



Decay, DNA techniques and forensics: practice questions

8 questions • 26 marks • mark scheme at the back

For Pearson Edexcel International AS Biology XBI11 and International A Level Biology YBI11. **A Level only** is IA2 content (Units 4 to 6), not needed for the International AS.

Name

Total / 26

1 UNIT 4 STYLE [4 marks]
A Level only

Explain the role of saprotrophic bacteria and fungi in the recycling of carbon.

2 UNIT 4 STYLE [1 mark]
A Level only

Which step of the polymerase chain reaction takes place at about 72 °C?

- A. ☐ Denaturation of DNA
- B. ☐ Annealing of primers
- C. ☐ Extension of new strands by Taq polymerase
- D. ☐ Cutting of DNA by restriction enzymes

3 UNIT 4 STYLE [4 marks]
A Level only

Describe the stages in one cycle of the polymerase chain reaction.

A Level only

Calculate the number of copies of a DNA sequence after 25 cycles of PCR, starting with a single molecule. Give your answer in standard form to two significant figures.

Answer = ...

A Level only

A sample of DNA was cut with a restriction enzyme and the fragments were separated by gel electrophoresis alongside a DNA ladder. The table shows the distance moved by the ladder bands. A band from the sample moved 33 mm. (a) Explain why the DNA fragments move through the gel and why shorter fragments move further. (2) (b) Use the table to estimate the length of the fragment in the sample. (2)

DNA ladder	
Length of fragment / base pairs	Distance moved / mm
5000	12
3000	20
2000	27
1000	38
500	47

A Level only

Why do muscles become stiff (rigor mortis) after death?

- A. ☐ No ATP is available, so myosin heads stay attached to actin
- B. ☐ Calcium ions are no longer released, so actin and myosin are locked together
- C. ☐ Lactic acid denatures the muscle proteins
- D. ☐ Blood clotting prevents muscle fibres moving

Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [4] A Level only

- they secrete (extracellular) enzymes onto dead organisms / waste (1)
- which digest / hydrolyse organic compounds to soluble products (1)
- the microorganisms absorb the products and use them in respiration (1)
- releasing carbon dioxide into the atmosphere (1)
- which is taken up by producers in photosynthesis (1)
- Max 4

2. [1] A Level only

C C (1)

3. [4] A Level only

- heat to about 95 °C to separate the two strands / break hydrogen bonds (1)
- cool to about 55 to 65 °C so that primers anneal / bind to the complementary sequences (1)
- heat to about 72 °C (1)
- Taq polymerase adds nucleotides to the primers to make complementary strands (1)
- Max 4

4. [2] A Level only

- $2^{25} = 33\,554\,432$ (1)
- 3.4×10^7 (1)

5. [4] A Level only

- (a) DNA is negatively charged (phosphate groups) so it moves towards the anode / positive electrode (1)
- smaller fragments move more easily through the gel mesh (1)
- (b) the band lies between the 2000 and 1000 base pair bands (1)
- estimate of 1300 to 1500 base pairs (1) (the band is a little over half way between the 2000 and 1000 bands; accept 1300 to 1500)

6. [4] A Level only

- (a) man 1 (1)
- the child has bands D and F, which the mother does not have, and man 1 has both while man 2 has neither (1)
- (b) other men might share the same bands by chance / the bands might match another man (1)
- only a small number of loci were used / more loci are needed to reduce the probability of a chance match (1)

7. [6] A Level only

- body temperature: measure core temperature and compare with 37 °C (1)
- body cools towards the surroundings, so a lower temperature suggests a longer time since death (1)
- rate affected by air temperature / clothing / body mass, which must be recorded (1)
- rigor mortis: ATP not made, so myosin heads cannot detach from actin and muscles stiffen (1)
- begins a few hours after death and passes off after 1 to 2 days, so the stage shows time since death (1)
- insects: blowflies lay eggs, hatch into larvae and pupate (1)
- the species and size / stage of the oldest larvae show the time since eggs were laid (1)
- growth depends on temperature, so allowance is made / degree days (1)
- the succession of species shows the stage of decomposition (1)
- using more than one method gives a more reliable estimate (1)
- Max 6

8. [1] A Level only

A A (1)