

Mark schemes

1

- (a) Box around single nucleotide.

1

- (b)

DNA strand	Percentage of each base			
	A	C	G	T
Strand 1	(16)	34	21	29
Strand 2	29	(21)	(34)	16

2 rows correct = 2 marks;

1 row correct = 1 mark.

2

- (c)
- Reference to DNA polymerase;
 - (Which is) specific;
 - Only complementary with / binds to 5' end (of strand);
Reject hydrogen bonds / base pairing
 - Shapes of 5' end and 3' end are different / description of how different.

4

[7]

2

- (a)
- Helicase;
 - Breaks hydrogen bonds;
 - Only one DNA strand acts as template;
 - RNA nucleotides attracted to exposed bases;
 - (Attraction) according to base pairing rule;
 - RNA polymerase joins (RNA) nucleotides together;
 - Pre-mRNA spliced to remove introns.

6 max

- (b)
- Polymer of amino acids;
 - Joined by peptide bonds;
 - Formed by condensation;
 - Primary structure is order of amino acids;
 - Secondary structure is folding of polypeptide chain due to hydrogen bonding;
Accept alpha helix / pleated sheet
 - Tertiary structure is 3-D folding due to hydrogen bonding and ionic / disulfide bonds;
 - Quaternary structure is two or more polypeptide chains.

5 max

- (c) 1. Hydrolysis of peptide bonds;
 2. Endopeptidases break polypeptides into smaller peptide chains;
 3. Exopeptidases remove terminal amino acids;
 4. Dipeptidases hydrolyse / break down dipeptides into amino acids.

4

[15]

3

- (a) 1. Calcium ions diffuse into myofibrils from (sarcoplasmic) reticulum;
 2. (Calcium ions) cause movement of tropomyosin (on actin);
 3. (This movement causes) exposure of the binding sites on the actin;
 4. Myosin heads attach to binding sites on actin;
 5. Hydrolysis of ATP (on myosin heads) causes myosin heads to bend;
 6. (Bending) pulling actin molecules;
 7. Attachment of a new ATP molecule to each myosin head causes myosin heads to detach (from actin sites).

5 max

- (b) 1. Releases relatively small amount of energy / little energy lost as heat;
Key concept is that little danger of thermal death of cells
2. Releases energy instantaneously;
Key concept is that energy is readily available
3. Phosphorylates other compounds, making them more reactive;
 4. Can be rapidly re-synthesised;
 5. Is not lost from / does not leave cells.

2 max

[7]

4

- (a) 1. Maltose;
 2. Salivary amylase breaks down starch.

2

(b) Maltase.

1

(c) (Mimics / reproduces) effect of stomach.

1

- (d) 1. Add boiled saliva;
 2. Everything same as experiment but salivary amylase denatured.

2

- (e) 1. Some starch already digested when chewing / in mouth;
 2. Faster digestion of chewed starch;
 3. Same amount of digestion without chewing at end.

Accept use of values from graph

3

[9]

5

(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 "malt ose"

3. To form enzyme substrate complex.

Accept E-S complex

3

[5]

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) 1. Fewer children / less likely that children with asthma eat fish;
Accept converse.
2. Fewer children / less likely that children with asthma eat oily fish;
MP1 and 2 – Allow use of numbers.
3. Little / only 2% / no difference in (children with or without asthma who eat) non-oily fish.
Do not accept arguments related to amount of fish eaten

3

- (b) 1. (Shake with) ethanol / alcohol;
1. Accept named alcohol
2. Then add (to) water;
2. Order must be correct
3. White / milky / cloudy (layer indicates oil).
3. Ignore forms emulsion as in stem
3. Ignore precipitate

3

[6]

8

- (a) (i) **(Both)**
- Are polymers / polysaccharides / are made of monomers / of monosaccharides;
 - Contain glucose / carbon, hydrogen and oxygen;
 - Contain glycosidic bonds;
 - Have 1–4 links;
Neutral: references to 'unbranched', insoluble, formed by condensation, flexible and rigid
Are made of the monomer glucose = MP 1 and 2 = 2 marks
 - Hydrogen bonding (within structure).
Ignore reference to H bonds between cellulose molecules

2 max

- (ii) (Starch)
- Contains α / alpha glucose;
Assume 'it' refers to starch
Accept: converse arguments only if linked directly to cellulose
Accept: forms α glycosidic bonds
 - Helical / coiled / compact / branched / not straight;
 - 1,6 bonds / 1,6 branching;
 - Glucoses / monomers same way up;
 - No H-bonds between molecules;
 - No (micro / macro) fibres / fibrils.

2 max

- (b) (i) 1. No / few organelles / very little cytoplasm / cytoplasm at edge / more room / hollow / large vacuole / large space / thick walls;
Accept strong walls for thick walls
2. (So) easier / more flow / (thick / strong walls) resist pressure.
Easier flow may be expressed in other ways e.g. lower resistance to flow

2

- (ii) 1. Mitochondria release energy / ATP / site of respiration;
Q *Reject: 'produce energy'*
but accept produce energy in form of ATP
2. For active transport / uptake against concentration gradient.
Note: no mark is awarded for simply naming an organelle
- OR:**
3. Ribosomes / rough endoplasmic reticulum produce(s) proteins;
Concept of making proteins needed
4. (Proteins) linked to transport e.g. carrier proteins / enzymes.

2

[8]

9

- (a) (i) Joins nucleotides (to form new strand).
Accept: joins sugar and phosphate / forms sugar-phosphate backbone
Reject: (DNA polymerase) forms base pairs / hydrogen bonds

1

- (ii) (Prokaryotic DNA)
1. Circular / non-linear (DNA);
Accept converse for eukaryotic DNA
Ignore: references to nucleus, binary fission, strands and plasmids
2. Not (associated) with proteins / histones;
Accept does not form chromosomes / chromatin
3. No introns / no non-coding DNA.
Accept only exons
Q *Neutral: no 'junk' DNA*

2 max

- (b) (i) 1. Have different genes;
Reject: different alleles
2. (Sobases / triplets) are in a different sequence / order;
Accept: base sequence that matters, not percentage
3. (So) different amino acid (sequence / coded for) / different protein / different polypeptide / different enzyme.
Unqualified 'different amino acids' does not gain a mark
Reject: references to different amino acids formed
Ignore: references to mutations / exons / non-coding / introns

2 max

(ii) (Virus DNA)

1. A does not equal T / G does not equal C;
Accept: similar for equal
Accept: virus has more C than G / has more A than T
2. (So) no base pairing;
3. (So) DNA is not double stranded / is single stranded.

2 max

[7]

10

- (a) 1. DNA replicated;
Reject: DNA replication in the wrong stage
2. (Involving) specific / accurate / complementary base-pairing;
Accept: semi conservative replication
3. (Ref to) two identical / sister chromatids;
4. Each chromatid / moves / is separated to (opposite) poles / ends of cell.
Reject: meiosis / homologous chromosomes / crossing over
Note: sister chromatids move to opposite poles / ends = 2 marks for mp 3 and mp 4
Reject: events in wrong phase / stage

4

- (b) (i) 1. To allow (more) light through;
Accept: transparent
2. A single / few layer(s) of cells to be viewed.
Accept: (thin) for better / easier stain penetration

2

- (ii) 1. More / faster mitosis / division near tip / at 0.2 mm;
Neutral: references to largest mitotic index
2. (Almost) no mitosis / division at / after 1.6 mm from tip;
Accept: cell division for mitosis
Penalise once for references to meiosis
3. (So) roots grow by mitosis / adding new cells to the tip.
Accept: growth occurs at / near / just behind the tip (of the root)
Accept: converse arguments

2 max

[8]