



**EXAM PAPERS PRACTICE**

Boost your performance and confidence with these topic-based exam questions

Practice questions created by actual examiners and assessment experts

Detailed mark scheme

Suitable for all boards

Designed to test your ability and thoroughly prepare you

2002

**XVIII**

1583

Time allowed  
**62 Minutes**

**Score**

**/52**

**Percentage**

**%**

**Biology**

**AQA  
AS & A LEVEL**

**Mark Scheme**

**3.1 Biological molecules**



- 1 (a) Deoxyribose. 1
- (b) 1. Thymine 18 (%);  
2. Guanine 32 (%). 2
- (c) DNA polymerase. 1
- (d) 1. (**Figure 1** shows) DNA has antiparallel strands / described;  
2. (**Figure 1** shows) shape of the nucleotides is different / nucleotides aligned differently;  
3. Enzymes have active sites with specific shape;  
4. Only substrates with complementary shape / only the 3' end can bind with active site of enzyme / active site of DNA polymerase. 4
- [8]**



2 (a) Concentration of substrate solution / of enzyme solution / pH.

1

(b) 1. 2.5 / 0.04;  
*1 mark for correct value*

2.  $\text{g dm}^{-3} \text{ minute}^{-1}$  /  $\text{g dm}^{-3} \text{ s}^{-1}$ ;  
*1 mark for related unit*

2

- (c) 1. Initial rate of reaction faster at 37 °C;  
2. Because more kinetic energy;  
3. So more E–S collisions / more E–S complexes formed;  
4. Graph reaches plateau at 37 °C;  
5. Because all substrate used up.

*Allow converse for correct descriptions and explanations for curve at 25 °C*

5

[8]



3 (Maintaining constant pH to avoid)

1. Named protein / enzyme (in blood) sensitive to / affected by change in pH;

*Accept converse for MP2 and MP3.*

*Named example should be a protein that might be affected (by change in pH) eg haemoglobin, carrier protein in plasma membrane.*

*Accept 'change in H<sup>+</sup> concentration' for 'change in pH'.*

2. (Resultant) change of charge / shape / tertiary structure;

*The change in charge idea relates to the enzyme / protein and not the blood (plasma) or red blood cells.*

*'Denaturation' alone is insufficient.*

3. Described effect on named protein or enzyme.  
e.g. less oxygen binds with haemoglobin / less transport across membranes / fewer substrates can fit active site / fewer enzyme-substrate complexes.

*Idea of 'less' or 'fewer' required. Ignore suggestion of 'no' or 'none'.*

[3]



4

(a) 1. Inhibition;

*Accept either competitive or non-competitive inhibition or a description of either.*

2. Changes tertiary structure (of enzyme);
3. Changes shape of / blocks active site (of enzyme);

*The active site must be in the context of the enzyme / cytochrome oxidase.*

4. Enzyme cannot bind to its substrate / no enzyme-substrate complex formed.

*Accept 'ES'. Accept 'substrate cannot attach to enzyme'.*

3 max

(b) (Antidote reacts with / binds to cyanide) so cyanide cannot bind to enzyme / cytochrome oxidase

OR

(Antidote reacts with / binds to cyanide) so causing cyanide to be released from the enzyme / cytochrome oxidase.

*Key idea is how the antidote affects the cyanide.*

1



- (c) (i) 1. **A + C + E** / all liver (trials)  
2. **B + D + F** / all kidney (trials)  
3. **D + E** / all rat (trials);;
- Accept a description of any trial letter.  
All 3 groups correct = 2 marks.  
Any 2 groups correct = 1 mark.  
1 group / no groups correct = 0 mark.*

2 max

- (ii) 1. Cyanide reduces oxygen use / rate of respiration in **A** and **B**  
/ in both  
OR  
as concentration of cyanide increases, the use of oxygen decreases in both;  
*Accept use of letters or description of the animal **and** organ  
Reference to 'both', in some way, is required.*
2. Greater effect of cyanide (on oxygen use) on sheep kidney / **B**  
than on sheep liver / **A**;  
*Comparison required in the statement. The statement should not be inferred from MP3.*
3. Appropriate calculations of mean oxygen use from the data  
E.g. 1 liver falls by 74% whereas kidney falls by 87%  
OR  
liver falls to 0.26 / to 26% whereas kidney falls to 0.13 / to 13%  
E.g. 2 liver falls by 2.0(au) whereas kidney falls by 12.2(au);

*Check correct calculations using the data but a comparison must be shown. Accept other calculations using the data.*

3

- (iii) 81(%)  
*Correct answer = 2 marks.  
Allow 1 mark for either:  
Showing 8.1 divided by 10 or answer of 19(%.  
Ignore '+' or '-' in showing the difference.*

2

[11]

- 5 (a) 1. Large / dense / heavy cells;  
2. Form pellet / move to bottom of tube (when centrifuged);  
3. Liquid / supernatant can be removed.  
*Must refer to whole cells.* 3
- (b) Break down cells / cell parts / toxins.  
*Idea of 'break down / digestion' needed, not just damage* 1
- (c) 1. To stop / reduce them being damaged / destroyed / killed;  
*Reject (to stop) bacteria being denatured.*  
2. By stomach acid.  
*Must be in context of stomach.* 2
- (d) 1. More cell damage when both present / A;  
2. Some cell damage when either there on their own / some cell damage in B and C;  
*MP1 and MP2 – figures given from the graph are insufficient.*  
3. Standard deviation does not overlap for A with B and C so difference is real;  
*MP3 and MP4 **both** aspects needed to gain mark.*  
4. Standard deviations do overlap between B and C so no real difference.  
  
*MP3 and MP4 accept reference to significance / chance for 'real difference'*

3 max

- (e) 1. Enzyme (a protein) is broken down (so no enzyme activity);  
*Accept hydrolyse / digested for 'broken down'.*
2. No toxin (as a result of protein-digesting enzyme activity);  
*Must be in the correct context.*
3. (So) toxin is protein.  
*This must be stated, not inferred from use of 'protein-digesting enzyme'.*

3

[12]



6 (a) Accept **three** suitable suggestions:

1. (Lactase / beads) can be reused / not washed away;  
*1. Accept lactase / beads not wasted*  
*1. Less lactase used is insufficient*
2. No need to remove from milk;  
*2. Accept lactase not present in milk.*
3. Allows continuous process;
4. The enzyme is more stable;
5. Avoid end-product inhibition.  
*Ignore ref to SA*

3 max

- (b)
1. (Lactose hydrolysed to) galactose and glucose;
  2. (So) more sugar molecules;  
*2. Idea of **more** sugars essential*
  3. (So) more / different receptors stimulated / sugars produced are sweeter (than lactose).

2 max

[5]

- 7 (a) C. *Ignore name of organ* 1
- (b) E. *Ignore name of organ* 1
- (c) 1. Active site (of enzyme) has (specific) shape / tertiary structure / active site complementary to substrate / maltose;  
*Reject active site on substrate.*  
*Must have idea of shape*  
*Assume "it" = maltase*  
*Accept (specific) 3D active site*  
*Reject has same shape*
2. (Only) maltose can bind / fit;  
*Accept "substrate" for "maltose"*
3. To form enzyme substrate complex.  
*Accept E-S complex*

3

[5]