

1)

(a)(i)	Hydrolysis;	1	Accept phonetic spelling. Ignore reaction.
a)(ii)	(Alpha) glucose;	1	Accept α glucose. Reject β glucose / beta glucose
(b)(i)	Add Benedict's (reagent) <u>and</u> heat / warm; Red/orange/yellow/green (colour);	2	Reject Add HCl Accept brown, reject other colours
b)(ii)	2 products / 2 sugars produced;	1	Look for idea of <u>two</u> Accept named monosaccharides produced. "More" insufficient for mark Neutral if incorrect products named Neutral "lactose is a polysaccharide" Neutral "lactose is not a reducing sugar" Neutral: Reference to surface area.
1(c)	1. Galactose is a similar shape / structure to <u>lactose</u> /both complementary; 2. (Inhibitor / Galactose) fits into / enters / binds with <u>active site</u> (of enzyme); 3. Prevents/less substrate fitting into / binding with (active site) / fewer or no E-S complexes;	2 max	1. Q Reject: <u>Same</u> shape / structure 2. Accept blocks active site Look for principles: 1 Shape 2 Binding to active site 3 Consequence
(d)	Low / decreased <u>water potential</u> (in gut); Water enters gut / lumen / leaves cells by <u>osmosis</u> ;	2	Neutral ref to concentrations Accept ψ for water potential

2)

(a)(i)	Increase to 30°C/31°C <u>and</u> then decreases / optimum or max rate at 30°C/31°C;	1	Accept: peak at 30°C/31°C
a)(ii)	1. Enzyme denatured / hydrogen bonds/bonds holding tertiary structure broken / tertiary structure changed; 2. Change in shape of <u>active site</u> (of enzymes); 3. Substrate / protein no longer fits / binds (into active site) / few or no ES complexes; 4. More enzyme (molecules) denatured as temperature increased;	3 max	1. Reject: Peptide bonds broken Denatures active site = 2 marks for mp 1 and 2 2. Q Only allow second point if active site is used correctly Accept: active site no longer complementary 3. Accept: Substrate cannot bind to enzyme
(b)(i)	Use <u>buffer</u> / test pH (at end/ at intervals);	1	Accept a method of measuring pH. Reject litmus.
b)(ii)	(30°C/31°C)Maximum rate / optimum temperature;	1	Accept other valid answers e.g. temp below 30°C as enzyme not denatured.
b)(iii)	Works best at pH 6 / at higher pH activity decreases;	1	Accept converse Insufficient: pH 6 had largest clear area

3)

i(a)	1. Uses energy / ATP; 2. Against concentration gradient / low to high concentration; 3. Does not use channel proteins / <u>only</u> uses carrier proteins;	2 max	Assume "it" refers to active transport. 1. Facilitated diffusion is passive - neutral 2. Along / across concentration gradient- neutral Accept up/ down concentration gradient Accept AT does not need concentration gradient.
b)(i)	To see the effect of the drug / effect not due to anything else in the tablet;	1	Neutral "to compare results"
b)(ii)	Placebo / dummy drug / tablet without drug; (Otherwise) treated the same;	2	No drug - neutral Accept: Example e.g. tablet given at same time
i(c)	Decrease for 3 hours;	1	Accept decreases from 1 - 4 hours

4)

(a)	<ol style="list-style-type: none"> 1. <u>Coronary</u> artery / vessel is blocked/narrows; 2. Restricts oxygen supply to heart muscle / cells / tissue; 3. Prevents respiration / ATP production / or (heart) muscle / tissues/cells die; 	3 max	<ol style="list-style-type: none"> 1. Q Do not accept references to veins or capillaries. 3. Do not accept "Heart dies"
b)(i)	<p>Protein on (surface of) <u>chlamydia</u>;</p> <p>That initiates an immune response (in mice) / causes antibody production;</p>	2	<p>Neutral "foreign protein"</p> <p>Do not accept glycoprotein.</p> <ol style="list-style-type: none"> 2. Accept description of initiating immune response.
b)(ii)	<ol style="list-style-type: none"> 1. Antibodies/memory cells against chlamydia (protein/antigen) are present; 2. Protein on heart (muscle) similar to chlamydia protein/antigen; 3. T cells / antibodies (attack heart muscle cells); 	2 max	<ol style="list-style-type: none"> 2. Look for idea that both proteins are similar 3. Detail of what is attacking the heart muscle cells
(c)	<p>FOR</p> <ol style="list-style-type: none"> 1. Prevents / reduces heart disease/attacks; 2. Cheaper to vaccinate than treat heart disease; <p>AGAINST</p> <ol style="list-style-type: none"> 3. Vaccination costly; 4. Don't know frequency of chlamydia infection; 5. Research in mice might not be replicated in humans / humans might have a different protein; 6. Vaccine could cause heart disease or immune response against heart (muscle); 	3 max	<p>2 max for arguments against</p> <p>Accept other valid answers</p>

5)

(a)	<ol style="list-style-type: none"> 1. Phagocyte attracted to bacteria by chemicals / recognise antigens on bacteria as foreign; 2. Engulf/ingest bacteria; 3. Bacteria in vacuole / vesicle; 4. Lysosome fuses with / empties enzymes into vacuole; 5. Bacteria digested / hydrolysed; 	4 max	<ol style="list-style-type: none"> 1. Accept names chemical e.g. toxin 2. Allow description of engulfing 3. Accept: bacteria in phagosome. 5. Neutral: Break down 5. Accept digestive enzymes destroy bacteria 5. Do not accept "destroy bacteria" as it is in question stem
(b)	<ol style="list-style-type: none"> 1. Microvilli; 2. Large/increased surface area; 3. Many mitochondria; 4. (Mitochondria/respiration) produce ATP / release or provide energy (for active transport); 5. Carrier proteins for active transport; 6. Channel / carrier proteins for facilitated diffusion; 7. <u>Co-transport</u> of sodium (ions) and glucose or symport / carrier protein for sodium (ions) and glucose; 8. Membrane-bound enzymes digest disaccharides / produce glucose 	6 max	<ol style="list-style-type: none"> 1. Reject villi on epithelial cells 1. Accept brush border 2. Accept large SA:vol ratio 3. Need idea of "lots" 4. Reject: energy produced 5. Accept Na⁺K⁺ pump 7. Neutral: Channel proteins 8. Accept named example

6)

(a)	In one country where the percentage of fat (in the diet) is 35%, the death rate (from breast cancer) is 20 per 100 000;	1	<u>Must</u> have reference to country Accept1 per 5 000 / 0.02%
(b)	1. No. of deaths from breast cancer divided by total population $\times 100\,000$; 2. No. of deaths from breast cancer divided by all deaths $\times 100\,000$; 3. Sample and count deaths from breast cancer in 100 000 people;	1 max	If sample not 100 000 then must scale appropriately
(c)	1. Positive correlation; 2. But correlation does not show causation / some other (named) factor may be involved; 3. Evidence against positive correlation e.g. different death rates at same % fat / similar death rates at different % fat / some countries with higher death rate have lower fat intake;	3	1. Accept description of positive correlation / directly proportional. Accept positive relationship. 2. Do not accept casual in place of causal. 3. Answer must be consistent with data.

7)

l(a)	1. Crush/grind; 2. With ethanol/ alcohol; 3. Then add water/then add to water; 4. Forms emulsion / goes white/cloudy;	3	2 Water must be added <u>after</u> ethanol for third mark. 4 Do not accept carry out emulsion test.
b(i)	4/four;	1	
b(ii)	1. Phosphate/ PO_4 ; 2. Instead of one of the fatty acids / and two fatty acids;	2	"It" refers to phospholipid. 1 Accept minor errors in formula. Do not accept phosphorus/phosphorus group.
b(iii)	1. Double bonds (present); 2. Some/two carbons with only one hydrogen / (double bonds) between carbon atoms / not saturated with hydrogen; 3. In (fatty acid) C/3;	2 max	Answer refers to unsaturated unless otherwise clearly indicated. 1 and 2. May be shown in appropriate diagram.

8)

4(a)	Something that increases chance / increases probability / makes it more likely;	1	
(b)(i)	1976 –/to/and 1980;	1	
(b)(ii)	1980 –/to/and 1996;	1	
4(c)	<ol style="list-style-type: none"> 1. Correlation does not mean that there is a causal relationship; 2. May be some other factor/named factor; 3. Associated with vehicles and asthma / producing rise in both; 4. (After 1980) asthma continues to rise but exhaust concentration falls / negative correlation (after 1980); 	3 max	1. Do not accept casual

9)

3(a)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> </table>	✓	✓	✓	✓				✓	✓	3	<p>Mark across, one mark for each correct row.</p> <p>If crosses are used and no ticks, accept cross as equivalent to tick.</p> <p>If crosses are used as well as ticks, mark tick only.</p>
✓	✓	✓										
✓												
	✓	✓										
(b)(i)	<ol style="list-style-type: none"> 1. Mitochondria respire; 2. Release energy/ produce ATP; 3. Transport against gradient; <p style="text-align: center;"><i>OR</i></p> <ol style="list-style-type: none"> 4. Infolding of membrane; 5. Increases area; 6. More proteins for active transport; 	2 max	<ol style="list-style-type: none"> 2. Do not credit make energy 3. Do not credit active transport as this is given in question. 3. Do not accept diffusion against. 4. Reject microvilli but if mentioned can still accept points 5 and 6. 									
(b)(ii)	<ol style="list-style-type: none"> 1. Ribosomes make proteins/ enzymes; 2. Enzymes are proteins; <p style="text-align: center;"><i>OR</i></p> <ol style="list-style-type: none"> 3. Mitochondria respire; 4. Release energy/produce ATP; 5. (Energy/ATP) for protein / enzyme synthesis; 	2	Ignore references to Golgi or rough ER.									
(b)(iii)	Microvilli increase area / have large area;	1	Ignore references to other properties of microvilli.									

10)

(a)	Has more than one/four polypeptide chains / made up of polypeptide chains;	1	
(b)	<ol style="list-style-type: none"> 1. Antibody/variable region has specific amino acid sequence/primary structure; 2. The shape/tertiary structure of the binding site; 3. Complementary to/fits/binds with these antigens; 4. Forms complex between antigen and antibody; 	3 max	<p>2 Do not accept active site for this point.</p> <p>3 Accept active site for this point.</p>