

Question	Answer	Marks
3(a)	<p>irregular / plates / AW, of cartilage ; A cartilage not C-shaped rings</p> <p><i>other features</i> <i>any two from:</i> smooth muscle ; elastic, tissue / fibres ; mucous glands ; thick wall / wall many layers ; large lumen (relative to thickness of wall) ; large size relative to surrounding alveoli ; I surrounded by alveoli</p>	3
3(b)	<p><i>evidence must match stated structure</i></p> <p>blood vessel ; <i>plus any one from:</i> presence of tunica media / circular layers of smooth muscle ; three layers in wall ; similar to structure on left, which has blood cells ; not bronchiole, qualified ; e.g. as no ciliated epithelium not rounded shape / no definite shape</p> <p>OR</p> <p>artery ; A arteriole <i>plus any one from:</i> small lumen relative to thickness of wall ; A small lumen with thick wall thick, tunica media / muscle layer ; thick tunica externa ;</p> <p>OR</p> <p>vein ; <i>plus any one from:</i> no definite shape / not rounded / not oval / AW ; large lumen relative to thickness of wall / large lumen and thin wall ; thin tunica media ;</p>	2
3(c)	<p>goblet cells, produce / secrete / AW, mucus to trap, pathogens / AW ; A dust / dirt / particles etc for AW</p> <p>cilia, waft / moves / carries / push, mucus, to back of throat / AW ;</p>	2

Question	Answer	Marks
4(a)(i)	<p><i>any three from:</i></p> <p>I heterochromatin / euchromatin envelope / two membranes / double membrane / inner and outer membrane ; nuclear pores ; A pores in nuclear envelope <i>for two marks</i> (outer surface of) outer membrane with ribosomes ; <i>ref. to</i> (outer nuclear) <u>membrane</u> continuous with RER ; R inner membrane</p> <p>AVP ; e.g. perinuclear space A intermembranous space pore complexes</p>	3
4(a)(ii)	<p><i>any two from:</i></p> <p>resolution / resolving power, is, low / lower / poor / AW / 200 nm / 0.2 μm ; (A range 100–300 nm) A electron microscope has a higher resolution further detail ; e.g. ribosomes / ER, smaller than 200 nm can only see cell structures greater than (limit of) resolution cannot see structures smaller than 200 nm cell structures too small for the resolution (<i>needs ref. to resolution</i>) cell structures, too small to / do not, interfere with light waves ; AW</p>	2
4(b)	<p>if letter used in more than one row, R these rows correct interphase knowledge G2 = A, S = B, G1 = blank ; <i>cytokinesis</i> blank ; <i>prophase</i> C ; <i>anaphase</i> E ; <i>telophase</i> D ;</p>	5
4(c)	<p><i>any three from:</i></p> <p><i>large numbers of B-lymphocytes / plasma cells (in primary immune response)</i></p> <p>1 large quantity of (specific) antibody, produced / released or (large quantity of) antibody to form antibody-antigen complexes / to bind antigen (for phagocytosis) / AW ;</p> <p><i>large numbers of memory B-lymphocytes so</i></p> <p>2 provide long term <u>immunity</u> / memory cells long-lived / provides immunological memory ; A remain in, circulation (for a long time) AW</p> <p>3 able to produce fast(er), secondary (immune) response ; A second response will be fast(er) A immune response faster on second encounter (with antigen / pathogen) / AW</p> <p>4 higher concentration / faster production, of antibodies (than primary response) ; I 'more' alone</p> <p>5 person does not have, symptoms / become ill (of / from, same disease) ; A presence of same, pathogen / antigen, does not cause disease</p> <p>6 AVP ; memory cells can (divide to) produce plasma cells more plasma cells present than primary response able to form more memory cells</p>	3

Question	Answer	Marks
4(d)	<p><i>any two from:</i> immune response / antibodies produced, against, self antigens ; I immune system attacks self A autoimmunity / autoimmune disease</p> <p><i>idea that faulty B-lymphocytes not destroyed ;</i> A <i>ref. to T-lymphocytes if in correct context</i></p> <p>(specific) antibody, binds to / acts on / AW, self-antigen / receptor, on the (cell surface membranes of) muscle cells / at neuromuscular junction ; A antibody binds to acetylcholine receptors</p> <p><i>ref. to consequence to muscle cells ; e.g.(nerve) impulse conduction impaired action of transmitter substance hindered</i></p>	2

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5(a)	fructose ; I α or β	1
5(b)	<p><i>any two from:</i> formation of enzyme-substrate complex / substrate fits into active site ; A substrate binds to active site</p> <p>(so) reactants held close together (e.g. for bond formation) ; lowers, <u>activation energy</u> / <u>energy of activation</u> ; A E_a / A_e</p> <p><i>can award annotated on a sketch detail ; e.g. transfer of electrons strain on bonds alternative pathway holds substrate in a way that the bonds needed to be broken are exposed</i></p>	2
5(c)	<p>I <i>ref. to denaturation, either mp2 or mp10 can be awarded</i></p> <p><i>any four from:</i> <i>immobilised</i></p> <p>1 higher optimum temperature ; AW e.g. peak / max activity / 100% activity ;</p> <p>2 74 / 75 / 76°C, v, 56 / 57 / 58 / 59°C ; A one correct value and calculation e.g. 17°C lower</p> <p>3 <i>idea that greater range of pH with, higher activity / greater stability ; AW allow use of comparative data at one pH value to support if answer unclear</i></p> <p>4 <i>idea that if pH changes, less effect on enzyme activity ;</i> A resists changes in pH</p> <p>5 <i>ref. to more active at, higher temperatures / temperatures above 68°C ;</i> A more thermostable / less effect on enzyme at higher temperatures A free enzyme not active above 70°C <i>allow use of comparative data at one temperature to support if answer unclear</i></p>	

Question	Answer	Marks
5(c)	<p>6 one advantage of immobilised ; e.g. reusable</p> <ul style="list-style-type: none"> ○ less / no, contamination of product (by enzyme) ○ easier, downstream processing / separation of enzyme from product ○ longer shelf-life useful if enzyme, difficult to obtain A ref. to cost effective ○ can use in continuous processes so more productive ○ suggestion that (can carry out process at) lower pH (more acid conditions and) may be more effective against microorganisms <p><i>free enzyme</i></p> <p>7 higher activity, at lower temperatures / between 35°C to 68°C ; <i>in context of a range, quoting one temperature not enough</i></p> <p>8 two temperatures, comparative values for both enzymes to support mp7 ;</p> <p>9 optimum temperature lower so cheaper maintaining that temperature ; AW A lower temperatures cost efficient to maintain and enzyme works well / AW</p> <p>10 (values of optimum) 74 / 75 / 76°C, v, 56 / 57 / 58 / 59°C ; A calculation, e.g. 17°C lower</p> <p>11 lower optimum temperature still high enough to kill microorganisms ;</p>	
6(a)(i)	<p>same shape <u>and</u> shift to the right ; <i>must start to rise within 2 small squares of 0 and end at or near to existing curve</i></p>	1
6(a)(ii)	<p><i>max 2 if concept of more not mentioned in response</i> <i>any three from:</i></p> <p>1 actively respiring tissue means more carbon dioxide ;</p> <p>2 increase in, formation of carbonic acid / dissociation of carbonic acid / hydrogen ions, (in the red blood cell) ; A from equation</p> <p>3 more hydrogen ions, bind to haemoglobin / form haemoglobin acid ; A HHb</p> <p>4 (causes) more oxygen (to be), unloaded / dissociated / AW (from haemoglobin); I <i>ref. to faster / quicker</i> I <i>incorrect ref. to affinity causing unloading, e.g. CO₂</i> A lower (percentage) saturation of haemoglobin with oxygen A oxygen released, more easily / readily from haemoglobin</p> <p>5 haemoglobin <u>affinity</u> for oxygen decreases ;</p> <p>6 more oxygen to meet demand for (aerobic / cellular) <u>respiration</u> ; AW I more oxygen for respiring tissues</p>	3

Question	Answer	Marks
6(b)	<p>CO₂ = (passive / simple) diffusion ; HCO₃⁻ = <u>facilitated</u> diffusion ;</p> <p>I ref. to size CO₂ is, non-polar / not charged / not ionic <u>and</u> can cross, hydrophobic core / phospholipid bilayer ; HCO₃⁻ is, charged / ionic / hydrophilic <u>and</u> (needs to) cross, via, transport / carrier, protein ; A channel protein</p> <p><i>if explanation mps not gained, allow 1 mark for CO₂ is, non-polar / not charged / not ionic <u>and</u> HCO₃⁻ is, charged / ionic / hydrophilic</i></p>	4

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