐ 10–20 ☑ 20–30 ☐ 30–40 ☐ 40–50 ☐ **1**

(*c*) Calculate the average mass of one limpet when the population density is 20 per m^2.

Space for calculation

Average mass **5** g **1**

(*d*) Use values from Graph 1 to describe the effect of increasing population density on the total biomass of limpets.

(1) As population density increases the total biomass increases

(2) Up to a population density of 40 per m^2

(3) At a total biomass of 125g per m^2 **2**

(4) After this the total biomass stays constant

ALL 4 points for 2 marks

ANY 3 points for 1 mark

(*e*) Explain how intraspecific competition causes the trend in average shell length shown in Graph 1.

Marks

At high population density/As population density increases, there is greater competition between limpets so (average) shell length decreases

1

Additional Notes

OR At low population density/As population density decreases, there is less competition between limpets so (average) shell length increases

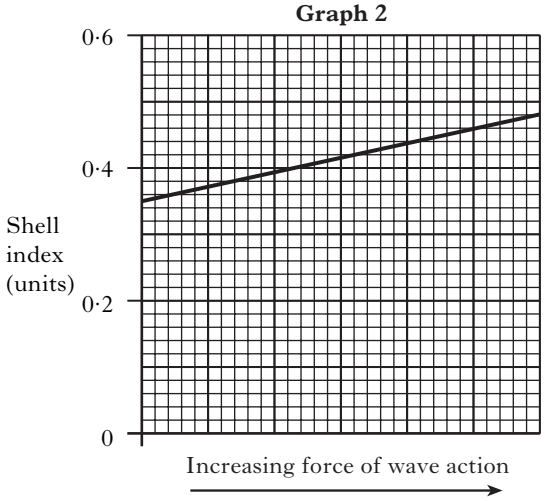
(*f*) The table below shows information about limpets on shore A which is sheltered and on shore B which is exposed to strong wave action.

Graph 2 below shows the effect of wave action on limpet shell index.

Limpet shell index = $\frac{\text{shell height}}{\text{shell length}}$

Shore A (sheltered)		*Shore B (exposed)*	
Shell height (mm)	*Shell length* (mm)	*Shell height* (mm)	*Shell length* (mm)
16	52	9	21
19	54	11	26
20	55	14	31
21	56	16	34
22	57	17	35
23	58	17	36
26	60	–	–
Average = 21	Average =	Average = 14	Average =

Graph 2



(i) **Complete the table** by calculating the average shell length of limpets on both shores. **1**

Space for calculation

56 30·5/31 (both required for 1 mark)

(ii) Express as the **simplest whole number ratio** the average shell height for shore A and shore B.

Space for calculation

Ratio **3** : **2** **1**

(iii) A limpet shell collected on one of the shores had a length of 43 mm and a height of 20 mm. Use Graph 2 to identify which shore it came from and justify your choice.

Tick (✓) the correct box Shore A ☐ Shore B ☑

Justification

Shell index shows it came from a region with strong wave action

1

Marks

Additional Notes

10. (*a*) The grid below shows adaptations of bony fish for osmoregulation.

A	few, small glomeruli	**B**	active secretion of salts by gills	**C**	high filtration rate in kidney
D	active uptake of salts by gills	**E**	low filtration rate in kidney	**F**	many, large glomeruli

Use letters from the grid to answer the following questions.

(i) Which **three** adaptations would be found in freshwater fish?

Letters **C** , **D** and **F** . **1**

(ii) Which **two** adaptations would result in the production of a small volume of urine?

Letters **A** and **E** . **1**

(*b*) The table shows some adaptations of a desert mammal which help to conserve water.

For each adaptation, tick (✓) the correct box to show whether it is behavioural **or** physiological.

Adaptation	*Behavioural*	*Physiological*
High level of blood ADH		✓
Lives in underground burrow	✓	
Nocturnal foraging	✓	
Absence of sweating		✓

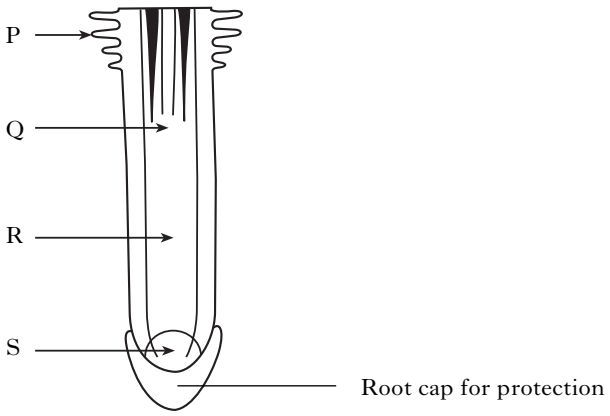
2

All 4 correct = 2 marks **2 or 3 correct = 1 mark**

Marks

Additional Notes

11. (*a*) The diagram below shows a section through part of a root.



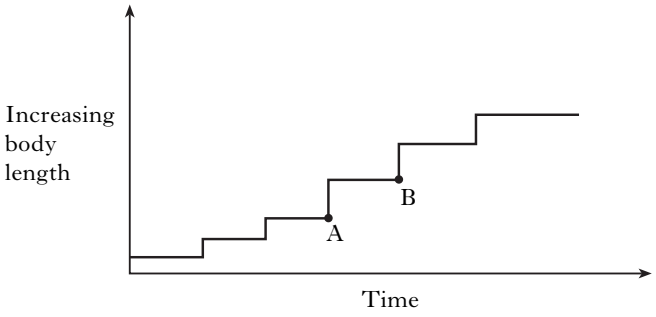
(i) Which letter shows the position of a meristem?

Letter **S** **1**

(ii) Name a cell process responsible for increase in length of a root.

Division/Mitosis/Elongation/Vacuolation **1**

(*b*) The diagram below shows the growth pattern of a locust.



Explain the reason for the shape of the growth pattern between A and B.

Insect moults/Skin is shed/Exoskeleton is shed at A

allowing growth/increase in body length (= 1 mark)

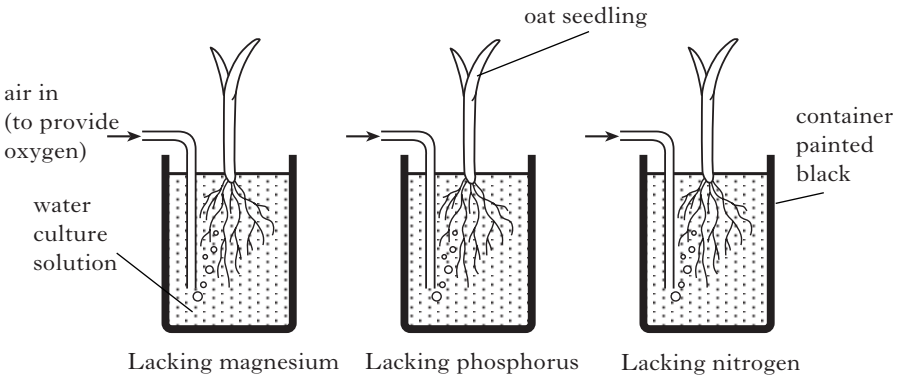
Skin/Exoskeleton hardens preventing further growth/increase in length (= 1 mark) **2**

Marks

Additional Notes

12. The diagram below shows the apparatus used to investigate the growth of oat seedlings in water culture solutions. Each solution lacks one element required for normal growth.

The containers were painted black to prevent algal growth.



1

(*a*) Describe a suitable control for this experiment.

Same set up/Similar container with all elements present/no elements missing OR A container painted black with an oxygen supply and with an oat seedling in water culture solution containing all the elements

1

(*b*) Suggest a reason why algal growth should be prevented in the culture solutions during the investigation.

Algae may use same resources/minerals/nutrients

1

(*c*) The table below shows the elements investigated and symptoms of their deficiency.

Place ticks (✓) in the correct boxes to match each element with the symptoms of its deficiency.

Element	*Symptoms of deficiency*	
	Leaf bases red	*Chlorotic leaves*
Magnesium		✓
Phosphorus	✓	
Nitrogen	✓	✓

2

All 4 correct = 2 marks **2 or 3 correct = 1 mark**

Marks

Additional Notes

12. **(continued)**

(*d*) Name a magnesium containing molecule found in oat seedlings.

Chlorophyll/Chlorophyll a/Chlorophyll b **1**

(*e*) Explain why the uptake of elements by oat seedling roots is dependent on the availability of oxygen.

Oxygen needed for respiration to release energy/ make ATP (= 1 mark)

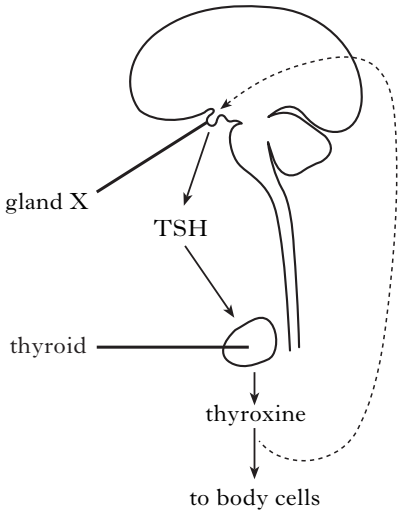
Active transport/Uptake of elements requires energy/ ATP (= 1 mark) **2**

Marks

Additional Notes

13. The production of thyroxine in mammals is controlled by the hormone TSH. Thyroxine controls metabolic rate in body cells and has a negative feedback effect on gland X.

The diagram below shows the relationship between TSH and thyroxine production.



(*a*) Name gland X.

Pituitary **1**

(*b*) In an investigation into the effect of thyroxine, groups of rats of similar mass were treated as follows.

Group A were fed a normal diet.

Group B were fed a normal diet plus thyroxine.

Group C were fed a normal diet plus an inhibitor of thyroxine production.

The table below shows the average hourly oxygen consumption in cm^3 per gram of body mass in rats from each group.

Group	*Average hourly oxygen consumption* (cm^3g^{-1})
A	1·6
B	2·8
C	1·2

(i) Explain how the results in the table support the statement that an increase in metabolic rate leads to an increase in oxygen consumption.

Group B have more thyroxine than Group A and this increases their metabolic rate (= 1 mark)
And Group B have higher oxygen consumption (= 1 mark)
OR Group A have more thyroxine than Group C and this increases metabolic rate (= 1 mark)
Group A have higher oxygen consumption (= 1 mark) **2**

Marks

Additional Notes

13. (*b*) (continued)

(ii) What evidence suggests that rats fed a normal diet make thyroxine?

They/Group A have a higher O_2 consumption than rats with the thyroxine inhibitor/Group C **1**

(iii) How would the level of TSH production in group A compare with group C?

(Group A will produce) less/lower (TSH than C) OR Group C make more TSH than Group A **1**

(iv) Calculate the percentage decrease in oxygen consumption which results from feeding the thyroxine inhibitor to rats.

Space for calculation

25 % decrease **1**

(v) The table below relates to aspects of the appearance and behaviour of rats in groups B and C.

Group	*Appearance of ears and feet*	*Behaviour*
B	Pink	Lie stretched out
C	Pale	Lie curled up with feet tucked in

Complete the following sentences by underlining **one** of the alternatives in each pair.

1 Compared with rats in group B, the rats in group C have a { higher / <u>lower</u> } metabolic rate and show { <u>constriction</u> / dilation } of skin blood vessels. **1**

2 The behaviour of rats in group C allows them to { lose / <u>conserve</u> } body heat. **1**

SECTION C (Essays)

Both questions in this section should be attempted.

Note that each question contains a choice.

Questions 1 and 2 should be attempted on the blank pages which follow.

Supplementary sheets, if required, may be obtained from the invigilator.

Labelled diagrams may be used where appropriate.

1. A Give an account of gene mutation under the following headings:

(i) Occurrence of mutant alleles and the effect of mutagenic agents

1. Random/spontaneous/by chance **(1)**
2. Low frequency/rare **(1)**
3. One type of mutagenic agent eg chemicals or named chemical such as mustard gas **(1)**
4. A second type of mutagenic agent eg radiation or named type of radiation as X-rays, gamma rays, UV light **(1)**
5. Mutagenic agents cause or induce mutations/increase mutation rate/increase chance of a mutation occurring/increase frequency of mutation **(1)**

Maximum 3 Marks

(ii) Types of gene mutation and how they alter amino acid sequences

6. Gene mutation is a change in the bases/base types/base sequence/base order *Note: this must be stated, and cannot be shown in a diagram. Also,* ***nucleotide*** *can be taken as equivalent to* ***base****.* **(1)**

Points 7, 8, 11 and 12 may be shown as suitably labelled diagrams with only bases A,T, G and C used.

7. Substitution: base/bases – replaced with another/others **(1)**
8. Inversion: order of bases reversed/bases turned round **(1)**
9. Substitution/Inversion may change base order of codon
   OR Substitution/Inversion is a point mutation **(1)**
10. Substitution/Inversion may change only one/two amino acid(s) **(1)**
11. Deletion: base/bases – deleted from chromosome/removed/taken out **(1)**
12. Insertion: base/bases – inserted into chromosome/added/put in **(1)**

12a. Substitution, inversion, deletion and insertion ALL named
Note: the mark for 12a can only be awarded if zero marks scored in 7+8+11+12 **(1)**

13. Deletion/Insertion changes codons/triplets after the mutation
    OR Deletion/Insertion is a frameshift mutation **(1)**
14. Deletion/Insertion changes all amino acids <u>after the mutation</u> **(1)**
15. Protein made (following substitution or inversion) will work/will be unaffected
    OR Protein made (after deletion or insertion) will not function/will not work/is the wrong protein/enzyme **(1)**

Maximum 7 Marks

Maximum Total = 10 Marks

SECTION C

1. B Give an account of water movement through plants under the following headings:

(i) The transpiration stream

1. Water enters root hairs **(1)**
2. Water moves from a high water concentration/from HWC down/along a concentration gradient
   OR Water moves from a hypotonic solution/moves by osmosis (*accept anywhere but only* ***once***) **(1)**
3. Water moves across the cortex **(1)**
4. Water moves through cells/through cell walls/through intercellular spaces **(1)**
5. Continuous/Unbroken column/thread of water in the xylem/the vessels/the stem/the plant **(1)**
6. Root pressure helps move water up xylem/up stem/up plant **(1)**
7. A force /An attraction between water molecules (cohesion) **(1)**
8. A force/An attraction between xylem/vessels and water molecules (adhesion) **(1)**
   8a. Cohesion and adhesion both named. Note: *Award mark for 8a only if zero marks scored for 7+8* **(1)**
9. Transpiration draws/pulls water up xylem/up stem/up plant **(1)**
10. Water evaporates into air spaces of leaf **(1)**
11. Water (vapour) diffuses out through stomata/through pore **(1)**
12. Transpiration rate can be increased by increase in temperature/increase in wind speed/increase in light intensity/decrease in humidity/decrease in air pressure **OR** any converse (any one for 1 mark) **(1)**

Maximum 8 Marks

(ii) Importance of the transpiration stream

13. Uptake/Transport of minerals/nutrients/nutrient ions/salts/a named ion eg nitrate **(1)**
14. Cooling effect **(1)**
15. Provides water for photosynthesis/turgidity/support **(1)**

Maximum 2 Marks

Maximum Total = 10 Marks

SECTION C

2. A Give an account of the mechanisms and importance of temperature regulation in endotherms.

Mechanisms:

1 Temperature regulation controlled by negative feedback **(1)**
2 Hypothalamus monitors blood temperature **OR** Hypothalamus is the temperature detecting centre/temperature monitoring centre/temperature control centre **(1)**
3 Hypothalamus sends out nerve messages to effectors/to skin **(1)**
4 Vasodilation (or description) occurs in response to temperature rise/to hot conditions **(1)**
5 Heat lost/Heat radiated from skin [**OR** converse for vasoconstriction – points 4,5] **(1)**
6 Sweating in response to temperature rise/to hot conditions **(1)**
7 Heat lost by evaporation of water/sweat [**OR** converse for cold conditions – points 6, 7] **(1)**
8 In response to drop in temperature/In cold conditions hair erector muscles contract/erector muscles make hairs stand up/erector muscles raise hairs **(1)**
9 Trapped air gives insulation/Trapped air reduces heat loss **(1)**
10 In response to drop in temperature/In cold conditions increase in metabolic rate/increased movement/shivering **(1)**

Maximum (7)

Importance:

11 Chemical reactions/Metabolism controlled by enzymes **(1)**
12 Enzymes have an optimum temperature/have a temperature at which they work best/do not work well at low temperatures/do not work well at high temperatures **(1)**

Maximum (1)

1 mark for coherence + 1 mark for relevance **Maximum Total = 10 Marks**

Coherence

1 The writing must be under **sub headings** or divided into **paragraphs**.
A sub heading/paragraph for 'Mechanisms' and a sub heading/paragraph for 'Importance'.
2 Related information should be **grouped together**.
Information on 'Mechanisms' should be grouped together and at least **4** points must be given.
Information on 'Importance' should be grouped together and at least **1** point must be given.

Both must apply correctly to gain the **Coherence** Mark.

Relevance

1 **Must not** give details of ectotherms or any other homeostatic system eg blood glucose level or water content of blood.
2 **Must** have given at least **four** relevant points from 'Mechanisms' and at least **one** relevant point from 'Importance'.

Both must apply correctly to gain the **Relevance** Mark.

SECTION C

2 . B Give an account of the effect of light on shoot growth and development, and on the timing of flowering in plants and breeding in animals.

Shoot growth and development:

1. Plants/Shoots show phototropism **OR** shoots grow towards light **(1)**
2. Greater concentration of auxin/IAA on dark side **OR** Less auxin/IAA on light side **OR** Auxin/IAA moves to dark side **(1)**
3. Greater elongation of cells on dark side **OR** Less elongation of cells on light side **(1)**
4. Etiolation in absence of light/in the dark **(1)**
5. Description of etiolation: small leaves; yellow/chlorotic leaves; long internodes/long and thin stems (any **TWO** for the mark) **(1)**
   OR Description of appearance of plant in light: large leaves, green leaves, short internodes/short and thick stems (any **TWO** for the mark) **(1)**

Maximum (3)

Timing of flowering in plants

6. Plants show photoperiodism **OR** Flowering is affected by the photoperiod **(1)**
7. Photoperiod is the number of hours of light in a day/in 24 hours **(1)**
8. Long-day plants flower when:
   Either the photoperiod reaches/is above a critical level/a certain number of hours
   OR hours of darkness below a critical level/below a certain number of hours **(1)**
9. Short-day plants flower when:
   Either the photoperiod is below a critical level/is below a certain number of hours
   OR hours of darkness above a critical level/above a certain number of hours **(1)**

Maximum (3)

Timing of breeding in animals

10. Long day breeders/Birds/Small mammals/Named example – breed in spring as photoperiod increases **(1)**
11. Short day breeders/Large mammals/Named example – breed in autumn as photoperiod decreases **(1)**
12. Young are born when conditions favourable/when food abundant
    OR Young have long period of growth before winter/before unfavourable conditions **(1)**

Maximum (2)

1 mark for coherence + 1 mark for relevance **Maximum Total = 10 Marks**

Coherence

1 The writing must be under **sub headings** or divided into **paragraphs**.
There should be a sub heading/paragraph for each of 'Shoot growth and development', 'Timing of flowering in plants' and 'Timing of breeding in animals'.

2 Related information should be **grouped together**.
Information on each of 'Shoot growth and development', 'Timing of flowering in plants' and 'Timing of breeding in animals' should be grouped together. There must be a minimum of **5** points with **at least 1 point given for each group**.

Both must apply correctly to gain the **Coherence** mark.

Relevance

1 **Must not** give details of any **other** effects of IAA or any effects of GA.

2 **Must** have given a minimum of **5** relevant points with at least **1** point from 'Shoot growth and development' plus at least **1** point from 'Timing of flowering in plants' plus at least **1** point from 'Timing of breeding in animals'.

Both must apply correctly to gain the **Relevance** mark.

[*END OF MARKING INSTRUCTIONS*]