Forensics, DNA Profiling and PCR (Topic 6): Edexcel SNAB A Level Biology Exam Questions by Topic

15 questions · 38 marks · about 46 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · A level Paper 1 · June 2019 · Q5(b) · 3 marks

(b) Describe the changes that occur inside a body in the first week after death.

(3)

Question 2 · A level Paper 1 · June 2025 · Q1(a) · 3 marks

1 A sequence of changes takes place in the body of a mammal after death.
Forensic scientists can use this to help determine the time of death.

(a) State three changes that take place in the body of a mammal in the **first 24 hours** after death.

(3)

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Question 3 · information from earlier in the question

(c) Body farms use the bodies of pigs to study the changes in insect species on a body after death.

Question 3 · A level Paper 1 · June 2019 · Q5(c)(ii) · 3 marks

(ii) Explain how the results of this study could be used to help to establish the time of death of a human.

(3)

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Question 4 · A level Paper 1 · June 2018 · Q2(b) · 2 marks

(b) Microorganisms are also found on a dead body.

Describe the role of decomposers, such as microorganisms, in the carbon cycle.

(2)

Question 5 · A level Paper 1 · October 2020 · Q10(b)(ii) · 3 marks

(ii) After the grain is harvested, farmers plough the stems (straw) from wheat plants into the soil. This improves the quality of the soil.
These stems contain polysaccharides.

Explain how microorganisms in the soil break down the stems.

(3)

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Question 6 · information from earlier in the question

3 Peat bogs are formed over millions of years from the remains of plants and animals.

Waterlogging and acidic conditions prevent the decomposition of plants and animals in peat bogs.

The photograph shows peat being cut from a peat bog.



(Source: © Reimar/Shutterstock)

Question 6 · A level Paper 1 · June 2022 · Q3(a)(ii) · 3 marks

(ii) Explain why the conditions in peat bogs prevent decomposition.

(3)

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Question 7 · A level Paper 1 · June 2025 · Q9(d) · 2 marks

(d) Soil also stores large quantities of carbon.

Discuss the role of microorganisms in carbon storage in forest soils.

(2)

Question 8 · information from earlier in the question

2 Skulls can be used as evidence for human evolution.

The only type of human present today is the modern human. In the past, another type of human, called Neanderthal, occupied the same geographical area.

The photograph shows the skulls of both types of human.



Modern human skull Neanderthal skull

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Genetic studies now show that these two types of human have interbred.

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Question 8 · A level Paper 1 · November 2021 · Q2(c) · 2 marks

(c) Explain how the results of electrophoresis could provide evidence for interbreeding between the two types of human.

(2)

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Question 9 · A level Paper 3 · June 2018 · Q1(a)(i) · 3 marks

1 A deer was found dead on National Trust land. Some people thought that the wounds that led to the deer's death could have been caused by a big cat such as a black panther.



(a) Samples of DNA from the wounds of this deer were collected.

Investigators used the polymerase chain reaction (PCR) to increase the quantity of DNA in the samples.

(i) Describe how one PCR cycle would increase the quantity of DNA present.

(3)

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Question 10 · A level Paper 3 · October 2020 · Q5(b)(i) · 2 marks

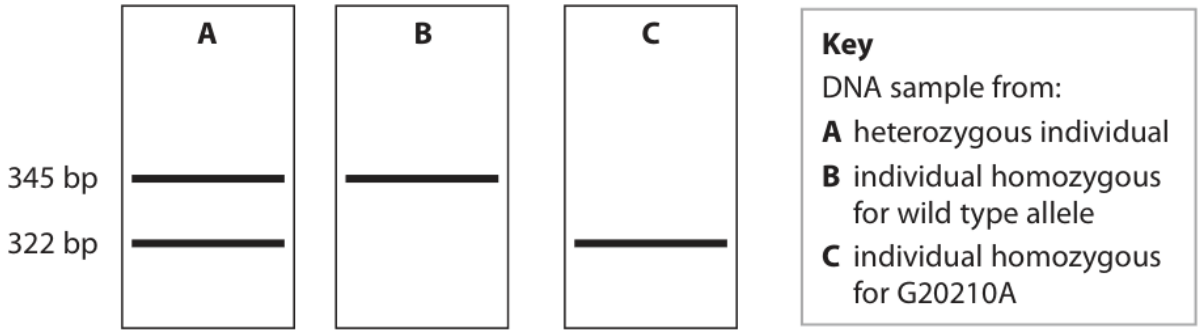
(b) Individuals with a family history of DVT may be offered a genetic test for the G20210A allele.

In this test, a sequence of 345 base pairs (bp) from this gene is amplified using the polymerase chain reaction (PCR).

A specific restriction enzyme is then added to the amplified DNA.

The DNA fragments produced are then separated using gel electrophoresis.

The diagram shows the results of gel electrophoresis for three individuals, A, B and C.



(i) Explain the role of DNA primers in the production of the amplified 345bp sequence.

(2)

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Question 11 · A level Paper 3 · October 2020 · Q5(b)(ii) · 3 marks

(ii) Explain why the amplified DNA fragments for the G20210A allele and the wild type allele are different.

(3)

Question 12 · A level Paper 1 · October 2020 · Q4(c)(i) · 2 marks

(c) The RNA produced during transcription is known as pre-mRNA. Pre-mRNA can be modified before being translated on the ribosome.

(i) Describe how the pre-mRNA may be modified before being translated on the ribosome.

(2)

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Question 13 · A level Paper 1 · October 2020 · Q4(c)(ii) · 2 marks

(ii) Explain why modification of pre-mRNA enables one gene to give rise to more than one protein.

(2)

Question 14 · A level Paper 1 · June 2023 · Q9(b) · 3 marks

(b) Gene expression leads to the synthesis of proteins that give rise to the phenotype.

Describe how one gene can give rise to more than one protein.

(3)

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Question 15 · A level Paper 3 · November 2021 · Q2(a)(i) · 2 marks

2 Acetylcholinesterase is an enzyme involved in regulating the transmission of nerve impulses across some synapses.

(a) Acetylcholinesterase is found on the cell surface membranes of neurones and red blood cells.

These acetylcholinesterase molecules have different primary structures.

In humans, a single gene codes for acetylcholinesterase.

(i) Explain how a single gene can give rise to acetylcholinesterase molecules with different primary structures.

(2)

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Mark schemes

Question 1 · A level Paper 1 · June 2019 · Q5(b) · 3 marks

Question Number	Answer
5(b)	A description that makes reference to three of the following: • (body) temperature falls (1) • rigor mortis / stiffening of the muscles (1) • autolysis / break down of cells by enzymes in the body (1)
	• putrefaction / discolouration / bloating (1)

Additional guidance	Mark
ALLOW algor mortis ALLOW breakdown of tissues by enzymes ALLOW accumulation of gases	**(3)**

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Question 2 · A level Paper 1 · June 2025 · Q1(a) · 3 marks

Question Number	Answer
1(a)	A description that makes reference to the following: • fall in (body) temperature (1) • rigor mortis (1) • autolysis / bloating / fall in pH / discolouration of skin (1)

Additional guidance	Mark
IGNORE any explanations ALLOW algor mortis / cooling ALLOW increase in temperature if qualified DO NOT ALLOW 'increase or decrease' without giving reason for possible increase ALLOW stiffening of the muscles IGNORE contraction of the muscles ALLOW description of autolysis as break down of the body by its own enzymes ALLOW livor mortis / hypostasis / blood pooling ALLOW ref to a named colour for discoloration	(3)

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Question 3 · A level Paper 1 · June 2019 · Q5(c)(ii) · 3 marks

Number		
5(c)(ii)	An explanation that makes reference to three of the following: • record which {insects / species} are present (on the human) (1) • compare with results from investigation (on pigs) to determine time of death (1) • take into account which stages of the lifecycle are present (1) • (when using stage of succession to determine time of death) environmental variables need to be taken into account (1)	**(3)**

Question 4 · A level Paper 1 · June 2018 · Q2(b) · 2 marks

Question Number	Answer
2(b)	A description that makes reference to two of the following: • decomposers break down organic material (from the dead body) (1) • (decomposers) respire (1) • releasing carbon dioxide (into the atmosphere) (1)

Additional Guidance	Mark
ALLOW organic molecules / named organic molecule / organic compounds ALLOW respiration takes place ALLOW methane in context of anaerobic respiration	**(2)**

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Question 5 · A level Paper 1 · October 2020 · Q10(b)(ii) · 3 marks

Question Number	Answer
10(b)(ii)	An explanation that makes reference to three of the following • the stems contain starch or cellulose (1) • enzymes are { secreted / released } by the microorganisms (1) • which break down the glycosidic bonds (1) • which releases glucose that is used by the microorganisms in respiration (1)

Additional guidance	Mark
ALLOW lignin ALLOW enzymes from microorganisms digest (starch / cellulose)	**(3)**

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Question 6 · A level Paper 1 · June 2022 · Q3(a)(ii) · 3 marks

Question Number	Answer
3(a)(ii)	An explanation that makes reference to three of the following • conditions are anaerobic (1) • therefore less (aerobic) respiration by decomposers (1) • acidic conditions {inhibit /denature} enzymes (1) • therefore (enzymes) cannot {digest / break down} organic material (1)

Additional guidance	Mark
ALLOW (waterlogging) reduces the oxygen content ALLOW microorganisms / named decomposers ALLOW decomposers respiring anaerobically ALLOW description of denaturing eg change in shape of active site ALLOW break down plants / animals /peat	(3)

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Question 7 · A level Paper 1 · June 2025 · Q9(d) · 2 marks

Question Number	Answer
9(d)	An answer that makes reference to two of the following: • (microorganisms as) decomposers {break down / digest} organic matter (1) • carbon (from the products of digestion) assimilated into the microorganisms (1) • (some carbon used to) produce carbon dioxide in respiration (of microorganisms / decomposers) (1)

Additional guidance	Mark
ALLOW biological molecules ALLOW carbon used to produce (named) organic molecules in the soil	(2)

Question 8 · A level Paper 1 · November 2021 · Q2(c) · 2 marks

Question Number	Answer
2(c)	An explanation that makes reference to the following • by comparing the {location / number of} bands produced by the two types of DNA (1) • similarities would indicate interbreeding (in the past) (1)

Additional guidance	Mark
ALLOW a description eg looking whether the bands are next to each other	**(2)**

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Question 9 · A level Paper 3 · June 2018 · Q1(a)(i) · 3 marks

Question Number	Answer
1(a)(i)	A description that makes reference to three of the following: • heat to 90-98°C { to break hydrogen bonds between (DNA) strands / separate the strands of DNA} (1) • { joining of primers / annealing } at 50-75°C (1) • { elongating / extension / addition of nucleotides } / DNA polymerase involved in formation of phosphodiester bonds (1) • to double the quantity (of the DNA) (1)

Additional Guidance	Mark
ALLOW heating to 90-98°C to break hydrogen bonds or to unzip DNA or to denature the DNA ALLOW 'binding/aligning' for joining ALLOW description of production of complementary strands of DNA ALLOW taq polymerase ALLOW replication for doubling	(3)

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Question 10 · A level Paper 3 · October 2020 · Q5(b)(i) · 2 marks

Question number	Answer
5(b)(i)	An explanation that makes reference to two of the following: • primers have a specific base sequence (1) • bind to complementary bases (at either end) of the DNA be amplified (1) • therefore, provide a site for the DNA polymerase to bind (1)

Additional guidance	Mark
IGNORE contain complementary bases ALLOW primers attach to the start of the STR sequence ALLOW anneal for bind ALLOW allowing DNA polymerase to create a complementary strand	**(2)**

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Question 11 · A level Paper 3 · October 2020 · Q5(b)(ii) · 3 marks

Question number	Answer
5(b)(ii)	An explanation that makes reference to three of the following: • the base sequences of the alleles are different (1) • the restriction enzyme {recognises / cuts} at a specific {site / DNA base sequence} (1) • that is only present in the G20210A allele (1) • therefore, a shorter fragment is produced for the G20210A allele (1)

Additional guidance	Mark
ALLOW they have different numbers of base pairs e.g. wild type 345bp and the G20210A has 322bp	**(3)**

Question 12 · A level Paper 1 · October 2020 · Q4(c)(i) · 2 marks

Question Number	Answer
4(c)(i)	A description that makes reference to the following • pre mRNA contains exons and introns (1) • introns are removed and exons are spliced together (to produce a strand of mRNA) (1)

Additional guidance	Mark
ALLOW reference to introns and exons in the correct context i.e. exons are coding and introns are non-coding regions ALLOW 'joined together' for 'spliced'	**(2)**

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Question 13 · A level Paper 1 · October 2020 · Q4(c)(ii) · 2 marks

Question Number	Answer
4(c)(ii)	An explanation that makes reference to the following • the {exons can be spliced together in a different order / different exons can be removed } (1) • therefore producing different sequences of amino acids (1)

Additional guidance	Mark
	(2)

Question 14 · A level Paper 1 · June 2023 · Q9(b) · 3 marks

Question Number	Answer
9(b)	A description that makes reference to three of the following • introns are removed (1) • exons can then be arranged in several different ways / exons can be removed (1) • this produces different mRNA (from the same gene) (1) • translation (of the mRNA) gives different {amino acid sequences / different polypeptides / different proteins} (1)

Additional guidance	Mark
ALLOW alternative splicing	(3)

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Question 15 · A level Paper 3 · November 2021 · Q2(a)(i) · 2 marks

Question number	Answer
2(a)(i)	An explanation that makes reference to two of the following: • (pre-)mRNA splicing / post-transcriptional modification (1) • different exons removed (1) • (therefore) producing different {sequences of amino acids / mRNA sequences} (1)

Additional guidance	Mark
ALLOW the exons can be joined in different sequences ALLOW (the acetylcholinesterase) gene is made up from several exons and introns IGNORE producing different primary structure	Choose a item. (2)

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