



INSIGHT

Year 12 Trial Exam Paper

2013

BIOLOGY

Written examination

Sample answers

This book presents:

- high-level sample answers
- explanatory notes
- mark allocations

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Section A: Multiple-choice questions



Tip

- *Make an attempt to answer EVERY question. Do not leave blank spaces. Even if you are uncertain, the process of putting pen to paper may trigger your memory and you have a chance of getting some marks, which is better than getting no marks if you leave it blank. At the same time, do not just write everything that comes into your head. Use some judgement.*

Question 1

Answer is B

Explanatory notes

A is incorrect – steroid hormones are derived from cholesterol which is a hydrophobic molecule and will therefore not dissolve in water.

B is correct – most amino acids are soluble in water.

C is incorrect – lipids are hydrophobic molecules and will therefore not dissolve in water.

D is incorrect – cholesterol is a hydrophobic molecule and will therefore not dissolve in water.

Question 2

Answer is D

Explanatory notes

A is incorrect – active transport involves the expenditure of energy to move a substance against a concentration gradient, in this case water molecules are crossing the plasma membrane, which does not require the expenditure of energy.

B is incorrect – cytolysis occurs when a cell bursts due to excess water movement into the cell.

C is incorrect – plasmolysis occurs in plant cells (not animal) when the plasma membrane pulls away from the cell wall due to loss of water through osmosis.

D is correct – crenation is the shrinkage of a cell due to water loss as a result of being placed in a solution of higher solute concentration than its own cytosol.

Question 3**Answer is B****Explanatory notes**

If red blood cells are placed in hyposaline solution, water will diffuse into the cells. Water is a polar molecule and mostly moves across the plasma membrane through aquaporins – proteins that form channels in the lipid bilayer. It can also move through the lipid bilayer but to a lesser degree. This is shown in B.

A is incorrect – this shows the principle pathway of water out of the plasma membrane through the aquaporins, with some through the lipid bilayer.

B is correct – this shows the principle pathway of water into the cell through the aquaporins, which is most likely to occur in the red blood cells.

C is incorrect – this shows the principle pathway of water out of the plasma membrane through the lipid bilayer.

D is incorrect – this shows the pathway of water into the cell through the lipid bilayer.

Question 4**Answer is A****Explanatory notes**

A polymer forms when many monomers become connected by peptide bonds in sequence.

A is correct – lipids do not form polymers.

B is incorrect – fatty acids can form polymers by bonding with glycerol.

C is incorrect – monosaccharides form polymers to produce polysaccharides.

D is incorrect – nucleotides form polymers to produce nucleic acid.

Question 5**Answer is D****Explanatory notes**

A is incorrect – whilst β pleated sheets are present in the secondary structure of a protein they are a structure and not a form of bonding.

B is incorrect – disulphide bridges are covalent bonds found in the tertiary structure of a protein.

C is incorrect – ionic bonds resulting from the interactions between positively and negatively charged side chains of the polypeptide occur in the tertiary structure.

D is correct – hydrogen bonds form between hydrogen and oxygen atoms in the polypeptide backbone of the secondary structure.

Question 6**Answer is C****Explanatory notes**

purines: adenine and guanine pyrimidines: cytosine and thymine

A is incorrect – cytosine has been shown as a purine and guanine as a pyrimidine.

B is incorrect – thymine has been shown as a purine and adenine as a pyrimidine.

C is correct – guanine has been shown as a purine and cytosine as a pyrimidine.

D is incorrect – adenine and thymine share a double hydrogen bond, not a triple bond.

Question 7**Answer is B****Explanatory notes**

A is incorrect – heat can be a very efficient source of energy.

B is correct – heat causes the peptide bonds in enzymes to weaken and eventually break, which irreversibly changes the structure of the enzyme.

C is incorrect – some metabolic reactions do proceed in the absence of heat (as energy), however there are many that require heat (as energy) to proceed.

D is incorrect – heat produced by metabolising cells does not disperse rapidly and can be readily harnessed in coupled reactions.

Question 8**Answer is A****Explanatory notes**

A is correct – glutamine is being built from glutamic acid and ammonia; energy is required to build it.

B is incorrect – whilst glutamine is being built from glutamic acid and ammonia, energy is not released during the building of the molecule.

C is incorrect – glutamine is being built in this process, not broken down.

D is incorrect – glutamine is being built in this process, not broken down and energy is not released during the process.

Question 9**Answer is D****Explanatory notes**

When ATP is available, glutamine formation is exergonic and therefore can occur spontaneously.

A is incorrect – formation of glutamine will be exergonic (not endergonic) due to the availability of ATP.

B is incorrect – formation of glutamine will be exergonic (not endergonic) due to the availability of ATP.

C is incorrect – formation of glutamine will be exergonic and will occur spontaneously due to the availability of ATP.

D is correct – formation of glutamine is exergonic and occurs spontaneously due to the availability of ATP.

Question 10**Answer is B****Explanatory notes**

A is incorrect – steroid hormones are hydrophobic and do not dissolve in the blood.

B is correct – steroid hormones are hydrophobic and bind readily to specific carrier proteins for transport in the blood.

C is incorrect – peroxisomes are organelles that break down hydrogen peroxide in cells; they are not for transport.

D is incorrect – lysosomes contain hydrolytic enzymes required for intracellular digestion; they are not for transport.

Question 11**Answer is A****Explanatory notes**

A is correct – receptors for steroid hormones are found in the cytosol (or on the nuclear membrane) of target cells.

B is incorrect – receptors for peptide (not steroid) hormones are found on the plasma membrane of target cells.

C is incorrect – receptors for steroid hormones are not found on the mitochondrial membranes of target cells.

D is incorrect – receptors for steroid hormones are not found in the nuclei of target cells, they can be found on their nuclear membranes.

Question 12**Answer is A****Explanatory notes**

Organelles are membrane-bound structures within a cell.

A is correct – the nucleus is a membrane-bound structure and is the site of DNA transcription, which leads to protein production.

B is incorrect – a ribosome, whilst being the site of protein production, is not a membrane-bound structure, rather it is a complex of RNA and protein molecules.

C is incorrect – the cytoskeleton is a network of microtubules and filaments that play a role in mechanical, transport and signalling function, not protein production.

D is incorrect – plasmodesmata are channels found in cell walls that connect the cytoplasm of neighbouring cells; they are not associated with protein production.

Question 13**Answer is C****Explanatory notes**

A is incorrect – if first exposure is to uncooked egg, there is a high risk of allergy; this is not correct.

B is incorrect – if first exposure is to uncooked egg after 6 months of age, there is a high risk of allergy; this is not correct.

C is correct – if first exposure is to cooked egg between the ages of 4 and 6 months, there is a low risk of allergy.

D is incorrect – if first exposure is to uncooked egg between the ages of 4 and 6 months, there is an increased risk of allergy.

Question 14**Answer is D****Explanatory notes**

A is incorrect – an anticodon is a nucleotide triplet on one end of a tRNA molecule that binds to a specific complementary codon on an mRNA molecule.

B is incorrect – an antigen is a macromolecule that triggers an immune response by binding to receptors on B cells or T cells.

C is incorrect – an antidote is a substance that is capable of counteracting poison.

D is correct – immunoglobulins are proteins that function as antibodies.

Question 15

Answer is A

Explanatory notes

A is correct – immunoglobulins are found embedded in the plasma membranes of B cells and are comprised of 4 polypeptide chains, 2 heavy and 2 light.

B is incorrect – immunoglobulins are comprised of 4 polypeptide chains not 2.

C is incorrect – immunoglobulins are found embedded in the plasma membranes of B cells, not T cells.

D is incorrect – immunoglobulins are found embedded in the plasma membranes of B cells, not T cells, and are comprised of 4 polypeptide chains not 2.

Question 16

Answer is D

Explanatory notes

A is incorrect – necrosis is the name given to unprogrammed death of cells and living tissue; it is less orderly than apoptosis.

B is incorrect – chemiosmosis is an energy coupling mechanism that uses energy to drive cellular work.

C is incorrect – meiosis is a form of cell division that results in the production of gametes.

D is correct – apoptosis, or programmed cell death, is a process that can occur in all living cells.

Question 17

Answer is A

Explanatory notes

A is correct – plant pheromones act externally to affect the behaviour of the receiving individual.

B is incorrect – plant pheromones act externally of the secreting organism, not internally.

C is incorrect – plant pheromones trigger responses in members of the same AND different species, not only different species.

D is incorrect – plant pheromones trigger responses in members of the same AND different species, not only the same species.

Question 18**Answer is C****Explanatory notes**

A is incorrect – transgenic *N. attenuata* would not have any effect on chemical signalling in *Geocoris* bugs.

B is incorrect – transgenic *N. attenuata* would not have any effect on chemical signalling in *M. sexta*.

C is correct – heavy infestation by *M. sexta* suggests that defence against herbivores is not taking place. Jasmonates are most likely not being produced as a result of the **lox3** gene being switched off.

D is incorrect – *M. sexta* larvae do not usually attack and eat *Geocoris* bugs; it is unlikely that the introduction of transgenic *N. attenuata* will produce this effect.

Question 19**Answer is B****Explanatory notes**

A is incorrect – erythrocytes transport O₂ around the circulatory system; they are not associated with defence or the immune response.

B is correct – macrophages are phagocytic cells that function in innate immunity to kill pathogenic cells.

C is incorrect – mast cells release histamine and other molecules to trigger an inflammatory response in response to infection and allergic reactions.

D is incorrect – dendritic cells are antigen presenting cells and assist in initiating primary immune response.

Question 20**Answer is D****Explanatory notes**

A is incorrect – the antigenic determinant is the epitope; it will not bind to itself.

B is incorrect – the antibody tail is embedded in the plasma membrane; the epitope cannot bind to it.

C is incorrect – there is no antibody binding site to which epitopes bind.

D is correct – epitopes bind to antigen binding sites.

Question 21**Answer is B****Explanatory notes**

A is incorrect – the cell is growing in G1 phase, it is beginning to replicate its DNA and therefore its mass will be increasing, not decreasing.

B is correct – the cell has undergone the process of mitosis and cytokinesis in which the replicated contents are divided evenly to produce two daughter cells.

C is incorrect – the cell has already replicated its DNA and increased in mass in S phase.

D is incorrect – the cell has already replicated its DNA and increased in mass in S phase.

Question 22**Answer is A****Explanatory notes**

A is correct – there are no homologous chromosomes, only a double-stranded chromosome.

B is incorrect – there are no homologous chromosomes, only a double-stranded chromosome.

C is incorrect – there are no homologous chromosomes, only a double-stranded chromosome.

D is incorrect – there are no homologous chromosomes, only a double-stranded chromosome.

Question 23**Answer is A****Explanatory notes**

A is correct – homologous pairs of chromosomes are drawn apart during Anaphase I.

B is incorrect – homologous pairs of chromosomes are assembled together during Metaphase I.

C is incorrect – sister chromatids separate and are drawn apart during Anaphase II.

D is incorrect – sister chromatids assemble together on the spindle of the dividing cell during metaphase I and metaphase II.

Question 24**Answer is B****Explanatory notes**

A spermatocyte is a male gamete, which is haploid. In a normal gamete there will always be 27 autosomes present and there will either be two Y and two X chromosomes OR two Y and three X.

A is incorrect – a spermatocyte is a male gamete, which is haploid, therefore there will be 27 autosomes present, NOT 26.

B is correct – a spermatocyte is a male gamete, which is haploid, therefore there will be 27 autosomes present.

C is incorrect – a spermatocyte is a male gamete which is haploid, therefore there will be 27 autosomes present, NOT 28.

D is incorrect – a spermatocyte is a male gamete, which is haploid, therefore there will be 27 autosomes present, NOT 29.

Question 25**Answer is A****Explanatory notes**

A is correct – chromatin is formed when interacting proteins package loops of coiled DNA into a supercoil.

B is incorrect – a histone is a small protein that binds to DNA and plays a role in chromatin structure.

C is incorrect – a nucleosome is formed when a section of DNA is wound around a core of eight histone proteins.

D is incorrect – a centromere is the point of constriction on a chromosome, which is required for chromosome movement during cell division.

Question 26**Answer is D****Explanatory notes**

A is incorrect – daughter of Individual 3 and Individual 4 should have the condition and no sons would have it; daughter (Individual 12) does not have the condition; one of their sons (Individual 10) does.

B is incorrect – all sons of Individual 1 and Individual 2 will have the condition; their son (Individual 6) does not have the condition.

C is incorrect – all offspring of Individual 8 and Individual 9 (both of whom are recessive for the trait) must also be recessive for the trait; Individual 17 shows an autosomal dominant trait.

D is correct – Individual 8 and Individual 9 (both of whom do not show the trait) produce a child (Individual 17) with the trait.

Question 27**Answer is C****Explanatory notes**

A is incorrect – Individual 8 and Individual 9 are heterozygous for the trait; Individual 15 is homozygous dominant and is not recessive for the trait.

B is incorrect – Individual 8 and Individual 9 are heterozygous for the trait; Individual 15 can be homozygous dominant or heterozygous, not just heterozygous.

C is correct – Individual 8 and Individual 9 are heterozygous for the trait; Individual 15 can be homozygous dominant or heterozygous.

D is incorrect – the trait is not sex linked and whilst Individual 15 could be heterozygous for the trait, he cannot be considered hemizygous for the trait.

Question 28**Answer is B****Explanatory notes**

A is incorrect – each conception is an independent event; there will be a 50% chance the child will be recessive for the trait (not 25%).

B is correct – each conception is an independent event; there will be a 50% chance the child will be recessive for the trait.

C is incorrect – each conception is an independent event; there will be a 50% chance the child will be recessive for the trait (not 75%).

D is incorrect – each conception is an independent event; there will be a 50% chance the child will be recessive for the trait (not 100%).

Question 29**Answer is A****Explanatory notes**

A is correct – independently assorting genes are found on separate chromosomes.

B is incorrect – independently assorting genes are found on separate, not the same, chromosomes.

C is incorrect – independently assorting genes are not found on homologous chromosomes.

D is incorrect – independently assorting genes are not linked.

Question 30**Answer is A****Explanatory notes**

A is correct – the genotypes shown would produce fast-bobbing, red-throated; slow-bobbing, red-throated offspring.

B is incorrect – the genotypes shown would produce fast-bobbing, red-throated; fast-bobbing yellow-throated; slow-bobbing, red-throated; slow-bobbing, yellow-throated offspring.

C is incorrect – the genotypes shown would produce fast-bobbing, red-throated; fast-bobbing yellow-throated; slow-bobbing, red-throated; slow-bobbing, yellow-throated offspring.

D is incorrect – the genotypes shown would only produce fast-bobbing, red-throated offspring.

Question 31**Answer is C****Explanatory notes**

A is incorrect – the lack of recombination in mtDNA does distinguish it from nuclear DNA.

B is incorrect – nuclear DNA is inherited through both the maternal and paternal lines.

C is correct – mtDNA is passed down through the maternal line almost unchanged across many generations.

D is incorrect – mtDNA is passed down through the maternal line, not the paternal line.

Question 32**Answer is D****Explanatory notes**

A is incorrect – the chromosomes come from the donor not the recipient.

B is incorrect – the chromosomes come only from the donor, none come from the recipient.

C is incorrect – a full complement of chromosomes comes from the donor.

D is correct – an identical complement of chromosomes comes from the donor.

Question 33**Answer is D****Explanatory notes**

A is incorrect – DNA sequencing is the process of determining the precise order of nucleotides in a DNA molecule. This is not the process shown.

B is incorrect – polymerase chain reaction involves the amplification a few copies of DNA to produce thousands to millions of copies of the same DNA.

C is incorrect – gel electrophoresis involves passing fragments of DNA through a gel using an electric current.

D is correct – the image shows a restriction enzyme producing a DNA fragment.

Question 34**Answer is C****Explanatory notes**

A is incorrect – variation in eye colour is clearly evident in the human population.

B is incorrect – eye colour does not occur in discrete groups.

C is correct – there are at least seven colour variations in human eyes.

D is incorrect – temporal variation is associated with differences over time and is unrelated to the range in eye colour.

Question 35**Answer is B****Explanatory notes**

A is incorrect – even though the population is a founder population, it is genetic drift that causes the difference in the AFLPs.

B is correct – genetic drift that causes the difference in the AFLPs.

C is incorrect – natural selection does not cause the difference in the AFLPs, it is caused by genetic drift.

D is incorrect – the difference in the AFLPs is not caused by a population bottleneck, it is caused by genetic drift.

Question 36**Answer is C****Explanatory notes**

A is incorrect – in this phylogenetic tree, Kogiidae and Delphinidae are five times removed from each other; therefore they are not the most closely related.

B is incorrect – in this phylogenetic tree, Ziphiidae and Neobalaenidae are in different sub-orders and are therefore not the most closely related.

C is correct – in this phylogenetic tree, Physeteridae and Platanistidae share the greatest number of homologous structures with each other, therefore they are the most closely related.

D is incorrect – in this phylogenetic tree, Ziphiidae and Neobalaenidae are in different sub-orders and are therefore not the most closely related.

Question 37**Answer is D****Explanatory notes**

A is incorrect – allopatric speciation occurs as a result of geographical isolation; this is not represented by this diagram.

B is incorrect – there is no indication that any of these baleen whale families has become extinct.

C is incorrect – occurs when organisms not closely related, independently evolve similar traits in response to similar selection pressures; these whales are becoming increasingly less similar.

D is correct – occurs when related species evolve different traits in response to different selection pressures. This is shown in this phylogenetic tree.

Question 38**Answer is A****Explanatory notes**

A is correct – absolute dating can specifically determine the year or range of years and relative dating is only specific to the order in which something has appeared in the fossil record.

B is incorrect – absolute dating is specific and not an approximation.

C is incorrect – absolute dating refers to a specific order determined by date; relative dating is only specific to the order in which something has appeared in the fossil record.

D is incorrect – whilst absolute dating is derived from radiometric dating techniques; relative dating is only specific to the order in which something has appeared in the fossil record.

Question 39**Answer is C****Explanatory notes**

A is incorrect – common ancestry between chimps and humans diverges at around 6 million years ago, not 20 million years.

B is incorrect – there is no divergence between ancestral orangutans and hominins around 11 million years ago.

C is correct – common ancestry between chimps and humans diverges at around 6 million years ago.

D is incorrect – common ancestry between chimps and humans diverges at around 6 million years ago, not 100 000 years.

Question 40***Answer is D*****Explanatory notes**

A is incorrect – this is a likely explanation for hominins picking up lice from early gorillas.

B is incorrect – this is a likely explanation for hominins picking up lice from early gorillas.

C is incorrect – this is a likely explanation for hominins picking up lice from early gorillas.

D is correct – this is the least likely explanation; hominins and gorillas are very unlikely to have similar grooming practices.

END OF MULTIPLE-CHOICE QUESTIONS**SECTION A**

SECTION B – Short-answer questions**Tips**

- *The questions must be read carefully. Key words need to be identified and understood. Recognise and understand the requirements associated with words such as 'explain', 'identify', 'name', 'describe', 'outline', 'compare', 'state', 'justify', 'define', 'label', 'show working' and 'suggest', and look out for negatives and exceptions.*
- *The number of lines allocated to a question is indicative of the length of the response expected by the examiner. Try to use the space provided and avoid writing any more than what has been provided for.*
- *Working to a strict time, complete as many previous VCAA Biology examinations as possible. Check your answers carefully against the Examiner's reports.*
- *If you have any problems or difficulties in understanding the material you must consult your teacher.*

Question 1a.**Sample answer**

They were ignored by their mothers.

Mark allocation: 1 mark

Question 1b.**Sample answer**

Methylation can lead to suppression of gene activity.

Mark allocation: 1 mark

Question 1ci.**Sample answer**

Chromatin

Mark allocation: 1 mark

Question 1cii.**Sample answer**

A protein around which DNA winds for compaction and regulation.

Mark allocation: 1 mark

Question 1d.**Sample answer**

Methylation patterns are persistent and can last for several generations.

Mark allocation: 1 mark

Question 2a.**Sample answer**

Enzyme

Mark allocation: 1 mark

Question 2b.**Sample answer**

Starch

Mark allocation: 1 mark

Question 2c.**Sample answer**

By measuring the breakdown or decrease in the amount of starch OR by measuring the appearance of disaccharides or monosaccharides.

Mark allocation: 1 mark

Question 2d.**Sample answer***Hypothesis:*

High temperatures will reduce the rate of amylase activity.

OR

Low temperatures will reduce the rate of amylase activity.

OR

Amylase operates best at an optimal temperature.

OR

High temperatures will denature amylase.

OR

If there is an increase or a decrease in temperature beyond the optimal range, the rate of amylase activity will decline.

Experimental design:

Appropriate control

AND

Replicates/repeat the experiment OR adequate numbers within treatments

AND

Description of results that support hypothesis

Mark allocation: 3 marks

- 1 mark for hypothesis
- 2 marks for experimental design – 1 mark for control AND replicates/repeat experiment OR adequate numbers in treatments, 1 mark for description of results that support hypothesis

**Tip**

- *Success in the short-answer questions from the Unit 3 and 4 Biology exam requires both knowledge and problem-solving skills. In addition to the Key Knowledge, the Study Design for Biology describes a range of Key Skills. These will be assessed. You will need to be able to design a controlled experiment, write a hypothesis, and analyse, interpret and transpose data and information.*

Question 3ai.**Sample answer**

Phagocyte OR macrophage

Mark allocation: 1 mark

Question 3aii.**Sample answer**

The ingestion and destruction of microbes.

Mark allocation: 1 mark

Question 3aiii.**Sample answer**

Antigenic peptides (protein fragments) are displayed on the surface of the phagocyte by a major histocompatibility complex (MHC) marker.

Mark allocation: 2 marks

- 1 mark for correctly answering that antigenic peptides are displayed on the surface
- 1 mark for identifying that it is by a major histocompatibility complex (MHC) marker

Question 3bi.**Sample answer**

Receptor

Mark allocation: 1 mark

Question 3bii.**Sample answer**

The function of structure B (receptor) is to receive chemical signals from outside the cell whilst the function of structure C is most likely related to cell recognition (antigen).

Mark allocation: 2 marks

- 1 mark 'Structure B receives chemical signals'
- 1 mark 'Structure C is related to cell recognition'

Question 4a.**Sample answer**

By lowering the pH of the environment, the ionic bonds between charged amino acids can be changed. This can lead to the breaking of bonds between vitamin B12 and the protein.

Mark allocation: 2 marks

- 1 mark for 'ionic bonds between charged amino acids can be changed'
- 1 mark for 'leads to breaking of bonds between vitamin B12 and the protein'

Question 4b.**Sample answer**

Structure D – nucleus

Function – regulation of cell activity

Mark allocation: 2 marks

- 1 mark for correctly identifying structure D
- 1 mark for correctly identifying its function

Question 4c.**Sample answer**

There would be greater proportion of bound ribosomes. Proteins destined for export from a cell are synthesised on ribosomes bound to the endoplasmic reticulum (rough endoplasmic reticulum). IF is a glycoprotein which is secreted from the parietal cells and is therefore synthesised on the rough endoplasmic reticulum.

Mark allocation: 2 marks

- 1 mark for 'greater proportion of bound ribosomes, proteins for export are synthesised on the rough endoplasmic reticulum'
- 1 mark for 'IF is a glycoprotein which is secreted and is therefore synthesised on the rough endoplasmic reticulum'

Question 4d.**Sample answer**

Autoimmune disease

Mark allocation: 1 mark

Question 4e.**Sample answer**

They block the binding site for vitamin B12 on the IF molecule. Vitamin B12 can only be absorbed if it is bound to IF.

Mark allocation: 1 mark

Question 5a.**Sample answer**

In the matrix of the mitochondria.

Mark allocation: 1 mark

Question 5bi.**Sample answer**

Pyruvate

Mark allocation: 1 mark

Question 5bii.**Sample answer**

Oxidative phosphorylation

Mark allocation: 1 mark

Question 5biii.**Sample answer**

32–34 ATP and H₂O

Mark allocation: 1 mark

Question 5ci.**Sample answer**

Anaerobic respiration OR fermentation

Mark allocation: 1 mark

Question 5cii.**Sample answer**

In the absence of oxygen

Mark allocation: 1 mark

Question 5d.**Sample answer**

Light independent reaction OR Calvin Benson cycle OR Calvin cycle

Mark allocation: 1 mark

Question 5e.**Sample answer**

Carbon dioxide

Mark allocation: 1 mark

Question 5f.**Sample answer**

Molecule K is NADP

NADP will travel back to the thylakoid membrane/stack OR granum OR grana to pick up another hydrogen atom released by the light-dependent reaction.

Mark allocation: 2 marks

- 1 mark for identifying molecule K as NADP
- 1 mark for a correct explanation

Question 5g.**Sample answer**

PGAL NOT glucose

Mark allocation: 1 mark**Tip**

- *Students need to be able to apply knowledge to new and possibly unfamiliar scenarios. Instead of being asked to define cellular respiration, a question may require students to consider some information to determine whether cellular respiration is occurring.*

Question 6a.**Sample answer**

Synapse

Mark allocation: 1 mark

Question 6b.**Sample answer**

Diagram M shows chemical communication. In chemical communication, a neurotransmitter is released from the presynaptic membrane into the synaptic cleft and diffuses across to the postsynaptic membrane. Diagram M shows a synaptic cleft whereas diagram L does not.

Mark allocation: 2 marks

- 1 mark for identifying the correct diagram
- 1 mark for a correct explanation

Question 6c.**Sample answer**

Active site of acetylcholinesterase is blocked therefore it cannot breakdown ACh, therefore no more nerve impulses.

OR

Chemical substances could competitively bind with receptors on post-synaptic membrane and prevent ACh from continuing impulse transmission.

Mark allocation: 2 marks

- 1 mark for 'active site of acetylcholinesterase is blocked'
- 1 mark for 'no breakdown of ACh, therefore no further transmission'

OR

- 1 mark for 'competitive binding with receptors on post-synaptic membrane'
- 1 mark for 'ACh prevented from continuing impulse transmission'

**Tip**

- *Clear, accurate and concise responses are vital and must relate directly to the specific contexts given in examination questions. Avoid at all costs falling into the trap of rephrasing the question and answering in general terms. Your written responses should use the terminology related to the scenario presented in the question. If the stem of the question discusses the production of glucagon by α -cells in the pancreas, then make direct reference to them in your response. Make sure that you use correct spelling at all times, particularly when it comes to key words, e.g. mitosis/meiosis, glucagon/glycogen. Know how to apply the terms correctly.*

Question 7a.**Sample answer**

In the nucleus

Mark allocation: 1 mark

Question 7b.**Sample answer**

Feature	Name
2.	replication fork
3.	DNA polymerase
4.	DNA ligase
7.	leading strand

Mark allocation: 2 marks

- 2 marks for 4 correct answers
- 1 mark for 2 or 3 correct answers
- 0 marks for 1 or no correct answers

Question 7c.**Sample answer**

Okazaki fragments. Due to the opposite orientation of the DNA strands, the lagging strand forms in the 3'→5' direction. DNA polymerase cannot add nucleotides in the 3'→5' direction so the lagging strand is formed as a series of short discontinuous fragments in the 5'→3' direction.

Mark allocation: 2 marks

- 1 mark for identifying Okazaki fragments and 1 mark for identifying the correct cause of its formation

Question 8a.**Sample answer**

Molecule 1

5'UUAAUAUGUGCUACUUCGAACACUGUCCCAAAGGUUAGUAAUU 3'

Molecule 2

3'AAUUAUACACGAUGAAGCUUGUGACAGGGUUUCCAAUCAUUA 5'

Mark allocation: 1 mark**Question 8bi.****Sample answer**

Only molecule 1. An initiation code (AUG; in the order 5' → 3') is required to start the formation of a polypeptide chain, therefore it will be mRNA. Molecule 2 does have an AUG code but it is in the order 3' → 5' and will therefore not operate as an initiation code.

Mark allocation: 2 marks

- 1 mark for 'an initiation code is required to start the formation of a polypeptide chain'
- 1 mark for 'initiation code is present – AUG in the order 5' → 3''

Question 8bii.**Sample answer**

Translation

Mark allocation: 1 mark

Question 8c.**Sample answer**

met – cys – tyr – phe – glu – his – cys – pro – lys – gly – (stop)

Mark allocation: 1 mark

Question 8di.**Sample answer**

Increase in blood osmolarity, e.g. sweating profusely

Mark allocation: 1 mark

Question 8dii.**Sample answer**

Yes, it is an example of homeostasis. Homeostasis is the ability to maintain a stable, relatively constant internal environment within a narrow range. In this example, fluid is being retained in the body within a narrow range of limits.

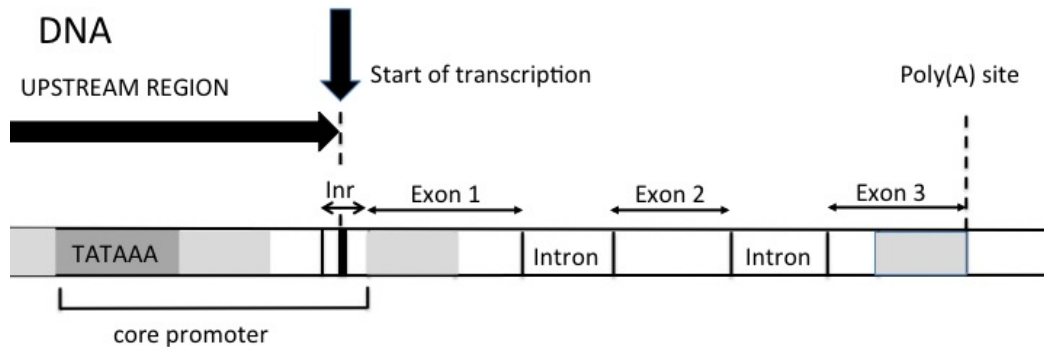
Mark allocation: 2 marks

- 1 mark for 'homeostasis is maintenance of a relatively stable internal environment within narrow limits'
- 1 mark for 'fluid is being retained within narrow limits'

Question 9a.**Sample answer**

Transcription factors and RNA polymerase assemble there for the beginning of transcription.

Mark allocation: 1 mark

Question 9b.**Sample answer**

Mark allocation: 1 mark

Question 9c.**Sample answer**

Exon is the coding part of a gene and the intron is the non-coding part.

Mark allocation: 2 marks

- 1 mark for 'exon is coding part of a gene'
- 1 mark for 'intron is non-coding part of a gene'

Question 9d.**Sample answer**

It will bind to the operator site and suppress its activity (switch it 'off').

Mark allocation: 1 mark

Question 10a.**Sample answer**

Reproductive isolation increases with geographic distance.

The results of the study provide evidence of an evolutionary process.

Mark allocation: 1 mark

Question 10bi.**Sample answer**

Allopatric speciation

Mark allocation: 1 mark

Question 10bii.**Sample answer**

Geographic isolation restricts gene flow. Random genetic mutations may occur in isolated populations, which may lead to other reproductive barriers from the ancestral species. Reproductive barriers in allopatric populations can prevent interbreeding with parent population when they are brought back together.

Mark allocation: 3 marks

- 1 mark for 'geographic isolation restricts gene flow'
- 1 mark for 'random genetic mutations that occur in isolated populations may lead to other reproductive barriers from the ancestral species'
- 1 mark for 'reproductive barriers can prevent interbreeding with parent population when they are brought back together'

Question 11ai.**Sample answer**

One of foramen magnum further forward, s-shaped spine, short broad bowl-shaped pelvis and position of gluteus maximus, long inwardly angled femora and angled femur head, lateral condyle on knee joint, foot has become a platform with inner arch and short toes.

Mark allocation: 1 mark

Question 11aii.**Sample answer**

Corresponding one of:

- Foramen magnum further forward – so skull balances on spine and does not hang from it
- S-shaped spine – keeps head and body above centre of gravity, acts like a spring
- Short, broad bowl-shaped pelvis and position of gluteus maximus – allows attachment of gluteus maximus for walking, retains abdominal organs and enables hamstring to pull leg back
- Long inwardly angled femora and angled femur head – keeps upper body over centre of gravity
- Lateral condyle on knee joint – stops sideways deflection of muscle while walking
- Foot has become a platform with inner arch and short toes – provides shock absorption and spring for efficient walking.

Mark allocation: 1 mark

Question 11b.**Sample answer**

Wernicke's area

OR

Broca's area

Mark allocation: 1 mark

Question 11c.**Sample answer**

To learn the complex skills associated with tool making and acquisition of language.

OR

To develop enhanced brain structure to enable new functions (language).

OR

To have the ability to imagine, be creative and construct new ideas, which lead to new thought processes that enhance survival.

Mark allocation: 1 mark

d. Complete the table.

1 mark

Biological evolution	Cultural evolution
traits from parents, no choice of traits inherited	
Action	Impact on gene pool
biomedical technology	

Question 11d.

Sample answer

Biological evolution	Cultural evolution
traits from parents, no choice of traits inherited	Traits from unrelated persons, immediate learning by teaching, imitation, choice involved
Action	Impact on gene pool
biomedical technology	maintains alleles in population that may otherwise not survive

Mark allocation: 1 mark

- 1 mark for 2 correct
- 0 marks for 1 or none correct

END OF SAMPLE ANSWERS

SECTION B