Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2012

Biology

Assessment Unit AS 1

assessing

Molecules and Cells

[AB111]

THURSDAY 7 JUNE, AFTERNOON

MARK SCHEME

/ denotes alternative points
; denotes separate points
Comments on mark values are given in bold
Comments on marking points are given in italics

Section A

1 Mitochondrion;
nucleus;
microvilli;
smooth endoplasmic reticulum/smooth ER;
middle lamella; [5] 5

2 **(a)** **(i)** Blue to purple/lilac; [1]

(ii) Benedict's (reagent); [1]

(b) A: protein;
B: glucose;
C: sucrose/non-reducing sugar;
D: fructose/maltose/lactose/galactose/reducing sugar other than glucose; [4] 6

3 **(a)** **(i)** Correct pairing of bases;
new strand antiparallel to existing strand; [2]

(ii) Cytosine = guanine = 21%;
Adenine and thymine both = (100 – 42) ÷ 2 = 29%; [2]

(b) **(i)** Restriction endonuclease; [1]

(ii) Gel electrophoresis; [1]

(c) Marker A: MRS/microsatellite repeat sequences/microsatellites/short tandem repeats;
Marker B: SNP/single nucleotide polymorphisms; [2] 8

BLE

4 (a) Any three from:

- cell lysed/burst
- as cell membrane cannot withstand the increased volume (due to water uptake)
- turgid/full turgor/cell swollen
- due to protoplasm pushing against the cell wall/presence of wall prevents further uptake [3]

(b) (i) It would be lower (inside the *Paramecium* cell)/higher outside the cell; [1]

(ii) The presence of more solutes will decrease the water potential inside the vacuole/removal of solutes from cytoplasm increases its water potential;
as the vacuole water potential becomes lower than that of the cytoplasm water is drawn in (by osmosis)/water leaves the cytoplasm (enters vacuole) because cytoplasm has a higher water potential; [2]

(iii) If these organisms do not regulate water content, they are likely to burst;
where a cell wall is present, entry of water is limited (by pressure potential)/contractile vacuoles allow excess water to be removed; [2] 8

5 (a) (i) 20; [1]

(ii) Male; [1]

(b) (i) Anaphase I;
homologous chromosomes are separated; [2]

(ii) Prophase I, **[$\frac{1}{2}$ mark]** crossing over takes place (between homologous chromosomes);
Metaphase I, **[$\frac{1}{2}$ mark]** bivalents assort independently/line up randomly (before being separated); [3]

(c) (i) Anaphase II; [1]

(ii) The breakdown of large molecules into sub-units;
where water is added; [2]

(iii) Amino acids/peptides; [1] 11

6 **(a)** Drawing marks awarded for the following points:
Shape of cell accurate and recognisable as cell **A** in the photograph;
cell and its neighbours in proportion to each other (e.g. where cells touch wall of neighbouring cell relevant length compared to cell **A**, chloroplast appropriate size);
appropriate organelles shown (e.g. peripheral cytoplasm, chloroplasts, possible nucleus, vacuole); [3]

Labels: **any four from**
- cell wall
- cell membrane
- nucleus
- chloroplasts
- thylakoids
- stroma
- intercellular spaces
- vacuole
- tonoplast
- cytoplasm
- middle lamella

[$\frac{1}{2}$ mark each] [2]

(b) Spongy mesophyll: intercellular air spaces evident/cells loosely packed;
Not epidermis: epidermal cells would not have chloroplasts/chloroplasts present in these cells/not a tightly packed layer of cells; [2]

(c) Calcium: to make calcium pectate (for cell walls)/middle lamella;
Magnesium: to make chlorophyll; [2]

(d) **Any two from**
- fungal cells lack chloroplasts/chlorophyll
- fungal cell walls made of chitin instead of cellulose
- fungal cells are multinucleate
- fungal cells store glycogen instead of starch
- fungal cells lack a large (central/sap) vacuole
- fungal cells have lysosomes
- fungal cells lack plasmodesmata
- fungal cells are heterotrophic/lysotrophic/not autotrophic [2] 11

7	(a)	(i)	Condensation (reaction); [1]		
		(ii)	1:3; [1]		
	(b)	(i)	**Any three from** • the enzyme's active site has a complementary fit to/is induced to fit the substrate shape • forming an enzyme-substrate complex/enzyme and substrate molecules must collide • the activation energy is lowered • the change in shape of the enzyme puts a strain on bonds (between glycerol and fatty acids)/glycerol and fatty acid (products) are released from the active site as they have a different shape to the substrate(s) [3]		
		(ii)	At temperatures above 60 °C, the ionic bonds/hydrogen bonds are broken; shape of active site is altered/binding sites are altered; [2]		
	(c)	(i)	Immobilisation decreases the maximum activity of the enzyme/activity at optimum pH (6.5); though increases the activity over a wider pH range; [2]		
		(ii)	Some enzymes when immobilised are inaccessible/may have a blocked active site; immobilised enzyme has increased stability/lower breakage of (ionic) bonds; [2]		11
			Section A		**60**

Section B

8 Thirteen points, with a maximum of seven from each section

Similarities and differences in structure:
- all three have (1,4) glycosidic links/formed by condensation reactions
- starch and glycogen contain alpha-glucose
- there are two components of starch, amylose and amylopectin
- in amylose the long chain of monomers is wound into a helix
- amylopectin is branched due to additional 1,6 (glycosidic) links
- glycogen is similar to amylopectin but more branched
- cellulose is composed of beta-glucose
- and forms straight chains (because every second glucose is 'upside-down')
- parallel chains are held together by hydrogen bonds/cross linkage

Role and distribution:
- starch and glycogen are both glucose/energy stores
- starch is found in chloroplasts/storage tissue (e.g. seeds/roots/tubers)
- glycogen is found in muscle/liver cells/fungi
- the helix/branching makes the molecules more compact (for storage)
- glycogen/amylopectin are more readily hydrolysed due to more terminal ends (for enzymes to work on)
- starch/glycogen are insoluble so exert no osmotic effect/cannot leach out of the cell
- cellulose offers tensile strength to plant cell walls
- layers of cellulose are arranged at varying angles to each other, which adds to the tensile strength [13]

Quality of written communication

2 marks:
The candidate expresses ideas clearly and fluently through well-linked sentences, which present relationships and not merely list features. Points are generally relevant and well-structured. There are few errors of grammar, punctuation and spelling.

1 mark:
The candidate expresses ideas clearly, if not always fluently. The account may stray from the point or may not indicate relationships. There are some errors of grammar, punctuation and spelling.

0 marks:
The candidate produces an account that is of doubtful relevance or obscurely presented with little evidence of linking ideas. Errors in grammar, punctuation and spelling are sufficiently intrusive to disrupt the understanding of the account. [2] 15

Section B **15**

Total **75**