Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2020

Marking Scheme

Biology

Higher Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

Introduction

The marking scheme is a guide to awarding marks to candidates' answers. It is a concise and summarised guide and is constructed so as to minimise its word content. Examiners must conform to this scheme and may not allow marks for answering outside this scheme. The scheme contains key words, terms and phrases for which candidates may be awarded marks. This does not preclude synonyms or terms or phrases which convey the same meaning as the answer in the marking scheme. Although synonyms are generally acceptable, there may be instances where the scheme demands an exact scientific term or unequivocal response and will not accept alternatives. The descriptions, methods and definitions in the scheme are not exhaustive and alternative valid answers are acceptable. If it comes to the attention of an examiner that a candidate has presented a valid answer and there is no provision in the scheme for accepting this answer, then the examiner must first consult with his/ her advising examiner before awarding marks. As a general rule, if in doubt about any answer, examiners should consult their advising examiner before awarding marks.

How to use the marking scheme

- Where only one answer is required alternative answers are separated by **'or'**.
- Where multiple answers are required each word, term or phrase for which marks are allocated is separated by a solidus (/) from the next word, term or phrase.
- The mark awarded for an answer appears in **bold** next to the answer, e.g. **3.**
- Where there are several parts in the answer to a question, the mark awarded for each part appears in brackets, e.g. **5(4)** means that there are five parts to the answer, each part allocated 4 marks.
- The answers to subsections of a question may not necessarily be allocated a specific mark; e.g. there may be six parts to a question – (a), (b), (c), (d), (e), (f) and a total of 20 marks allocated to the question. The marking scheme might be as follows, **2(4) + 4(3).** This means that the first two correct answers encountered are awarded 4 marks each and each subsequent correct answer is awarded 3 marks.
- A word or term that appears in brackets **( )** is not a requirement of the answer, but is used to contextualise the answer or may be an alternative valid answer.

Some examples of the marking process

1. **Key words or terms or phrases may be awarded marks, only if presented in the correct context**.

   Sample question: *Outline how water from the soil reaches the leaf.*

   Marking scheme states: Concentration gradient/ osmosis/ root hair/ root pressure/ cell to cell/ xylem/ transpiration **or** evaporation/ cohesion (or explained) **or** adhesion (or capillarity or explained) **or** tension (or explained). ***Any six* 6(3)**

   Sample answer: *Water is drawn up the xylem by osmosis*.

   - Although the candidate has presented two key terms (xylem, osmosis), the statement is incorrect and the candidate can only be awarded 3 marks for referring to the movement of water through the xylem.

2. **Cancelled Answers**

   The following is an extract from S.63 *Instructions to Examiners, 2019* (section 5.3, p.14), "Where a candidate answers a question or part of a question once only and then cancels the answer, you should ignore the cancelling and treat the answer as if the candidate had not cancelled it."

   Sample question: *What is pollination?*

   Marking scheme states: Transfer of pollen/ from anther/ to stigma. **3(3)**

   - ***Sample answer:*** ~~transfer of pollen by insect to stigma~~.
     - The candidate has cancelled the answer and has not made another attempt to answer the question and may be awarded 2(3) marks.
     - If an answer is cancelled and an alternative version given, the cancellation should be accepted and marks awarded, where merited, for the un-cancelled version only.
     - If two (or more) un-cancelled versions of an answer are given to the same question or part of a question, both (or all) should be marked and the answer accepted that yields the greater (greatest) number of marks. Points may not, however, be combined from multiple versions to arrive at a manufactured total.

3. **Surplus Answers – Only in Section A**

   A surplus wrong answer cancels the marks awarded for a correct answer.

   (i) *Sample question 1*: *The walls of xylem vessels are reinforced with …….*

   Marking scheme states: Lignin **4 marks**

   - ***Sample answer:***
     - Chitin, lignin – there is a surplus answer, which is incorrect, therefore the candidate scores 4 – 4 marks = 0.
     - ~~Lignin~~ – the answer, which is correct, has been cancelled by the candidate, but there is no additional or surplus answer, therefore the candidate may be awarded 4 marks.
     - Lignin, ~~chitin~~ - there is a surplus answer, which is incorrect, but it has been

cancelled and as the candidate has given more than one answer (i.e. the candidate is answering the question more than once only), the cancelling can be accepted and s/he may be awarded 4 marks.

(ii) *Sample question 2: Name the **four** elements that are always present in protein.*

Marking scheme states: Carbon/ hydrogen/ oxygen/ nitrogen **4(3)**

- *Sample answer:*
  - Carbon, hydrogen, oxygen, nitrogen, calcium – there is a surplus answer, which is incorrect, which cancels one of the correct answers, therefore the candidate is awarded **3(3)** marks.
  - Carbon, hydrogen, oxygen, calcium – there is no surplus answer, there are three correct answers, and therefore the candidate is awarded **3(3)** marks.
  - Carbon, hydrogen, oxygen, calcium, aluminium – there is a surplus answer, which is incorrect, and which cancels one of the three correct answers, therefore the candidate is awarded **2(3)** marks.
  - Carbon, hydrogen, oxygen, calcium, ~~aluminium~~ – there is a surplus answer, which is incorrect, but it has been cancelled so the candidate may be awarded **3(3)** marks.

In the other sections of the paper, Sections B and C, there may be instances where a correct answer is nullified by the addition of an incorrect answer. This happens when the only acceptable answer is a specific word or term. Each such instance is indicated in the scheme by an asterisk *****.

Annotations used in the marking

The scripts were marked by examiners using an online marking platform. The following table illustrates the various **annotations** (symbols) applied by the examiners when marking the scripts. The meaning and use of each of the annotations applied are also explained in the table. These annotations will be seen on a script if viewed as part of the appeal process. Annotations applied by an examiner will be viewed in red. Scripts that were also marked by an advising examiner will show annotations in a green colour.

Annotation	Meaning
	This symbol indicates a correct response/ answer.
	This symbol indicates an incorrect response/answer.
	**Only in Section A** Surplus incorrect answer. A surplus incorrect answer has cancelled a correct answer.
	This symbol is placed on all blank pages or part of page to indicate it has been seen by the examiner.
	This symbol can be used by an examiner to indicate a part of a question answer of significance.
	This symbol is used to indicate a correct response for a label on a diagram. Used in the following questions in 2020; • Q 13 (b) (iv)/ Q 14 (c)/ Q15 (c) (ii)
	This symbol is used to indicate an incorrect response for a label on a diagram Used in the following questions in 2020; • Q 13 (b) (iv)/ Q 14 (c)/ Q15 (c) (ii)
	This symbol is used to indicate a correct response for a diagram. Used in the following questions in 2020; • Q 13 (b) (iv)/ Q 14 (c) (i)/ Q15 (c) (i)
	This symbol is used to indicate an incorrect response for a diagram. Used in the following questions in 2020; • Q 13 (b) (iv)/ Q 14 (c) (i)/ Q15 (c) (i)

Section A	Best 5	5(20)

1 **5(4) i.e. best five answers from (a) – (f)**

(a) *Give an example of trace element in human diet:*

Iron **or** zinc **or** copper **or** any correct example

(b) *Name the chemical elements found in all lipids:*

Carbon (C), Hydrogen (H) and Oxygen (O) **All three**

(c) *Name the basic unit that makes up all lipids:*

3 Fatty Acids (joined to) glycerol **or** Triglyceride

(d) *Respiration is an example of:*

Catabolic (Catabolism)

(e) *What is a polysaccharide?*

Many (greater than two) sugar (or named monosaccharide) units (or molecules)

(f) *Name a storage polysaccharide in animals:*

Glycogen

Q1 For each part (a) – (f)	Number of correct responses	1
	Mark	4

2 **6(3) + 2**

(a) *What is the purpose of carrying out an experiment?*

To test the hypothesis (or explanation or conclusion or prediction or idea)

(b) *Why is a control normally used when carrying out an experiment?*

To compare (the results of the experiment)

(c) *Which group was the control group?*

B **or** (group drinking glass of water)

(d) *Give two reasons why the method of sample selection used reduces the reliability:*

Not random **or** biased (or unfair)/only friends (or implied)/ (sample) size too small

Any two

(e) *Give **two** ways to show how the experimental design could be improved:*

NOT SAMPLE SELECTION

Longer period of time/ same volume in each glass/ repeat/

double blind testing (or no labels on glass) **Any two**

Q2 (a) – (f)	Number of correct responses	1	2	3	4	5	6	7
	Mark	3	6	9	12	15	18	20

3	**6(3) + 2**						
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
	F	**F**	**T**	**F**	**T**	**F**	**F**

Q3 (a) – (f)	**Number of correct responses**	1	2	3	4	5	6	7
	Mark	3	6	9	12	15	18	20

4 **6(3) + 2**

(a) *What do the letters DNA stand for?*

Deoxyribonucleic Acid

(b) *Identify molecule G:*

Guanine

(c) *Identify the structure labelled as "**J**":*

Nucleotide

(d) *Part of Molecule labelled K*:

Base pair **or** complementary bases

(e) *Type of Bonding labelled L:*

Hydrogen (bonding)

(f) *One structural difference between DNA and RNA, other than the number of strands:*

DNA has (the sugar) deoxyribose **and** RNA has (the sugar) ribose
or DNA has deoxyribose **and** RNA does not
or RNA has ribose **and** DNA does not
or DNA has (the base) Thymine **and** RNA has (the base) Uracil
or DNA has the base Thymine **and** RNA does not
or RNA has the base Uracil **and** DNA does not
or RNA has shorter (strand)

Any one difference

(g) *Give one non-nuclear location of DNA in cells:*

Chloroplast **or** Mitochondrion

Q4 (a) – (f)	**Number of correct responses**	1	2	3	4	5	6	7
	Mark	3	6	9	12	15	18	20

5 **6(3) + 2**

(a) *Function of cones:*

To detect colour

(b) *Function of the optic nerve:*

To send impulse (or message) from eye to brain

(c) *Function of the iris in the eye:*

To control the amount of light entering (the eye). Accept controls pupil size

(d) *Function of the Eustachian tube in the ear:*

To equalise (or balance) pressure **or** to relieve pressure **or** to prevent pressure build up

(e) *Function of semi-circular canals in the ear:*

(To control) balance

(f) *Function of Ligament in joints:*

To join bone to bone

(g) *Function of cartilage around the ends of bones:*

Shock absorber **or** to reduce friction (or described)

Q5 (a) – (f)	**Number of correct responses**	1	2	3	4	5	6	7
	Mark	3	6	9	12	15	18	20

6 **6(3) + 2**

(a) *Identify the part labelled* **B***:*

Axon

(b) *Name the substance produced A:*

Neurotransmitter (or named example)

(c) *Name the substance produced by the schwann cell:*

Myelin

(d) *What is the function of this substance?*

To speed up the impulse **or** to insulate (the axon)

(e) Arrow drawn on diagram **From Right to Left** ←

(f)

Disorder	Paralysis	**or**	Parkinson's Disease
Cause:	Damage (injury) to Spinal Cord **or** Stroke **or** Cerebral palsy **or** Multiple sclerosis **or** other valid cause		Decrease in dopamine levels **or** decrease in serotonin levels **or** Unknown **or** Genetic (mutations) factors **or** Environmental factors **or** mild stroke **or** drug induced **or** aging **or** other valid cause
Treatment:	Physical Therapy **or** Occupational Therapy **or** Electrical stimulation of Spinal Cord **or** surgery other valid treatment		Levo (L)-Dopa (with carbidopa) **or** serotonin (or dopamine) mimicking drug **or** exercise **or** Physiotherapy **or** Deep Brain stimulation **or** other valid treatment

Q6 (a) – (f)	**Number of correct responses**	1	2	3	4	5	6	7
	Mark	3	6	9	12	15	18	20

Section B	Best 2	2(30)

7 (a) **3 + 3**

(i) *What is an immobilised enzyme?*

An enzyme that is fixed (or attached or trapped)

or an enzyme in (or on) a gel (or an inert substance) **3**

(ii) *Give one advantage of using immobilised enzymes:*

Can be recovered **or** can be reused **or** pure product **3**

Q7 (a) (i) – (ii)	Number of correct responses	1	2
	Mark	3	6

7 (b) **8(3)**

Name the enzyme or cell that you used:

Named enzyme **or** Yeast **3**

(i) *Describe how you immobilised that enzyme or cell:*

(Sodium) alginate/
Mix with enzyme (or yeast)/
(Drop) into Calcium chloride (solution)/
How dropped (dropper or syringe)/
Leave (to harden)/
Rinse **Any four 4(3)**

(ii) *Outline how you used the immobilised enzyme or cell to examine its application:*

Add to matching substrate/
In a named vessel/
Named product (to match substrate)/
How to test for named product/
Control described

Any three 3(3)

Q7 (b) (i) – (ii)	Number of correct responses	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

8 (a) **3 + 3**

(i) *What is meant by the term germination?*

Growth (or development) of a seed (into new plant)

or growth of embryo (or named part of embryo) **3**

(ii) *State three factor necessary for successful germination:*

Oxygen **and** water **and** suitable temperature **All three** **3**

Q8 (a) (i) – (ii)	**Number of correct responses**	1	2
	Mark	3	6

8 (b) **8(3)**

(i) *Why were the seeds soaked in water prior to the experiment?*

To start germination **or** breaking dormancy **or** needed for metabolism
(enzyme activity) **or** to activate enzymes (or activate named enzyme)

or to soften testa **or** to dissolve nutrients **3**

(ii) *Describe how you further prepared the seeds and add them to the agar plate(s):*

Split (or cut) the seeds/

Sterilise (the seeds) **or** soak in disinfectant (or in named disinfectant)/

Flat (or exposed or cut) side (onto the agar)/

(Control) boiled or dead seeds **Any three** **3(3)**

(iii) *Under what conditions did you store the plate(s) containing the seeds?*

Incubator **or** at suitable temperature (15^{o}C – 30^{o}C) **3**

For a period of time (1 – 7 days) **3**

(iv) *How did you test to show that digestion had occurred?*

Add iodine **or** biuret solution (**must match agar type**) **3**

(v) *State the result of the plate that showed that digestion had occurred:*

(Blue black with) clear areas (or yellow or brown areas) under

(or around) seeds **or** (Purple with) clear area under (or around) seeds

(must match test in (iv)) **3**

Q8 (b) (i) – (v)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

9 (a) **3 + 3**

(i) *Why is the blood in the right side of the heart being kept separate from the blood in the left?*

Prevents oxygenated and deoxygenated blood mixing

or to allow difference in blood pressure

or oxygenated on LHS **and** deoxygenated on RHS **3**

(ii) *What is meant by the term diastole?*

Relaxation **3**

Q9 (a) (i) – (ii)	**Number of correct responses**	1	2
	Mark	3	6

9 (b) **8(3)**

(i) *How did you identify the right-hand side from the left-hand side of the heart?*

Left thicker (or firmer) **3**

(ii) *On which surface of the heart did you observe the coronary artery (groove)?*

Front **or** ventral **3**

(iii) *Describe how you dissected the heart to identify the bicuspid valve:*

(Shallow) cut (incision)/

With a scalpel/

On left (side)/

(Dissecting) board **or** washing **or** safety point/

(Valve) between top and bottom chambers (atria and ventricle)

Any four **4(3)**

(iv) *State the precise location of **one** semilunar valve:*

Base of aorta **or** base of pulmonary artery **3**

or between ventricle and aorta (or pulmonary artery)

Describe how you further dissected the heart to locate this valve:

Cut into the aorta **or** cut into the pulmonary artery **3**

Q9 (b) (i) – (iv)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

Section C	Best 4	4(60)

10 (a) (i) *Why necessary for an organism to possess an adaptation to its habitat?*

To increase chance of survival (of species) **or** to compete better **3**

(ii) *Two types of adaptation that an organism can exhibit:*

Structural **or** Competitive **or** Behavioural **Any two** **2(3)**

Q10 (a) (i) – (ii)	Number of correct responses	1	2	3
	Mark	3	6	9

(b) (i) ***Two*** *methods by which Gunnera outcompetes native plants:*

Shades out (native vegetation)/ huge seed banks/

spreads by creeping surface rhizomes/ can fix its own nitrogen/

spreads by the scattering of plant fragments **Any two** **2(3)**

(ii) *What method is usually used to control the population of Gunnera?*

Glyphosate **or** herbicide **3**

(iii) *Suggest **one** reason why Gunnera is so successful at growing in poor quality soil:*

(The plant) can fix its (own) nitrogen (or explained) **3**

(iv) *Suggest why biological control using herbivores not successful:*

Toxic (Cyano)bacteria **or** poisoned by (Cyano)bacteria **or** too difficult for herbivore grazers to access plants (along cliffs and stream sides) **3**

(v) *Suggest **two** ways how Gunnera many invade and colonise new areas:*

Creeping surface rhizomes/ scattering of plant fragments/ birds

(animals) scatter seeds/ seed banks **Any two** **2(3)**

(vi) *Name **two** abiotic factors that has limited the spread of Gunnera in Ireland:*

(low) water/(low) humidity / frost (accept <u>low</u> temperature) **Any two** **2(3)**

Q10 (b) (i) – (vi)	Number of correct responses	1	2	3	4	5	6	7	8	9
	Mark	3	6	9	12	15	18	21	24	27

(c) (i) *Suggest **one** reason why ecological surveying is important:*

Conservation **or** find out what species (or organisms) are present **or** find out population numbers **or** prevent (protect) species from extinction **or** monitor biodiversity **or** monitor changes to ecosystem **or** monitor human impact on an ecosystem **3**

(ii) *1. Named ecosystem:*

Correctly named ecosystem **3**

2. Draw a food chain from this named ecosystem containing four members.

If no arrows read from left to right or from bottom to top **3**

3. Why are food chains mostly limited to four or five members?

Large energy loss **or** little energy available to be passed on **3**

4. Pyramid of numbers:

Must match food chain above **3**

5. 1. Position of producer:

at the bottom **3**

2. Position of secondary consumer:

third from bottom **3**

6. Give **one** limitation of the use of pyramids of numbers:

Do not take size of organism into account **or** difficult to draw to scale

or maybe inverted **or** some populations cannot be estimated **3**

Q10 (c) (i) – (ii)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

11 (a) (i) *Name the type of nutrition exhibited by organisms that carry out photosynthesis*:

Autotrophic **3**

(ii) *Write a balanced chemical equation to summarise photosynthesis:*

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

All formulae correct **3**

Correctly balanced **3**

Q11 (a) (i) – (ii)	**Number of correct responses**	1	2	3
	Mark	3	6	9

(b) (i) *What is the role of stomata in photosynthesis?*

Gas exchange *Allow* entry of CO_2 **or** exit of O_2 **3**

(ii) *The cells of which labelled part contain the most chloroplasts in its cells?*

Label B **3**

(iii) *What is the role of the chlorophyll molecules in photosynthesis?*

Traps (or absorbs) light **3**

(iv) *What particles are released from chlorophyll during the light dependent stage?*

*Electrons (e^-) **3**

(v) *Give an account of the events of **pathway 2:***

Electrons trapped by NADP **or** form $NADP^-$/ H^+ attracted to $NADP^-$ / to form NADPH/ photolysis of water **or** water splits/ into protons (H^+) / and electrons (e^-)/ O_2 formed / electrons pass to chlorophyll/ ATP formed

Any five 5(3)

Q11 (b) (i) – (v)	**Number of correct responses**	1	2	3	4	5	6	7	8	9
	Mark	3	6	9	12	15	18	21	24	27

(c) (i) *Name the 3-Carbon molecule which enters the mitochondrion:*

*Pyruvate (*Pyruvic acid) **3**

(ii) *Name the two products formed when the 3-Carbon molecule at (i) above is broken down:*

*CO_2 **3**

*Acetyl (Co A) **3**

(iii) *Name the series of reactions that take place:*

Krebs Cycle **3**

(iv) *Outline the events that take place in the electron transport chain (system)*

High energy electrons/ pass along carriers/ (electrons) lose energy/ (used to) form ATP/ from ADP and P/ (electrons) combine with O_2 and H^+/ to form water.

Any four **4(3)**

Q11 (c) (i) – (ii)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

12 (a) (i) *What is meant by the term heredity?*

Passing on (or transmission) of characteristics (traits or genes) from one generation (or cell) to the next **3**

(ii) *State Mendel's Law of Independent Assortment (2nd Law):*

Each member of one pair of alleles can combine (randomly) **3**

With either member of another pair (at gamete formation) **3**

OR

Members of one pair of factors (alleles) separate independently

Of members of another pair of factors (alleles) (at gamete formation)

Q12 (a) (i) – (ii)	**Number of correct responses**	1	2	3
	Mark	3	6	9

(b) (i) *DNA Profiling:*

Generating a pattern of bands from a (DNA) sample **3**

Genetic screening:

(Test) to show presence (or absence) of a gene **3**

(ii) *Explain each of the Stages, 1 to 4, of DNA Profiling:*

Stage 1: DNA is isolated (or extracted or released) **3**

Stage 2: DNA (strands are) cut (into fragments using enzymes) **3**

Stage 3: Fragments are separated on the basis of size **3**

*Stage 4: (*The pattern) is analysed (or compared or examined) **3**

(iii) *State **two** applications of DNA Profiling:*

Forensic (or example) **3**

Medical (or example) **3**

(iv) *Explain why identical twins have the same DNA profile:*

(Both) have same genotype (or same genes)

or (both) come from same zygote (fertilised egg) **3**

Q12 (b) (i) – (iv)	**Number of correct responses**	1	2	3	4	5	6	7	8	9
	Mark	3	6	9	12	15	18	21	24	27

(c) (i) *Allele:*

A version (variant) of a gene **or** alternative form of a gene **3**

Incomplete dominance:

When both alleles are expressed

or heterozygous condition is intermediate **3**

Homozygous:

(When) identical alleles are present (for a trait) **3**

Phenotype:

The (physical) expression of a gene (or of genotype) **3**

(ii) *"Blue" Rooster X "Blue" Hen.*

Offspring Genotypes: BB, Bb, bb **3**

Offspring Phenotypes: Black, Blue (or speckled), White **3**

Ratio of offspring Phenotypes: 1 Black: 2 Blue: 1 White **3**

(iii) *Ratio*: * 3 Black: 1 White **3**

Q12 (c) (i) – (iii)	**No. of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

13 (a) (i) *Homeostasis:*

(Ability to) maintain a constant (or stable) internal environment **3**

(ii) *Why is homeostasis important:*

(For) metabolism **or** (for) enzyme activity **3**

(iii) *Excretion*

Removal of metabolic waste **or** getting rid of waste products from cells (or body) **3**

Q13 (a) (i) – (ii)	**Number of correct responses**	1	2	3
	Mark	3	6	9

(b) (i) *Precise location where urea is made:*

*Liver **3**

(ii) *Name the food source from which urea is derived:*

*Protein (*Amino acids) **3**

(iii) *1. Location of Bowman's capsule:* *Cortex **3**

2. Location of loop of Henle: *Medulla **3**

3. Name the part labelled 'A'. *Ureter **3**

Q13 (b) (i) – (iii)	**Number of correct responses**	1	2	3	4	5
	Mark	3	6	9	12	15

(b) (iv) *Drawing:*

Bowman's capsule + 2 convoluted tubules with loop **3**

Glomerulus + capillary (blood vessels) surrounding tubules **3**

Labels:

Bowman's capsule, Loop of Henle, proximal convoluted tubule, collecting duct, distal convoluted tubule, glomerulus. **6(1)**

Q13 (b) (iv) Drawing	**Number of correct responses**	1	2
	Mark	3	6

Q13 (b) (iv) Labels	**Number of correct responses**	1	2	3	4	5	6
	Mark	1	2	3	4	5	6

(c) (i) *What is the main difference between plasma and filtrate?*

Plasma has proteins (7g/100 cm^3) filtrate has none **3**

Explain why:

Proteins too big to be pass through (the glomerulus wall) **3**

(ii) *Explain the results between:*

1. *Blood plasma and filtrate:*

Glucose (molecules) small enough to pass through (the glomerulus wall) **or** all the glucose passes through (or is filtered) **3**

2. *Glomerular filtrate and urine:*

(All) glucose is reabsorbed (back into the blood) **3**

(iii) *1. What is the effect on the volume of urine produced by a high salt intake?*

(volume) decreases (or lowers) **or** low (volume) **3**

Explain:

ADH/ from pituitary/ makes (walls of) collecting duct (or of distal tubule)/ more permeable to water/ more water reabsorbed

Any three 3(3)

Q13 (c) (i) – (ii)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24

14	Any **two** of (a), (b), (c)	**(30, 30)**

14 (a) (i) *What is the role of the menstrual cycle?*

To prepare (endometrium **or** uterus) for pregnancy (or for implantation) **or** egg development **or** egg release (or ovulation) **3**

(ii) *Name the event that involves the Uterine lining between days 1-4 of the cycle:*

Menstruation **or** (having) a period **3**

(iii) *The event is triggered by a large drop in what Hormone?*

*Progesterone **3**

(iv) *Where is oestrogen produced?*

*Graafian follicle **or** *ovary **3**

(v) *Sketch graph to show changes in oestrogen levels:*

Rise day 4-14 **and** drop day 14-28 **3**

(vi) *Name the event that occurs at day 14:*

*Ovulation (or egg release) **3**

Name the hormone that causes this to happen.

*LH **or** *Luteinising hormone **3**

(vii) *Name the structure that the follicle turns into after day 14*

*Corpus luteum **3**

(viii) *Does graph indicate pregnancy?*

*No **3**

Explain:

Uterine lining breaks down (at the end)

or corpus luteum breaks down **3**

Q14 (a) (i)-(viii)	**Number of correct responses**	1	2	3	4	5	6	7	8	9	10
	Mark	3	6	9	12	15	18	21	24	27	30

14 (b) (i) *1. Describe in detail the development of the pollen grain from a microspore mother cell:*

Diploid (microspore) mother cell / divides by meiosis/ to produce four haploid (nuclei or cells)/ divides by mitosis/ pollen grain with two haploid nuclei/ the generative nucleus/ the tube nucleus

Any three **3(3)**

2. Describe the events grain following pollination up to and including double fertilisation:

Pollen tube grows (down the style)/ the generative nucleus divides by mitosis/ into two (haploid) male gametes (or nuclei)/ (both male gametes) enter the embryo sac/ one fuses with egg/ the other fuses with polar nuclei

Any three **3(3)**

(ii) *Give **two** adaptations of wind-pollinated flowers:*

Anthers (or stigma or stamens) outside (flower)/ produce large quantity of pollen grains/ pollen grains light/ stigma is feathery

Any two **2(3)**

(iii) *State **two** advantages of sexual reproduction over asexual reproduction:*

Variation/ dispersal/ less overcrowding/ less competition/ less disease

Any two **2(3)**

Q14 (b) (i)-(iii)	**Number of correct responses**	1	2	3	4	5	6	7	8	9	10
	Mark	3	6	9	12	15	18	21	24	27	30

14 (c) (i) *Drawing:*

Cell wall + cell membrane **3**

Indication of nucleic acid **3**

Labels:

Cell wall/ cell membrane/ cytoplasm/ chromosome/ plasmid/ flagella/capsule **or** slime layer

Any three **3(1)**

Q14 (c) (i) Drawing	**Number of correct responses**	1	2
	Mark	3	6

Q14 (c) (i) Labels	**Number of correct responses**	1	2	3
	Mark	1	2	3

(ii) *Name the method of asexual reproduction in bacteria:*

*Binary fission **3**

(iii) *Describe the process of binary fission:*

DNA replicates/ cell elongates/ DNA to each side/ ingrowth of cell membranes (or cell walls)/ two new bacteria formed

Any three **3(3)**

(iv) *1. Name stage A:* *Lag

Name stage B: **Log*

Name stage C: *Stationary **All three** **3**

2. Name suitable label for axis Y:

Population **or** number (of micro-organisms) **3**

(v) *Indicate in diagram when endospore formation most likely to occur:*

Anywhere on stationery **or** anywhere on decline **3**

Q14 (c) (ii)-(v)	**Number of correct responses**	1	2	3	4	5	6	7
	Mark	3	6	9	12	15	18	21

15	Any **two** of (a), (b), (c)	**(30, 30)**

15 (a) (i) *What is a tropism?*

Growth response to a stimulus **3**

(ii) *Where precisely are auxins produced?*

Meristem **or** root tip **or** shoot tip **or** bud **3**

(iii) *What is the precise benefit to the plant of being positively phototropic*

(Absorb) more light **or** more photosynthesis **3**

(iv) *Give two uses of growth regulators in agriculture or horticulture:*

Herbicide (or weed killer) /rooting powder/ fruit ripening/

tissue culturing (or micropropagation)/ seedless fruit /larger fruit

Any two **2(3)**

(v) *What is the effect of different IAA concentration of growth of roots and shoots?*

Any three valid points from graph (must refer to root and shoot)

At least one point from each

Any three **3(3)**

(vi) *State two reasons why the action of auxin is similar to action of a hormone:*

Chemical (action)/ produced in one place/ act in another/

prolonged effect **or** widespread effect **2(3)**

Q15 (a) (i)-(vi)	**Number of correct responses**	1	2	3	4	5	6	7	8	9	10
	Mark	3	6	9	12	15	18	21	24	27	30

15 (b) (i) *What biochemical component of viral coats?*

*Protein **3**

(ii) *Name the other main chemical component of a virus:*

Nucleic acid **or** DNA **or** RNA **3**

(iii) *Why can viruses be described as obligate parasites?*

Can only replicate (reproduce) in a host (or cell) **3**

(iv) *Describe how viral particles can infect and replicate in a host cell:*

Attachment (of virus to host cell)/ entry of nucleic acid (or DNA or RNA)/ uses host structures (to replicate viral parts) / virus assembles / (new) virus (particles) produced (or released)

Any three **3(3)**

(v) *Name two types of induced immunity:*

*Active **3**

*Passive **3**

(vi) *Which type of immunity occurs after vaccination?*

*Active **3**

(vii) Give one difference between the active and passive immunity:

Active is longer lasting (than passive)

or active the body makes antibodies **and** passive the body receives antibodies **3**

Q15 (b) (i)-(vi)	**Number of correct responses**	1	2	3	4	5	6	7	8	9	10
	Mark	3	6	9	12	15	18	21	24	27	30

15 (c) (i) *Drawing:*

Long tip + root hairs **3**

(ii) *Labels of zones:*

Meristematic (or cell division) / elongation/ differentiation/ root cap (or protection)

Any three **3(1)**

Q15 (c) (i) Drawing	**Number of correct responses**	1
	Mark	3

Q15 (c) (ii) Labels	**Number of correct responses**	1	2	3
	Mark	1	2	3

(iii) *In which zone is water absorbed from the soil?*

*Differentiation **3**

(iv) *Name the process through water is absorbed from the soil:*

*Osmosis **3**

(v) *Name the tissue that transports water in roots:*

*Xylem **3**

(vi) *Give two ways in which this tissue is adapted to transporting water:*

Hollow/ continuous tube/narrow/ has pits/ wettable lining/ lignin

Any two **2(3)**

(vii) *Describe the mechanism by which water moves through this tissue to the leaves:*

Water molecules stick together **or** cohesion/forming continuous column)/ due to H bonding/ water molecules stick to sides of xylem **or** adhesion/ water evaporates (or transpiration)/ and pulls water upwards (or creates a tension)/ root pressure pushes water upwards

Any three **3(3)**

Q15 (c) (iii)-(vi)	**Number of correct responses**	1	2	3	4	5	6	7	8
	Mark	3	6	9	12	15	18	21	24