Mark schemes

Q1.

(a) 1. Homogenise (tissue) **to** break open cells

OR

Homogenise (tissue) **to** release organelles/nuclei;
*Accept blend **OR** grind **OR** chop for homogenise*

2. Filter **to** remove (intact) tissue/cells/debris;

3. Cold (solution) **to** prevent enzyme activity;
Accept 'slow down' for prevent

4. (Solution with) equivalent water potential **to** prevent osmosis

OR

(Solution with) equivalent water potential **to** prevent organelles bursting/shrinking;
Accept isotonic for 'equivalent water potential'
Reject if reference is made to cells

5. Buffered (solution) **to** stop enzymes/protein denaturing;

6. Centrifuge/spin at low(er) speed **so** nuclei in pellet/move to bottom

OR

Centrifuge at low(er) speed and supernatant/solution discarded;
*Accept up to 1000 revolutions min^{-1} **OR** 1000 × gravity for identified slow spin speed*

6

(b) 1. DNA in nucleus codes for enzyme/protein (production);
*Accept genetic material/code **OR** gene for DNA*
Accept polypeptide for protein/enzyme

2. Ribosomes/rough endoplasmic reticulum produce enzyme/protein

OR

Translation on ribosomes/rough endoplasmic reticulum;

3. Rough endoplasmic reticulum transports/modifies/processes enzymes/protein;
Ignore rER/RER only once

4. Mitochondria produce ATP;
Reject produce energy

5. Golgi apparatus modify/process/ package/transport enzymes/protein

OR

Golgi apparatus make/transport glycoprotein

OR

Golgi apparatus forms/releases vesicles;

Accept body for apparatus

Accept 'adds lipid/carbohydrate to' for modify

Accept lipoprotein for glycoprotein

6. Vesicles move (protein) to cell(-surface) membrane

OR

Vesicles fuse with cell(-surface) membrane;

Accept lysosome for vesicle

Accept exocytosis for 'fuse with cell membrane'

5 max

(c) 1. Ribose, Adenine **and** 3 phosphates;

Accept a labelled diagram showing ribose, adenine and 3 phosphates

*Accept adenosine **and** 3 phosphates*

Reject Adenosine and 3 phosphates if ribose/pentose is also mentioned

Ignore pentose sugar

2. ATP to ADP + Pi by ATP hydrol**ase** in hydrolysis (reaction);

Accept ATPase for ATP hydrolase

Accept hydrolayse

3. ADP + Pi to ATP by ATP synth**ase**;

Accept synthayse

4. (In) condensation (reaction);

4

[15]

Q2.

21-25	Extended Abstract Generalised beyond specific context	Response shows holistic approach to the question with a fully integrated answer which makes clear links between several different topics and the theme of the question. Biology is detailed and comprehensive A-level content, uses appropriate terminology, and is very well written and always clearly explained. No significant errors or irrelevant material. For top marks in the band, the answer shows evidence of reading beyond specification requirements.
16-20	Relational Integrated into a whole	Response links several topics to the main theme of the question, to form a series of interrelated points which are clearly explained. Biology is fundamentally correct A-level content and contains some points which are detailed, though there may be some which are less well developed, with appropriate use of terminology. Perhaps one significant error and, or, one irrelevant topic which detracts from the overall quality of the answer.
11-15	Multistructural Several aspects covered but they are unrelated	Response mostly deals with suitable topics but they are not interrelated and links are not made to the theme of the question. Biology is usually correct A-level content, though it lacks detail. It is usually clearly explained and generally uses appropriate terminology. Some significant errors and, or, more than one irrelevant topic.
6-10	Unistructural Only one or few aspects covered	Response predominantly deals with only one or two topics that relate to the question. Biology presented shows some superficial A-level content that may be poorly explained, lacking in detail, or show limited use of appropriate terminology. May contain a number of significant errors and, or, irrelevant topics.
1-5	Unfocused	Response only indirectly addresses the theme of the question and merely presents a series of biological facts which are usually descriptive in nature or poorly explained and at times may be factually incorrect. Content and terminology is generally below A-level. May contain a large number of errors and, or, irrelevant topics.
0		Nothing of relevance or no response.

Commentary on terms and statements in the levels mark scheme

The levels mark scheme for the essay contains a number of words and statements that are open to different interpretations. This commentary defines the meanings of these words and statements in the context of marking the essay. Many words and statements are used in the descriptions of more than one level of response. The definitions of these remain the same throughout.

Levels mark scheme word/statement	Definition
Holistic	Synoptic, drawing from different topics (usually sections of the specification)
A fully integrated answer which makes clear links between several different topics and the theme of the question.	All topics relate to the title and theme of the essay; for example, explaining the biological importance of a process. When considering, for example, the importance of a process, the explanation must be at A-level standard. 'Several' here is defined as at least four topic areas from the specification covered. This means some sentences, not just a word or two. It does not mean using many examples from one topic area.
Biology is detailed and comprehensive A-level content, uses appropriate terminology, and is very well written and always clearly explained.	Detailed and comprehensive A-level content is the specification content. Terminology is that used in the specification. Well written and clearly explained refers mainly to biological content and use of terminology. Prose, handwriting and spelling are secondary considerations. Phonetic spelling is accepted, unless examiners are instructed not to do so for particular words; for example, glucagon, glucose and glycogen.
No significant errors or irrelevant material.	A significant error is one which significantly detracts from the biological accuracy or correctness of a described example. This will usually involve more than one word. Irrelevant material is several lines (or more) that clearly fails to address the title, or the theme of the title.
For top marks in the band, the answer shows evidence of reading beyond specification requirements.	An example that is relevant to the title and is not required in the specification content. The example must be used at A-level standard.
Response mostly deals with suitable topics but they are not interrelated and links are not made to the theme of the question.	Not addressing the biological theme of the essay (eg importance) at A-level standard.

Phosphorus-containing substances and their importance in biological systems.

- 3.1.3 Lipids
- 3.1.5.1 Structure of DNA and RNA
- 3.1.5.2 DNA replication
- 3.1.6 ATP
- 3.1.8 Inorganic ions
- 3.2.1.1 Structure of eukaryotic cells
- 3.2.2 All cells arise from other cells
- 3.2.3 Transport across cell membranes
- 3.3.3 Digestion and absorption
- 3.4.1 DNA, genes and chromosomes
- 3.4.2 DNA and protein synthesis
- 3.4.3 Genetic diversity can arise as a result of mutation or during meiosis
- 3.4.4 Genetic diversity and adaptation
- 3.4.7 Investigating diversity
- 3.5.1 Photosynthesis
- 3.5.2 Respiration
- 3.5.4 Nutrient cycles
- 3.6.2.1 Nerve impulses
- 3.6.2.2 Synaptic transmission
- 3.6.3 Skeletal muscles
- 3.6.4.2 Control of blood glucose concentration (cyclic AMP)
- 3.6.4.3 Control of blood water potential
- 3.8.1 Alteration of the sequence of bases in DNA can alter the structure of proteins
- 3.8.2.1 Most of a cell's DNA is not translated
- 3.8.2.2 Regulation of transcription and translation
- 3.8.3 Using genome projects
- 3.8.4.1 Recombinant DNA technology

In order to fully address the question and reach the highest mark bands students must also include at least four topics in their answer, to demonstrate a synoptic approach to the essay.

Students may be able to show the relevance of other topics from the specification.

Note, other topics from beyond the specification can be used, providing they relate to the title and contain factually correct material of at least an A-level standard. Credit should not be given for topics beyond the specification which are below A-level standard.

[25]

Q3.

(a) Quaternary

Condensation/phosphorylation/redox

Release/loss/formation

(Aerobic) respiration;;

All correct = **2 marks**,

2–3 correct = **1 mark**,

0–1 correct = **0 marks**

Accept 'elimination', 'production' for release

2

(b) (Catalyses the synthesis of ATP)

1. Active site <u>complementary</u> to ADP + Pi;

2. Enzyme-substrate complex forms;
'E-S' alone is insufficient

(Allows the movement of H^+ ions)

3. Channel (in membrane/protein/enzyme);
Accept 'pore'

4. Allows <u>facilitated</u> diffusion of H^+

OR

(Channel) has tertiary structure specific for (only) H^+;

4

[6]

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The uses and importance of ATP in organisms

- 3.1.5.2 DNA replication
- 3.1.6 ATP
- 3.2.2 All cells arise from other cells (mitosis)
- 3.2.3 Active transport
- 3.3.3 Digestion and absorption − co-transport
- 3.3.4.2 Mass transport in plants
- 3.4.2 DNA and protein synthesis
- 3.4.3 Meiosis
- 3.5.1 Photosynthesis
- 3.5.2 Respiration
- 3.5.4 Nutrient cycles − nitrogen fixation
- 3.6.2.1 Nerve impulses − resting potential
- 3.6.2.2 Synaptic transmission
- 3.6.3 Myofibril/muscle contraction
- 3.6.4.2 Control of blood glucose concentration (2^{nd} messenger model)
- 3.6.4.3 Control of blood water potential

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[25]