A-LEVEL
BIOLOGY

BIOL1 –Biology and disease
Mark scheme

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Question	Marking Guidance	Mark	Comments
1(a)	1. Bilayer; 2. Hydrophobic / fatty acid / lipid (tails) to inside; 3. Polar / phosphate group / hydrophilic (head) to outside;	2 max	1. Accept double layer 1. Accept drawing which shows bilayer 2. & 3. need labels 2. & 3. accept water loving or hating
1(b)(i)	1. (Rough endoplasmic reticulum has) <u>ribosomes</u>; 2. To make protein (which an enzyme is);	2	1. accept "contains / stores" 2. Accept amino acids joined together / (poly)peptide 2. Reject makes amino acids 2. Ignore glycoprotein
1(b)(ii)	(Golgi apparatus) modifies (protein) **OR** packages / put into (Golgi) vesicles **OR** transport to cell surface / vacuole;	1	Accept protein has sugar added Reject protein synthesis Accept lysosome formation

Question	Marking Guidance	Mark	Comments
2(a)	**Two** suitable risk factors;; Examples, 1. Smoking; 2. High salt intake; 3. High (blood) cholesterol; 4. High blood pressure / stress; 5. Lack of exercise / obesity; 6. Heredity / genes / familial; 7. Gender; 8. Age;	2 max	Accept 2 reasonable factors 3. Accept high cholesterol in diet / intake 3. Accept high LDL 3. Diet high in saturated fat (Neutral lipid / diet)
2(b)	1. Reduced blood flow in coronary artery / coronary artery blocked; 2. Less / not enough / no oxygen; 3. Respiration drops / stops (so cells start to die);	3	QWC 1. accept clot in coronary artery 2. Accept less glucose 3. Ignore reference to energy production "less oxygen for respiration" = 2 marks

Question	Marking Guidance	Mark	Comments
3(a)	1. (Phagocyte engulfs) to form vacuole / vesicle / phagosome; 2. Lysosome empties contents into vacuole / vesicle / phagosome; 3. (Releasing) enzymes that digest / hydrolyse bacteria;	3	QWC 1. Accept surrounds bacteria with membrane 2. Accept joins / fuses 3. Ignore breakdown / destroy / lytic enzymes
3(b)	Two suitable structures;; <u>Examples</u>, 1. Cell wall; 2. Capsule / slime layer; 3. Circular DNA; 4. Naked DNA / DNA without histones; 5. Flagellum; 6. Plasmid; 7. Pilus; 8. 70s / smaller ribosomes; 9. Mesosome;	2 max	3. Reject "circular <u>chromosome</u>"

Question	Marking Guidance	Mark	Comments
4(a)(i)	Two of the following for 1 mark in any order 1. Microvilli; 2. Mitochondria; 3. Vesicles;	1 max	Must be structures so ignore "short diffusion pathways" 1. Reject villus / (micro)villus
4(a)(ii)	1. (Microvilli) increased / large / bigger (surface) area (for transport proteins / for diffusion); 2. (Mitochondria) to supply ATP/energy, for active transport / cotransport; 3. (Vesicles) to bring carrier proteins to membrane;	2 max	No double penalty for "Villus" from 4(a)(i) Must be clear links from structure to adaptation If link to 4)(a)(i) wrong but correct structure named in 4)(a)(ii) and then linked to correct adaptation then allow 2. Ignore references to "produce energy" 3. Accept vesicles allow endocytosis
4(b)	1. Lowers the water potential (of the cell); 2. Water moves (in) by osmosis;	2	1. Accept Ψ/WP 2. DQ "out"

Question	Marking Guidance	Mark	Comments
5(a)	1. Ventricle pressure rises **then** blood starts to flow into aorta; 2. (Because) pressure above that in aorta causes (aortic / semilunar) valve to open / pressure below that in aorta causes (aortic / semilunar) valve to be shut; 3. Ventricle pressure starts to fall **so** blood flow falls;	2 max	1. Accept times, eg ventricle pressure rises at 0.3 (25) seconds, followed by blood flow into aorta at 0.35 / 0.4 seconds 1. **Idea of sequence is essential** Accept times 3. **Idea of sequence is essential**
5(b)	1. Thickness of wall increases **because** ventricle (wall) contracts; 2. Contraction **causes** the increase in pressure;	2	1. must be idea that increase in thickness is linked to contraction 1. accept muscle for ventricle and systole for muscle contraction 2. Accept <u>thickening</u> of wall
5(c)	1. Between 120 ± 5;; 2. Length of cardiac cycle correct but final answer wrong;	2	2 marks for correct answer 1. length of cycles varies slightly 2. Length of cardiac cycle = 0.45 - 0.52

Question	Marking Guidance	Mark	Comments
6(a)	1. To show the effect of the inhibitor / drug; 2. To show the effect of yoghurt (on its own does not affect blood glucose);	2	
6(b)	1. Food is a factor affecting blood glucose / different foods contain different amounts of starch / glucose / sugar / carbohydrate; 2. To keep starch / fibre intake the same / similar;	2	1. accept converse 2. accept something in food which affects the inhibitor
6(c)	1. Fewer E-S complexes formed; 2. (With inhibitor) less / no starch digested to maltose ; 3. (So) less / no glucose from maltose; 4. (So) less absorption of glucose (from gut);	2 max	2. require knowledge that maltose comes from starch 3. require knowledge that glucose comes from maltose 3. accept no glucose

6(d)	**Suitable reason; with explanation;** Paired responses – do not mix and match <u>Examples</u>, 1. Need larger sample / only 30 mice / only 15 mice in each group; 2. Might not be representative / anomalies might have a bigger or smaller effect; ***OR*** 3. Investigation only lasted 20 days; 4. Can't see what longer term effects are; ***OR*** 5. Fall in blood glucose is small / numbers from graph; 6. Mice with inhibitor still have a large rise in blood glucose / so don't know if differences significant; ***OR*** 7. No stats / SDs / SEs; 8. So don't know if differences significant; ***OR*** 9. Blood glucose could continue to fall; 10. which could be harmful; ***OR*** 11. No group without yoghurt; 12. So cannot compare to other groups;	2 max	Ignore references to correlation does not prove causation, it could be due to other factors 1. accept small sample size 2. accept mean not reliable 3. experiment was not long enough 6. accept differences are due to chance

Question	Marking Guidance	Mark	Comments
7(a)	1. FEV falls / drops with age (even without TB); 2. FEV falls faster / drops further / is lower (with age) with TB / greater drop in FEV with TB; 3. FEV falls fastest / drops furthest / is lowest in those who had TB twice (R); 4. Results for TB once (Q) start in early twenties and for TB twice (R) in late twenties / from 30;	3 max	2."Fall in FEV" insufficient 3. worth 2 marks as subsumes point 2 3. the more times they have had TB = twice **"The more times they have had TB, the lower their FEV" = <u>2 marks</u>**
7(b)	(Fibrosis causes / due to), 1. Development of scar tissue / scarring / connective tissue; 2. Loss of elasticity / elastic tissue / elastin in lungs; 3. Restricts inhalation; 4. Breathe out less / reduced FEV due to reduced lung elasticity / scar tissue does not recoil / is not elastic / lung tissue does not recoil;	3 max	FEV depends on how much can be inhaled – as well as ability to exhale 3. Accept resists expansion / lung capacity drops

Question	Marking Guidance	Mark	Comments
8(a)(i)	(**Whole-cell vaccine**), 1. Heat(ing) supposed to kill bacteria; 2. Some might be alive / active/ viable; 3. (If so) bacteria could reproduce; 4. Bacterium makes or contains toxin; 5. Toxin might not be affected / all destroyed by heat; 6. Bacteria or toxins attacking / killing person's cells;	3 max	Accept converse statements for other vaccine Reject references to the vaccine being alive or the disease reproducing etc 2. Accept active pathogens present
8(a)(ii)	(**Whole-cell vaccine**), 1. (Contains) many different / greater range of antigens; 2. Each antigen causes its own immune response / production of / has a specific (type of) antibody;	2	Ignore references to more / greater antigens unqualified. It is the <u>variety</u> of antigens that matters
8(b)	1. Only patients who had whooping cough have toxin / antibody / immune response; 2. Toxin is an antigen; 3. Toxin (only) produced by this bacterium; 4. Leading to presence of specific antibody; 5. Only 4% had this antibody / 13% did not have antibody;	3 max	1. Accept converse e.g. those without antibody had another disease 4. accept complementary antibody 5. must use numbers
8(c)	1. There may not be large rises; 2. Might be the result of wrong diagnosis / reference to difference in figures / 13% diagnosed with whooping cough didn't have it;	2	2. Ignore reference to new strains or antigenic variability

Question	Marking Guidance	Mark	Comments
9(a)	1. Tertiary structure / 3D shape of enzyme (means); 2. Active site complementary to maltose / substrate / maltose fits into active site / active site and substrate fit like a lock and key; 3. Description of induced fit; 4. Enzyme is a catalyst; 5. Lowers activation energy / energy required for reaction; 6. By forming enzyme-substrate complex;	5 max	1. Accept references to active site 2. Idea of shapes fitting together 5. Accept "provides alternative pathway for the reaction at a lower energy level" 6 Accept idea that binding stresses the bonds so more easily broken **Do not award point 6 simply for any reference to E-S complex**

9(b)	1. Inhibitors reduce binding of enzyme to substrate / prevent formation of ES complex; **(Competitive inhibition),** 2. Inhibitor similar shape (idea) to substrate; 3. (binds) in to active site (of enzyme); 4. (Inhibition) can be overcome by more substrate; **(Non-competitive inhibition),** 5. Inhibitor binds to site on enzyme other than active site; 6. Prevents formation of active site / changes (shape of) active site; 7. Cannot be overcome by adding more substrate;	5 max	Max 3 if only one type of inhibition dealt with Accept maltase and maltose as examples of enzyme and substrate (and others) 1. only once, for either inhibitor 3. Accept allows max rate of reaction to be reached / max product will eventually be formed 3. Accept complementary to active site 6. Accept does not allow max rate of reaction to be reached / max product will not be formed