SimpleStudy

PRACTICE MARKING SCHEME

LEAVING CERTIFICATE · ORDINARY LEVEL · SAMPLE PAPER 1 · 2027

Biology

Total marks	Duration	Structure
300	2 hr 30 min	7 questions

About this document

A practice marking scheme produced by SimpleStudy to help students and teachers prepare for the Leaving Certificate examination in Biology. The State Examinations Commission has published this sample paper without a marking scheme; the mark allocations and answers set out here are indicative.

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Marking Scheme

This marking scheme accompanies the State Examinations Commission's Sample Paper 1 in Leaving Certificate Biology, Ordinary Level. It is intended to support candidates and teachers preparing for the examination. It is not an official State Examinations Commission document.

General Marking Guidelines

- Accept all reasonable responses; the lists in this scheme are indicative, not exhaustive.
- Credit content that is correct even where it is poorly expressed.
- No penalty for spelling or grammar unless the meaning is unclear.
- Where a candidate contradicts themselves, award the lower mark.
- Credit accurate labelling on diagrams, and credit a correct answer given as a labelled diagram where the question does not require prose.
- Where a candidate offers more points than the number asked for, mark the first *n* presented, unless a later point is clearly labelled as a replacement.

Seven additions for this paper:

- There are seven questions, each worth 50 marks. Question 1 is compulsory and candidates answer any five of Questions 2 to 7, so six questions make up the 300 marks. Where a candidate answers all seven, mark all seven and credit the best six.
- **Named examples and terminology.** Where a part asks the candidate to name a structure, process or organism, the accepted biological term is required. A description that makes the identification unambiguous earns the mark; a vague term that could apply to several structures does not.
- **Diagrams.** Where a part asks for a labelled diagram, the marks divide between the drawing and the labels, and a label is credited only where it points to the correct structure.
- **Error carried forward.** Where a candidate uses an incorrect value or answer from an earlier part correctly in a later one, award the later marks in full. An error is penalised once only.
- **Graphical answers.** Where a part asks the candidate to draw on a printed graph or diagram, the marks are for the construction itself. **Credit only what the candidate has to supply:** where the grid already carries its axes, scale or labels, or where part of a line or set of points is already plotted, no marks are available for that work. This applies at 3(d)(i) and 4(b)(v).
- **Data questions.** Where a part asks the candidate to draw a conclusion or describe a trend, the answer must be supported by something read from the data or the graph; a correct statement made without reference to the evidence supplied earns the stating marks only.
- **Consequential answers.** Where a part asks the candidate to build on an earlier answer — a justification that must match a choice, or a graph drawn from a calculated total — the later part is marked against the candidate's own earlier answer.

How the marks are set

The paper prints a total of 50 marks for each question and no sub-part marks, so every internal split is indicative. The splits reconcile upward to each question total and to the paper total of 300 marks, and follow one set of rates:

- **A row of a tick, matching or completion table** carries **2 marks**.
- **A one-word answer in a single-line box**, or an answer read or selected from material printed on the page, carries **2 marks**.

- **A term supplied from the candidate's own knowledge, with the brief development the printed space allows**, carries **3 marks**.
- **Ticking one box from a printed list**, where the tick is the whole answer, carries **3 marks**; where a justification is also required, the tick carries 2 and the balance goes to the justification.
- **Developed points** are priced on the printed answer space, with the command verb as a tie-breaker.

Marking at Ordinary Level

This paper is assessed at Ordinary Level. The specification differentiates the two levels through the learning outcomes themselves: Ordinary level covers only the outcomes presented in normal type, while Higher level covers all of them, including those in bold type. Table 1 of the specification describes Ordinary level students as engaging with a broad range of knowledge, mainly concrete in nature but with some elements of abstraction or theory, and as demonstrating and using a moderate range of cognitive skills and tools, selecting from a range of procedures and applying known solutions to a variety of problems in both familiar and unfamiliar contexts. Examiners should therefore credit accurate, simply expressed biology, and should not withhold marks because an answer lacks the depth expected at Higher Level.

Paper Structure

Question 1	**50 marks**	Compulsory. Scientific inquiry, flower structure, the endocrine glands, the chest cavity and breathing, and the characteristics of life.
Question 2	**50 marks**	Measles and vaccination, the spread of viruses and immunity, viral replication, and genetic engineering.
Question 3	**50 marks**	Water movement in plants, leaf structure, and an investigation of light intensity and photosynthesis.
Question 4	**50 marks**	A woodland food chain and pyramid of numbers, and kick sampling to assess river water quality.
Question 5	**50 marks**	The skeleton and bone health, the synovial joint, antagonistic muscles, and the motor neuron.
Question 6	**50 marks**	The female reproductive system, fertilisation and chromosome numbers, pregnancy and birth, and IVF.
Question 7	**50 marks**	Food and protein, enzymes and an enzyme investigation, and immobilised enzymes in food processing.
Total	**300 marks**	Question 1 and any five of Questions 2 to 7.

Grading Descriptors (all parts carrying a development element)

High (H)	Point accurately stated and developed with correct biological reasoning, applied to the organism, data or diagram the part supplies. Full marks for the point.
Mid (M)	Relevant point stated with partial development, or biologically correct but not applied to the material the part supplies. Award the stating marks in full plus roughly half the development marks, rounded up to a whole mark.

Low (L) Point stated or asserted only; vague, or development that does not follow from the point stated. Stating marks only.

No criterion grid is used on this paper. *The longer parts — for example 5(d)(i) and 7(b)(iv) — are marked by required elements rather than holistically.*

Question 1 — 50 marks

Compulsory. Candidates answer all parts.

Indicative mark allocation: (a)(i) 2 · (a)(ii) 3 · (a)(iii) 3 · (b)(i) 4 · (b)(ii) 2 · (b)(iii) 2 · (b)(iv) 2 · (c)(i) 8 · (c)(ii) 3 · (c)(iii) 2 · (d)(i) 2 · (d)(ii) 2 · (d)(iii) 2 · (d)(iv) 2 · (d)(v) 2 · (e)(i) 4 · (e)(ii) 3 · (e)(iii) 2 = 50 marks. This question packs eighteen parts into fifty marks, so the single-line answers are priced at 2 throughout, as the rate table provides.

Part	Acceptable Answer(s)	Marks
(a)(i) Good experimental design	Only one variable is changed while all others are kept constant; a control is included for comparison; the experiment is repeated to check the results; a large enough sample is used; measurements are taken accurately with suitable instruments.	**2**
(a)(ii) Presenting results	**How:** in a table, a bar chart, a line graph or a pie chart (1). **Benefit:** a graph or chart shows the pattern or trend in the data at a glance, makes comparison between groups easy, and reveals an anomalous result far more readily than a list of numbers would (2).	**3**
(a)(iii) Equipment and its use	*1 mark for naming the item, 2 for its use.* A microscope, for magnifying structures too small to see with the naked eye; a Petri dish with agar, for growing microorganisms; a measuring cylinder, for measuring volumes of liquid; a thermometer, for measuring temperature; a quadrat, for sampling organisms in a habitat.	**3**
(b)(i) The two arrows *2 marks each*	An arrow from **Anther** to one of the pollen-bearing heads at the tip of a stamen; an arrow from **Petal** to one of the large coloured outer parts of the flower.	**4**
(b)(ii) Function of the anther	It produces and releases pollen grains, which contain the male gametes.	**2**
(b)(iii) Wind or insect	**Insect** pollination.	**2**
(b)(iv) Justification	The flower has large, brightly coloured petals and a scent that attract insects; the anthers are held inside the flower where an insect must brush against them; the pollen is sticky rather than light and dusty; nectar is produced. Any one, read from the image.	**2**
(c)(i) The four glands *2 marks each*	E: **pituitary** F: **thyroid** G: **pancreas** H: **adrenal**	**8**
(c)(ii) A gland and its hormone	*1 mark for the gland, 2 for a hormone it actually produces.* Thyroid — thyroxine; pancreas — insulin or glucagon; adrenal — adrenaline; pituitary — growth hormone, FSH, LH or ADH. The pairing must be correct.	**3**

Part	Acceptable Answer(s)	Marks
(c)(iii) The digestive gland	The **pancreas**.	**2**
(d)(i) Structure A	The **trachea**.	**2**
(d)(ii) Direction of air flow	An arrow drawn **downwards** along the trachea, from the throat towards the lungs.	**2**
(d)(iii) Function of the cartilage	The rings hold the trachea open, keeping the airway from collapsing when the pressure inside falls during inhalation, while remaining flexible enough to allow the neck to move.	**2**
(d)(iv) A gas leaving the blood	**Carbon dioxide**	**2**
(d)(v) The muscles between the ribs	The **intercostal muscles**.	**2**
(e)(i) Two characteristics of life ***2 marks each***	Nutrition; respiration; excretion; growth; response to stimuli; reproduction; movement; being made of cells.	**4**
(e)(ii) Why viruses are hard to classify	A virus shows almost none of the characteristics of life on its own (1): it does not respire, feed, grow or excrete, and it cannot reproduce by itself (2). It can only replicate by taking over the machinery of a living host cell, and outside a host it is inert, so it sits on the boundary between living and non-living.	**3**
(e)(iii) The eukaryota domain	A tick beside **animal cell** only.	**2**

Question 2 — 50 marks

Candidates answer any five of Questions 2 to 7. Each carries 50 marks.

Indicative mark allocation: (a)(i) 2 · (a)(ii) 3 · (a)(iii) 2 · (a)(iv) 4 · (a)(v) 5 · (b)(i) 6 · (b)(ii) 3 · (b)(iii) 3 · (c)(i) 6 · (c)(ii) 3 · (d)(i) 4 · (d)(ii) 6 · (d)(iii) 3 = 50 marks.

(a) Measles and vaccination (16 marks)

Part	Acceptable Answer(s)	Marks
(i) The group most at risk	**Infants** (babies)	**2**
(ii) Why that group	Infants are too young to have been vaccinated, since the vaccine is given later in childhood (2), and their immune systems are still immature, so they cannot fight the infection as effectively as older children and adults (1).	**3**
(iii) The year with the most cases	**1985**, with about 10 000 cases.	**2**
(iv) The overall trend	The number of cases fell very sharply after the vaccine was introduced in 1985 (2), dropping from about 10 000 to around 1000 by 1990 and to a few hundred by 1995. There was a small rise around 2000, to roughly 1500, but from 2005 onwards the numbers stayed low, close to the axis (2).	**4**
(v) If many were unvaccinated	The number of cases would **increase**, probably sharply (2). Justification (3): measles is highly infectious and spreads from person to person, so a high proportion of the population must be immune before it stops circulating — herd immunity. If many people were unvaccinated the virus would pass easily between them, and the passage states that 90% of cases occur in unvaccinated individuals. Infants too young to be vaccinated would also lose the protection that herd immunity gives them.	**5**

(b) Spread and immunity (12 marks)

Part	Acceptable Answer(s)	Marks
(i) Two ways viruses spread ***3 marks each***	In droplets breathed, coughed or sneezed into the air and inhaled by another person; by direct contact with an infected person or a contaminated surface and then touching the face; through contaminated food or water; through body fluids such as blood, or by sharing needles; from mother to baby during pregnancy or birth; by the bite of an insect vector.	**6**
(ii) Active or passive	**Active** immunity.	**3**
(iii) The molecule produced	A tick beside **Antibody**.	**3**

(c) Viral replication (9 marks)

Part	Acceptable Answer(s)	Marks
(i) Matching the steps ***2 marks each***	Insertion of nucleic acid: **2** Release of viruses: **5** Attachment of virus: **1**	**6**
(ii) A viral plant disease	**Tobacco mosaic virus** (tobacco mosaic disease). Accept potato leaf roll virus, cucumber mosaic virus, or another named viral plant disease.	**3**

(d) Genetic engineering (13 marks)

Part	Acceptable Answer(s)	Marks
(i) Genetic engineering	The deliberate transfer of a gene from one organism into another (2), so that the receiving organism carries the new gene and makes the protein it codes for (2). Accept the alteration of an organism's DNA by adding, removing or changing a gene.	**4**
(ii) The correct order ***2 marks each***	Ligation: **3** Transformation and expression: **4** DNA isolation: **1**	**6**
(iii) An application	*The use must be named and briefly described.* Bacteria engineered to carry the human insulin gene produce insulin for treating diabetes; crops engineered for pest resistance, herbicide tolerance or improved nutrition such as golden rice; production of human growth hormone or vaccines; gene therapy for inherited disease; enzymes for industry.	**3**

Question 3 — 50 marks

Candidates answer any five of Questions 2 to 7. Each carries 50 marks.

Indicative mark allocation: (a)(i) 4 · (a)(ii) 4 · (b)(i) 3 · (b)(ii) 5 · (b)(iii) 6 · (c)(i) 4 · (c)(ii) 4 · (c)(iii) 4 · (d)(i) 6 · (d)(ii) 4 · (d)(iii) 6 = 50 marks.

(a) Water movement (8 marks)

Part	Acceptable Answer(s)	Marks
(i) Completing the diagram ***2 marks each***	Water is lost by: **transpiration** Water moves in by: **osmosis**	**4**
(ii) The two arrows ***2 marks each***	An arrow from **Stomata** to the underside of a leaf; an arrow from **Lenticels** to the stem or woody trunk.	**4**

(b) Leaf structure (14 marks)

Part	Acceptable Answer(s)	Marks
(i) Structure X	The **vascular bundle** (accept leaf vein, or midrib).	**3**
(ii) A tissue within X and its function	*2 marks for the tissue, 3 for the function.* **Xylem** — carries water and dissolved minerals from the roots up to the leaf. Or **phloem** — carries the sugars made in photosynthesis away from the leaf to the rest of the plant.	**5**
(iii) Two adaptations ***3 marks each***	A broad, flat surface area to catch as much light as possible; thin, so that gases and light reach all the cells quickly; a palisade layer of tall cells packed with chloroplasts just below the upper surface; stomata in the lower epidermis allowing carbon dioxide in and oxygen out; air spaces in the spongy mesophyll letting gases circulate; a network of veins delivering water and removing sugars; a transparent upper epidermis and cuticle letting light through while limiting water loss.	**6**

(c) The investigation (12 marks)

Part	Acceptable Answer(s)	Marks
(i) The two variables ***2 marks each***	**Independent:** the light intensity, altered by changing the height of the lamp. **Dependent:** the number of leaf discs that float to the top.	**4**
(ii) Two factors kept constant ***2 marks each***	The temperature of the water; the volume and concentration of the sodium bicarbonate solution; the size and number of the leaf discs; the plant the discs were cut from; the time allowed, ten minutes.	**4**

Part	Acceptable Answer(s)	Marks
(iii) Keeping one factor constant	*The factor must be named and the method described.* **Temperature:** the container stood in a water bath kept at 25 °C, with a beaker or tank of water placed between the lamp and the container to absorb the heat from the lamp so that it did not warm the solution. Accept cutting all ten discs with the same cork borer so that they are the same size.	**4**

(d) The results (16 marks)

Part	Acceptable Answer(s)	Marks
(i) Completing the graph	The 20 cm line is already plotted as far as (6, 1), and the table highlights the two values that remain. The candidate plots **(8, 2)** and **(10, 3)** and extends the line to them. *2 marks for each point plotted accurately, and 2 for extending the line in the style of the printed one so that the two lines remain distinguishable.* A candidate who redraws the whole line correctly from the origin is not penalised.	**6**
(ii) A conclusion	The higher the light intensity, the faster the rate of photosynthesis (2). With the lamp at 10 cm all ten discs had floated by ten minutes, whereas with it at 20 cm only three had — so moving the lamp closer, which increases the light intensity, produced more oxygen in the same time (2).	**4**
(iii) Prediction at 15 cm	*3 marks for the prediction, 3 for the reason.* **Predict:** a line lying **between the two printed lines** — more discs floating than at 20 cm but fewer than at 10 cm; for example around five or six discs by ten minutes. **Reason:** 15 cm is between the two heights tested, so the light intensity is between the two values used, and since the rate of photosynthesis rises with light intensity the result must fall between the two sets of results.	**6**

Question 4 — 50 marks

Candidates answer any five of Questions 2 to 7. Each carries 50 marks.

Indicative mark allocation: (a)(i) 3 · (a)(ii) 4 · (a)(iii) 3 · (a)(iv) 6 · (a)(v) 5 · (b)(i) 3 · (b)(ii) 3 · (b)(iii) 3 · (b)(iv) 4 · (b)(v) 8 · (b)(vi) 5 · (b)(vii) 3 = 50 marks.

(a) The woodland food chain (21 marks)

Part	Acceptable Answer(s)	Marks
(i) Food chain	A sequence showing the feeding relationships between organisms in a habitat, through which energy passes from one organism to the next, beginning with a producer.	**3**
(ii) A predator and its prey *2 marks each*	**Predator:** hedgehog, **prey:** earthworms. Or **predator:** fox, **prey:** hedgehog. The pair must be adjacent in the chain and the right way round.	**4**
(iii) The role of the earthworm	A tick beside **Decomposer**.	**3**
(iv) Pyramid of numbers	Four horizontal bars drawn one above the other and labelled, from the bottom: oak leaves, earthworms, hedgehog, fox (3). The bars narrow going up, with the widest at the bottom, reflecting the falling numbers at each level (3).	**6**
(v) Reintroducing the wolf	*2 marks for the prediction, 3 for the justification.* **Predict:** the fox population would **decrease**. **Justify:** the wolf would prey on foxes and would also compete with them for the same food, so fewer foxes would survive and breed; the wolf is a new predator at the top of the chain and the foxes have no established defence against it.	**5**

Examiner note on (a)(iv). *The images show oak leaves rather than a whole tree, so the first trophic level is counted in leaves and the pyramid is a regular one, narrowing from a wide base. An inverted or irregular pyramid is creditable only where the candidate counts the producer as a single oak tree and says so.*

(b) Kick sampling (29 marks)

Part	Acceptable Answer(s)	Marks
(i) Equipment for collecting	A **net** (a kick net or pond net). Accept a sweep net, a white tray, or a sieve.	**3**
(ii) Good health and safety practice	They are wearing waders or wellington boots to keep dry and protect against sharp objects on the riverbed; they wear gloves to avoid contact with contaminated water; they work in pairs rather than alone; they wear high-visibility clothing. Any one, read from the photographs.	**3**
(iii) Help with identification	A **key** (a dichotomous or identification key). Accept an identification guide, chart or app.	**3**

Part	Acceptable Answer(s)	Marks
(iv) The total T	3 + 6 + 7 + 9 + 5 = **30** *2 marks for the working set out, 2 for the answer.*	**4**
(v) A suitable graph	Four bars drawn on the printed grid, taking the organisms in the order printed on the axis: **green caddisfly 25, flattened mayfly 30, freshwater snail 10, water louse 5**. *2 marks per bar drawn to the correct height.* Both axes, the scale and all four organism names are already printed, so no marks are available for axes, scale or labels. Bars should be of equal width with gaps between them, but do not penalise bars that touch where the heights are correct. Error carried forward from (iv) for the flattened mayfly bar.	**8**
(vi) Water quality	*2 marks for the judgement, 3 for the reason.* **Good quality.** The two organisms whose presence indicates good water — the flattened mayfly at 30 and the green caddisfly at 25 — are far more numerous than the two that dominate in poor water, the freshwater snail at 10 and the water louse at 5. Pollution-sensitive species therefore make up the large majority of the sample, which they could not do in polluted water.	**5**
(vii) An abiotic factor	Temperature; pH; light intensity; oxygen concentration; water flow rate; salinity; soil moisture; wind speed.	**3**

Question 5 — 50 marks

Candidates answer any five of Questions 2 to 7. Each carries 50 marks.

Indicative mark allocation: (a)(i) 3 · (a)(ii) 10 · (a)(iii) 3 · (a)(iv) 4 · (b)(i) 2 · (b)(ii) 3 · (b)(iii) 3 · (c)(i) 3 · (c)(ii) 4 · (c)(iii) 5 · (d)(i) 8 · (d)(ii) 2 = 50 marks.

(a) The skeleton (20 marks)

Part	Acceptable Answer(s)	Marks
(i) The axial bone	A circle around **Sternum**. The humerus, femur, pelvis and tibia all belong to the appendicular skeleton.	**3**
(ii) Labelling the five bones ***2 marks each***	**Humerus** at the upper arm; **femur** at the upper leg; **sternum** at the centre of the chest; **pelvis** at the hip; **tibia** at the front of the lower leg. Each label must point to the correct bone.	**10**
(iii) Function of the skull	It protects the brain from injury. Accept also that it protects the sense organs and supports the face.	**3**
(iv) Diet and bone health	Bones need **calcium**, which is laid down in the bone tissue to make it hard and strong, and a diet low in calcium leads to weak bones that break easily (2). **Vitamin D** is needed for calcium to be absorbed from food in the first place, and phosphorus and protein are also required; a poor diet in childhood leads to rickets and in later life to osteoporosis (2).	**4**

(b) The synovial joint (8 marks)

Part	Acceptable Answer(s)	Marks
(i) The arrow from Cartilage	An arrow drawn to the smooth pale layer covering the **ends of the two bones** where they meet within the joint.	**2**
(ii) Function of cartilage	It provides a smooth surface that reduces friction between the bones as they move, and acts as a cushion absorbing shock and preventing the bone ends from wearing against one another.	**3**
(iii) Function of the ligaments	They attach bone to bone across the joint, holding the two bones together and keeping the joint stable while still allowing it to move.	**3**

(c) Muscles (12 marks)

Part	Acceptable Answer(s)	Marks
(i) Why muscles need minerals	Calcium ions are required for muscle contraction itself — they trigger the interaction between the muscle filaments — so without enough calcium muscles cannot contract properly and cramp or weakness results.	**3**

Part	Acceptable Answer(s)	Marks
(ii) An antagonistic pair ***2 marks each***	**Biceps** and **triceps**. Accept quadriceps and hamstrings, or another correct pair.	**4**
(iii) Straightening the arm	Muscle **A must relax** and muscle **B must contract** (4). Because muscles can only pull and not push, the arm is straightened by the muscle on the opposite side of the joint shortening while the one that bent it lengthens (1).	**5**

(d) The motor neuron (10 marks)

Part	Acceptable Answer(s)	Marks
(i) The labelled diagram ***2 marks per label***	**Dendrites** branching at one end; the **cell body** containing the nucleus; the **axon** as the long fibre; the **Schwann cell** wrapped around the axon forming the myelin sheath. Each label must point to a correctly drawn structure.	**8**
(ii) Direction of the impulse	An arrow drawn **from the dendrites and cell body along the axon towards the axon endings** — that is, away from the cell body.	**2**

Question 6 — 50 marks

Candidates answer any five of Questions 2 to 7. Each carries 50 marks.

Indicative mark allocation: (a)(i) 8 · (a)(ii) 8 · (b)(i) 3 · (b)(ii) 3 · (b)(iii) 3 · (c)(i) 8 · (c)(ii) 8 · (c)(iii) 3 · (c)(iv) 4 · (c)(v) 2 = 50 marks.

(a) The female reproductive system (16 marks)

Part	Acceptable Answer(s)	Marks
(i) The four parts ***2 marks each***	A: **fallopian tube** B: **ovary** C: **cervix** D: **vagina**	**8**
(ii) Matching the statements ***2 marks each***	Meiosis occurs here: **B** Oestrogen and progesterone are produced here: **B** This part is also called the birth canal: **D** Fertilisation usually occurs here: **A** B is the letter used twice, as the question indicates.	**8**

(b) Fertilisation (9 marks)

Part	Acceptable Answer(s)	Marks
(i) Mitochondria in sperm	Mitochondria release the energy, as ATP, from respiration (1), and the sperm needs a great deal of energy to move its tail and swim the long distance to reach the egg cell (2).	**3**
(ii) Chromosomes in a sperm	A tick beside **23 chromosomes**.	**3**
(iii) Chromosomes in a zygote	A tick beside **46 chromosomes**.	**3**

(c) Pregnancy and birth (25 marks)

Part	Acceptable Answer(s)	Marks
(i) The correct order ***2 marks per box***	1. Fertilisation — 2. **Implantation** — 3. Placenta formation — 4. **Foetus growth** — 5. **Labour** — 6. **Birth**	**8**
(ii) Labelling the diagram ***2 marks each***	**Placenta** — the disc-shaped organ attached to the wall of the uterus; **umbilical cord** — the cord running from the placenta to the foetus; **uterus** — the muscular wall enclosing everything; **foetus** — the developing baby.	**8**

Part	Acceptable Answer(s)	Marks
(iii) A reason for one prenatal test	*One box must be ticked and the reason must match it.* **Urine sample test:** to check for protein, which can indicate pre-eclampsia, or for glucose, which can indicate gestational diabetes, and for infection. **Ultrasound exam:** to check the size, position and development of the foetus, to confirm the due date and to detect twins or abnormalities. **Blood test:** to determine the mother's blood group and rhesus factor, to check for anaemia, and to screen for infections.	**3**
(iv) Before and after birth ***2 marks each***	**In the hours before birth:** the muscles of the uterus begin to contract rhythmically and the contractions become stronger and more frequent; the cervix dilates; the amniotic sac breaks and the fluid is released. **In the hours after delivery:** further contractions expel the placenta and umbilical cord as the afterbirth; the uterus begins to shrink back; the mother begins to produce milk, starting with colostrum, and the baby is fed.	**4**
(v) Why IVF may be needed	Where the fallopian tubes are blocked or damaged so that sperm and egg cannot meet; where the sperm count is low or the sperm cannot swim effectively; where ovulation does not occur normally; where the cause of infertility is unknown and other treatments have failed.	**2**

Question 7 — 50 marks

Candidates answer any five of Questions 2 to 7. Each carries 50 marks.

Indicative mark allocation: (a)(i) 3 · (a)(ii) 3 · (a)(iii) 3 · (a)(iv) 3 · (b)(i) 3 · (b)(ii) 4 · (b)(iii) 3 · (b)(iv) 14 · (c)(i) 4 · (c)(ii) 5 · (c)(iii) 5 = 50 marks.

(a) Food and protein (12 marks)

Part	Acceptable Answer(s)	Marks
(i) The best source of protein	**Cheddar cheese**, with 25 g per 100 g against 3 g in rice and less than 1 g in butter.	**3**
(ii) The primary function of proteins	A tick beside **Growth and repair**.	**3**
(iii) The fourth element	**Nitrogen**	**3**
(iv) Where proteins are made	At the **ribosomes**.	**3**

(b) Enzymes (24 marks)

Part	Acceptable Answer(s)	Marks
(i) The correct statement	A tick beside **Enzymes are biological catalysts and are not used up in reactions**.	**3**
(ii) The two arrows ***2 marks each***	An arrow from **Enzyme** to the larger shape containing the notch or groove — the active site; an arrow from **Substrate** to the smaller shape that fits into it.	**4**
(iii) A factor affecting enzyme activity	**Temperature**; **pH**; substrate concentration; enzyme concentration.	**3**

Part	Acceptable Answer(s)	Marks
(iv) The investigation	*Marked by required elements; a labelled diagram earns the marks equally.* • The **factor investigated** named — temperature, pH, enzyme concentration or substrate concentration (2) • The **enzyme** named, for example catalase from potato or liver, amylase, or pepsin (2) • Its **substrate** named — hydrogen peroxide for catalase, starch for amylase, protein for pepsin (2) • Its **product(s)** named — water and oxygen for catalase, maltose for amylase (2) • A series of tests set up differing only in the factor investigated, with all other conditions held constant (2) • **How the rate was measured** — the volume of oxygen collected in a given time or the height of the froth produced; the time taken for the starch to disappear using iodine (2) • The results recorded and compared, and a conclusion drawn (2) This is the largest single allocation in the paper because the question itself demands five named items — enzyme, substrate, products, factor and method of measurement — before any account of the procedure, and the printed space is a full page with a separate diagram box.	**14**

(c) Immobilised enzymes (14 marks)

Part	Acceptable Answer(s)	Marks
(i) Food processing	The treatment of raw agricultural produce to turn it into food — processes such as washing, cutting, cooking, canning, freezing, milling, pasteurising or packaging — carried out to make the food safe, palatable or longer-lasting.	**4**
(ii) An immobilised enzyme	An enzyme that has been fixed or trapped onto or within an inert support material (3) — such as being encapsulated in alginate beads or bound to a membrane — so that it is held in place and does not mix freely with the substrate solution (2).	**5**
(iii) An advantage	The enzyme can be recovered at the end and used again, which lowers the cost (2); the product is not contaminated with enzyme and so needs less purification; the reaction can be run continuously by passing substrate over the immobilised enzyme; and the enzyme is more stable and keeps its activity for longer (3).	**5**

This marking scheme is indicative. The paper prints a total of 50 marks for each question and no sub-part marks, so all internal splits are those of this scheme; they reconcile to 50 marks for each question and to 300 marks for the six questions a candidate answers. Examiners should use professional judgement when awarding marks and should credit all reasonable responses not listed here. Prepared by SimpleStudy for study purposes; not an official State Examinations Commission document.