Version 1.0

General Certificate of Education
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Biology BIOL1

Biology and disease

Final

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Although specific marks are not awarded in question 1-7, marks will take into account the quality of written communication. Credit will only be awarded where candidates have presented information clearly and coherently and have used the specialist vocabulary indicated in the mark scheme for this unit. Specific references to the quality of written communication are marked **Q** in this mark scheme.

Question	Marking guidance	Mark	Comments
1(a)	Capsule / glycocalyx / slime layer; Circular / ring of / non-linear DNA / DNA without histones; Plasmid; Flagellum; Pilus; Small / less dense / 70s ribosomes;	3 max	**Q** *Reject:* capsid *Neutral:* slime *Neutral:* mesosome *Accept:* cell wall if qualified as murein / peptidoglyclan *Neutral:* structures *absent* from prokaryotes
1(b)	Lower / more negative water potential (in lumen / intestine / gut); Water enters (intestine) / leaves (body) cells by osmosis;	2	**Q** Use of correct terminology. Do not credit references to 'water concentration'. *Neutral*: hypertonic instead of lower water potential *Neutral*: water does not leave lumen by osmosis Must be in the correct context.
1(c)(i)	Kills / destroys bacteria; ***OR*** Does not contain bacteria / removes bacteria / sterile / prevents bacteria entering body;	1	**Q** Do not allow 'kills germs' *Accept:* microorganisms / pathogens / examples *Neutral:* denatures bacterial enzymes *Neutral:* to make it easier to dissolve the powder *Reject:* denatures bacteria / kills toxins

1(c)(ii)	Sodium (ions) / potassium (ions) / chloride (ions) / citrate (ions);	1	**Q** *Reject*: chlorine *Neutral:* salts *Accept*: chlorine ions *Accept*: sodium chloride / salt *Neutral:* water *Neutral:* amino acids

Question	Marking guidance	Mark	Comments
2(a)(i)	(Lung volume) increases / reaches a maximum (at **B**);	1	Do not negate mark for 'breathing out' if qualified e.g. when (lung volume) decreases
2(a)(ii)	Flattens / lowers / moves down; (Diaphragm / muscle) contracts;	2	 *Reject:* second mark only if intercostal muscles cause the diaphragm to flatten
2(b)	Pulmonary ventilation = tidal volume × breathing rate; Breathing rate increases / more breaths per min (between **C** and **D**) / peaks get closer; <u>Tidal volume</u> / volume of air (inhaled) <u>per breath</u> increases (between **C** and **D**) / deeper breaths; (<u>Tidal volume</u> increase) qualified by data from graph e.g. approximate three-fold increase / appropriate calculation;	3 max	*Accept:* ventilation rate instead of breathing rate *Neutral:* breathing increases *Accept:* breathe quicker *Neutral: v*olume in lungs increases *Accept:* distance from bottom to top of peak increases for 'tidal volume increases' *Neutral:* higher peaks for 'tidal volume increases'

Question	Marking guidance	Mark	Comments
3(a)	Peptide;	1	**Q** Do not accept polypeptide *Neutral:* covalent
3(b)	(F) H J E (K);	2	All three boxes correct = 2 marks Two boxes correct = 1 mark
3(c)	(Site of aerobic) respiration; Release ATP / energy; Active transport / transport against the concentration gradient / protein synthesis / exocytosis;	2 max	**Q** *Reject*: anaerobic respiration **Q** *Reject*: produces / makes energy *Accept:* produces ATP for energy *Reject:* produces ATP for respiration *Neutral:* protein secretion
3(d)(i)	Breaks open cells / disrupts cell membrane / releases cell contents / releases organelles / break up cells;	1	*Reject:* breaks down cell wall *Neutral:* separates the cells *Reject:* breaks up cells so they can be separated *Reject:* breaks up / separates organelles
3(d)(ii)	Removes (cell) debris / complete cells / tissue;	1	*Neutral:* to isolate organelle **G** / mitochondria *Neutral:* removes unwanted substances / impurities *Reject:* removes organelles / cell walls
3(d)(iii)	Reduces / prevents enzyme activity;	1	*Reject:* ref. to denaturation

3(d)(iv)	Prevents osmosis / no (net) movement of water / water does not enter organelle / water does not leave organelle; So organelle / named organelle is not damaged / does not burst / does not shrivel;	2	*Neutral:* ref. to water potential **Q** Ref. to cells rather than organelles negates the second mark only *Reject:* ref. to turgid / flaccid for second mark *Reject:* organelle 'explodes' for second mark

Question	Marking guidance	Mark	Comments
4(a)	(yes): Many women (with cervical cancer) have HPV 16 (18 &31); (no): Few women (with cervical cancer) have HPV 6 /11; (HPV infection does not mean causation because): Could be caused by another factor / example given / may be due to coincidence; No control group / did not study HPV in healthy women / did not study all HPV types / having cancer may increase susceptibility to HPV / does not add up to 100% / not all women with cancer have HPV / individual may have more than one HPV type;	3 max	*Neutral:* correlation between HPV (16) and cervical cancer *Reject:* many women with HPV 16 (18 &31) have cervical cancer / not all women have cancer *Accept:* figures from graph for 'many' and 'few' *Accept:* minor errors in reading HPV frequencies from graph *Reject:* does not mean HPV vaccine causes cancer; *Neutral:* refs. to sample size and factors that should have been kept constant
4(b)(i)	Protein / glycoprotein / glycolipid / polysaccharide; Causes immune response / antibody production;	2	 *Accept:* B / T cell production
4(b)(ii)	Memory cells produced / remain / stored (from previous infection); (When individual) comes into contact with virus / antigen (again); Rapid / secondary / greater response / many or more antibodies produced; Destroys virus / antigen before it can cause harm / symptoms / cancer;	3 max	*Neutral:* antibodies produced / remain *Neutral:* 'cell' instead of 'virus' *Reject:* 'bacteria' once only *Accept:* B cells / T cells *Reject:* if destroys the virus / antigen *in the vaccine* before it can cause harm **Q** Do not allow 'fights HPV' **Q** Do not allow 'memory cells remember'

4(c)	HPV destroyed in males / prevents males being carriers of HPV; Prevents males passing on HPV (to unvaccinated females) / HPV may cause (other) cancers in males;	2	*Neutral:* prevents males catching HPV *Accept*: reference to herd effect protecting the population

Question	Marking guidance	Mark	Comments
5(a)	Active site; (Complementary / specific) structure / shape; (Only) fits / binds to gangliosides; Forms enzyme-substrate complexes; ***OR*** Active site; (Complementary / specific) structure / shape; (Does not) fit / bind with other lipids; Does not form enzyme-substrate complexes;	3 max	Note: 'active site has a specific shape' = 2 marks; *Reject*: same shape Second mark for either route can refer to the enzyme or the substrate *Accept:* converse of second mark point and (different) structure / shape if referring to other lipids
5(b)(i)	No change / substrate remains high / horizontal line;	1	Curve should be labelled If curve **H** correctly labelled then assume other is curve **T** *Reject:* obvious rise or fall / rise then plateau
5(b)(ii)	Curve decreases rapidly at first then more slowly;	1	Curve should be labelled If curve **T** correctly labelled then assume other is curve **H** *Reject*: falling at a slower rate initially
5(c)	(Enzymes are) proteins; Digested / broken down / destroyed (by enzymes / acid); ***OR*** (Enzymes are) too large; To cross cell membranes / be absorbed / enter the bloodstream;	2	*Accept:* denatured (by acid) *Neutral:* digested by saliva *Reject:* digested by amylase *Neutral:* will not reach the bloodstream

Question	Marking guidance	Mark	Comments
6(a)	Two suitable factors, e.g: Named dietary factor(s) / (cigarette) smoking / high blood pressure / gender / age / alcohol / genes / lack of exercise / obesity / stress;	2 max	*Neutral:* cholesterol *Accept:* two different dietary factors for 2 marks e.g. LDL and salt *Accept:* LDL or fatty material *Accept:* ethnicity / race for 'genes' *Accept:* overweight for 'obesity'
6(b)(i)	Healthy volunteers have 'normally' functioning vessels; ***OR*** Blood vessel / lumen / diameter not affected by other factors / is of normal size;	1	*Accept:* a valid ethical argument e.g. treatment does not harm healthy volunteers *Reject:* ref. to change in artery thickness *Accept:* converse arguments for unhealthy volunteers Must be related to *this* investigation *Neutral:* to ensure that that the results are due to the independent variable
6(b)(ii)	Avoids bias / selection (by scientists);	1	*Neutral:* ref. to having the same number / gender / age of people in each group;
6(c)(i)	Same as experimental group; Chocolate with no flavenoids;	2	*Neutral:* no dark chocolate *Neutral:* placebo *Reject:* milk chocolate *Neutral:* ref. to fair testing

6(c)(ii)	(To ensure that results are) not due to some other substance in the chocolate / due to flavenoids (only);	1	Must be related to *this* investigation *Neutral:* to ensure that that the results are due to the independent variable *Neutral:* to show results are not due to other factors *Neutral:* to show results are only due to the chocolate *Neutral:* to compare results for people who did and did not have flavenoids
6(d)	Coronary artery also likely to have a wide lumen; (Less chance of) high blood pressure; (Less chance of) a blood clot / thrombosis; (Less chance of) atheroma / description given;	3 max	 *Accept:* reduces blood pressure *Neutral:* (less chance of) a blockage

Question	Marking guidance	Mark	Comments
7(a)	1 (Simple / facilitated) <u>diffusion</u> from high to low concentration / down <u>concentration gradient</u>; 2 Small / non-polar / lipid-soluble molecules pass via phospholipids / bilayer; ***OR*** Large / polar / water-soluble molecules go through proteins; 3 <u>Water</u> moves by osmosis / from high water potential to low water potential / from less to more negative water potential; 4 <u>Active transport</u> is movement from low to high concentration / against <u>concentration gradient</u>; 5 Active transport / <u>facilitated diffusion</u> involves proteins / carriers; 6 Active transport requires energy / ATP; 7 Ref. to Na^+ / glucose co-transport;	5 max	**Q** Do not allow across / along / with concentration gradient *Reject:* named molecule passing through membrane by an incorrect route for point 2 *Accept*: diagrams if annotated Only penalise <u>once</u> if active transport is not named in point 4. e.g. 'movement against the concentration gradient involves proteins and requires ATP' = 2 marks *Accept:* facilitated diffusion involves channels for point 5 *Reject:* active transport involves channels for point 5 Credit ref. to endo/exocytosis as an alternative to point 7

7(b)	1	Many alveoli / alveoli <u>walls</u> folded provide a large surface area;	5 max	*Neutral:* alveoli provide a large surface area
	2	Many capillaries provide a large surface area;		*Neutral:* greater / better diffusion *Neutral:* fast gas exchange
	3	(So) fast <u>diffusion</u>;		Allow 'fast <u>diffusion</u>' only <u>once</u>
	4	Alveoli or capillary walls / epithelium / lining are thin / short distance between alveoli and blood;		*Reject*: thin membranes / cell walls *Accept:* one cell thick for 'thin'
	5	Flattened / squamous epithelium;		*Accept*: endothelial
	6	(So) short <u>diffusion</u> distance / pathway;		
	7	(So) fast <u>diffusion</u>;		
	8	Ventilation / circulation;		*Accept:* descriptions for ventilation / circulation
	9	Maintains a diffusion / concentration gradient;		Do not double penalise if description lacks detail e.g. thin membranes so a short diffusion distance = 1 mark
	10	(So) fast <u>diffusion</u>;		