

A-level Biology Summer Learning A-level Exam Question Mark Scheme

- M1.** (a) Any two from:
- | | | |
|--------------|-------------------------------|---|
| Loop of DNA; | Non-cellulose cell wall; | |
| Plasmid; | Capsule; | |
| Flagellum; | Mesosome; | |
| | <i>Accept small ribosomes</i> | 2 |
- (b) (i) (Granules) turn blue-black / dark blue / black / purple with iodine; 1
- (ii) Cellulose / pectin; 1
- (c) Use principle:
 Feature of starch;
 Consequence in terms of storage;
 e.g.
 Insoluble;
 Therefore will not “wash” out of cell / affect water potential / affect osmosis;
 OR
 Molecule coiled / branched;
 Therefore large amount stored in small space / compact
 OR
 Does not affect water potential;
 So no effect on entry of water (into cell); 2
- [6]**
- M2.** (i) sugar or phosphate / S-P / nucleotide chain / backbone / original / parent DNA; 1
- (ii) X thymine; Y guanine; Z adenine;
(Allow T, G and A) Reject: thiamine 3
- [4]**
- M3.(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]

- M4.** (a) different form of a gene;

1

- (b) hydrogen bonds broken;
semi-conservative replication / both strands used (as templates);
nucleotides line up complementary / specific base pairing / A and T / C and G;
DNA polymerase;

4

- (c) deletion causes frame shift / alters base sequence (from point of mutation);
changes many amino acids / sequence of amino acids (from this point);
substitution alters one codon / triplet / one amino acid altered / code
degenerate / same amino acid coded for;

3

[8]

- M5.(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]

- M6.** (a) nucleotide;

1

- (b) (i) 21.4, 21.4; 28.6;

- (ii) amounts of A and T / C and G / complementary bases different;
therefore no base-pairing;

2 max

[5]

- M7.** (a) Any two of:

DNA	RNA
Large molecule	Smaller
Double stranded	Single stranded
Contains Thymine (T)	Contains Uracil (U)
Contains deoxyribose	Contains ribose

2 max

- (b) Base sequence (on DNA/in gene);Determines sequence of amino acids;By determining base sequence on (messenger) RNA;Code is a triplet code/three base code for an amino acid;

2 max

- (c) Pairs of chromosomes/two chromosomes;With genes for same features / with same genes;At same loci / in same sequence;

Accept same alleles

2 max

[6]

- M8.** (a) appropriately placed box;

1

- (b) (i) B;

- (ii) A;

2

- (c) (i) determines (sequence of) amino acids / specific protein produced / mRNA formation;

1

- (ii) hydrogen bonds;

1

- (iii) stability / protects bases / replication;

1

[6]

- M9.(a)** 1. Enzyme hydrolyses / breaks down protein to amino acids;

2. Products are soluble / can be washed away;

2

(b) **Arguments for biological washing powder:**

3 max if only arguments against biological washing powder are referred to

1. More effective with all stains;
Accept different ways of expressing 'effective' e.g. higher % of stain removed
2. Greater improvement with salad dressing / chocolate milkshake / chocolate pudding;

Arguments against biological washing powder:

3. Little / less improvement with raspberry sorbet / raspberry smoothie;
4. Only tested 5 / a small number of stains;
5. Only chose stains that would work / didn't select stains that wouldn't work;
6. Only included results that did work / didn't show results that didn't work;
7. Only one set of results / not repeated;
8. Only compared against one washing powder / may not be true for other washing powders;

Ignore references to unknown masses of powder, temperature of washes or other aspects of technique or different fabrics

4 max

- (c)
1. Enzyme **S** effective across a wider range of temperatures;
 2. Enzyme **S** *more* active above 50 °C / active up to 80 °C / active above 60 °C;
 3. Enzyme **S** more active below (about) 37 °C temperature;
 4. (Although) Enzyme **P** has higher rate of reaction at optimum / 40 – 50 °C;
 5. Enzyme **P** denatured above 50 °C;

*Answers should be in the context of choosing enzyme **S** but, if **P** is chosen, points 4 and 5 may still be awarded, if described*

In points 2 and 3, a temperature must be stated. Allow ± 5 degrees of values shown

3 max

- (d)
1. Stains caused by different substances;
 2. Enzymes are specific;
 3. Active site specific to substrate / other substrates cannot fit active site;
This could be expressed in other ways e.g. 'other substrates

are not complementary to the active site'

3
[12]

- M10.(a)** (i) (Human cells) don't have a cell wall;
Accept "they" refers to human cells. 1
- (ii) (Affects) protein synthesis;
Allow description e.g. 'amino acids not joined together / translation.
Reject: affects transcription. 1
- (b) 1. Mutation present / occurs;
Ignore antibiotic causes mutation.
2. Resistance gene / allele;
1. or 2.
Reference to immunity disqualifies first credited marking point.
3. Resistant bacteria (survive and) reproduce;
Reference to mitosis negates marking point 3. 2

[4]

- M11.** (a) Two suitable differences between DNA and RNA;
1 mark per correct row to 2 max

e.g.

DNA is double stranded, RNA is single stranded; DNA has thymine present, RNA has Uracil present;

Accept T and U

DNA is larger/heavier/longer, RNA is smaller/lighter/shorter; DNA has a deoxyribose sugar, RNA has a ribose sugar; DNA stays in the nucleus, RNA leaves the nucleus;

2 max

- (b) Three suitable examples;

e.g.

Carries coded information about the sequence of amino acids; Copied from DNA/gene; Code is in sequence of bases / triplet / three bases / a codon codes for one amino acid; Moves out of nucleus/goes into cytoplasm; To ribosomes;

Accept codons allow anticodons / tRNA to bind

*Accept carries 'start' and 'stop' codes
Accept moves through ribosomes*

3 max

[5]

- M12.**
- (a) (i) Increase to 30 °C / 31 °C and then decreases / optimum or max rate at 30 °C / 31 °C;
Accept: peak at 30 °C / 31 °C 1
- (ii) 1. Enzyme denatured / hydrogen bonds / bonds holding tertiary structure broken / tertiary structure changed;
2. Change in shape of active site (of enzymes);
3. Substrate / protein no longer fits / binds (into active site) / few or no ES complexes;
*1. Reject: Peptide bonds broken
Denatures active site = 2 marks for mp 1 and 2
2. Q Only allow second point if active site is used correctly
Accept: active site no longer complementary
3. Accept: Substrate cannot bind to enzyme* 3
- (b) (i) Use buffer / test pH (at end / at intervals);
*Accept a method of measuring pH.
Reject litmus.* 1
- (ii) (30 °C / 31 °C) Maximum rate / optimum temperature;
Accept other valid answers e.g. temp below 30 °C as enzyme not denatured. 1
- (iii) Works best at pH 6 / at higher pH activity decreases;
*Accept converse
Insufficient: pH 6 had largest clear area* 1

[7]