

- 1 (a) ref. to biological ;  
catalyst AW ;  
ref. to protein nature AW ; **[max. 2]**
- (b) (i) ref. to stains may be protein / fat / not removable with detergent only AW ;  
ref. to presence of lipase ;  
breaks down fat (stain) + to form fatty acids and glycerol ;  
ref. to presence of protease ;  
breaks down protein (stain) + to form amino acids ;  
ref. to products being soluble AW ; **[max. 3]**
- (ii) high temperature denatures enzymes ;  
so enzymes will not work AW ;  
low temperature + enzymes work slowly AW ;  
appropriate explanation e.g. ref to kinetic energy of molecules ;  
ref, to constant temperature maintains optimum conditions AW ; **[max. 3]**
- (iii) **TEMPERATURE AND EXPLANATION NEEDED FOR THE MARK**  
around 37°C + ref. to optimum temperature for enzyme action ;  
Ⓐ refs. to higher temperatures (up to 70°C with suitable explanation e.g.  
modified to withstand high temperatures) **[1]**
- (c) ref. to fermenter ;  
ref. to source of enzyme e.g. yeast / fungus / bacteria ;  
ref. to feedstock / starch solution ;  
ref. to suitable conditions – air bubbled ;  
ref. to suitable conditions – stirring ;  
ref. to intracellular enzymes + microbes filtered ;  
then crushed and extracted ;  
ref. to extracellular enzymes + extracted from filtered feedstock ; **[max. 4]**
- [max. 13]**

<p>2 (a)</p>	<p><i>method of pollination:</i> wind ;</p> <p><i>explanation to max 2:</i> Feathery / AW, stigma ; long, filament ; large, anthers / stamens ; anthers / stamens, hang outside flower ; anthers loosely attached (to filament) ; light pollen ; no petals ;</p>	<p>[1] +</p> <p>max [3]</p>	<p><b>A</b> 'only bracts'</p>
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Question	Answer	Marks	Additional Guidance
2 (b)	cross (pollination) ;	[1]	
(c)	pollen tube ; delivers male gamete / pollen nucleus / male nucleus to ovule ; AW	[2]	<b>A</b> female gamete/egg/female nucleus/ovum.
(d)	<i>idea that</i> tip of pollen tube opens / AW ; gametes / sex cells / ova and pollen nuclei fuse / join / combine ; formation of zygote ; diploid ;	max [2]	<b>A</b> male nucleus for pollen nucleus <b>ignore</b> pollen unqualified <b>ignore</b> meet / mix
(e) (i)	ovule ;	[1]	
(ii)	ovary (wall) ;	[1]	
(iii)	colonise new areas ; reduce (intraspecific) competition ; reduce inbreeding ; <b>ora</b>	max [1]	
(f)	stored food / food reserves (in seed) broken down ; named enzyme plus substrate ; product plus use ; enzymes required in process of respiration ;	max [2]	
		<b>[Total:13]</b>	

Question	Answer	Marks	Additional Guidance												
3 (a)	<p><b>A</b> – (waxy) cuticle;  <b>B</b> – palisade mesophyll / palisade layer / palisade cell;  <b>C</b> – (lower) epidermis / epidermal layer;  <b>D</b> – stoma / stomata / guard cell(s);  <b>E</b> – air / gas, space;</p>	<b>5</b>	<p><b>I</b> outer layer / AW  <b>R</b> mesophyll / palisade unqualified</p> <p><b>R</b> (spongy) mesophyll</p>												
(b)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th data-bbox="365 520 1025 621">function</th> <th data-bbox="1025 520 1252 621">letter from Fig. 1.2</th> </tr> </thead> <tbody> <tr> <td data-bbox="365 621 1025 719">controls movement of substances into and out of the cell</td> <td data-bbox="1025 621 1252 719" style="text-align: center;"><b>G</b></td> </tr> <tr> <td data-bbox="365 719 1025 817">creates a pressure to maintain the shape of the cell</td> <td data-bbox="1025 719 1252 817" style="text-align: center;"><b>K</b></td> </tr> <tr> <td data-bbox="365 817 1025 916">produces sugars using light as a source of energy</td> <td data-bbox="1025 817 1252 916" style="text-align: center;"><b>L</b></td> </tr> <tr> <td data-bbox="365 916 1025 979">withstands the internal pressure of the cell</td> <td data-bbox="1025 916 1252 979" style="text-align: center;"><b>J</b></td> </tr> <tr> <td data-bbox="365 979 1025 1044">controls all the activities of the cell</td> <td data-bbox="1025 979 1252 1044" style="text-align: center;"><b>F</b></td> </tr> </tbody> </table>	function	letter from Fig. 1.2	controls movement of substances into and out of the cell	<b>G</b>	creates a pressure to maintain the shape of the cell	<b>K</b>	produces sugars using light as a source of energy	<b>L</b>	withstands the internal pressure of the cell	<b>J</b>	controls all the activities of the cell	<b>F</b>	<b>5</b>	
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Question	Answer	Marks	Guidance for Examiners
3 (c) (i)	volume of, oxygen / gas, increases (with time); levels off / reaches a plateau / AW; increases rapidly at start and then slows down; use of data;	max 3	I 'reaction stops'  e.g. levels off at 6.2 cm <sup>3</sup> of oxygen at 90 seconds data quotes must have units
(ii)	substrate / hydrogen peroxide / reactant / AW, fits into enzyme; active site; shape is, complementary / AW; any reference to lock and key; product(s) / oxygen and water, formed and leaves the enzyme; AVP;	max 3	A answers in the context of catalase I 'speeds up the reaction' R if shape is the same  A product and enzyme separate e.g. enzyme can work again / enzyme not used up / enzyme is not changed during reaction / lowers activation energy
		[Total: 16]	

4	(a)	(i)	amylase <b>A</b> carbohydrase	[1]	<b>Ig</b> odd spelling
		(ii)	<ol style="list-style-type: none"> <li>1 starch is not soluble / large /complex</li> <li>2 fungus does not, secrete / produce, amylase</li> <li>3 for absorption (of glucose) / AW</li> <li>4 ref to, respiration / growth, (of fungus)</li> <li>5 as nutrient, for fungus / fermentation / AW</li> </ol>	[max 2]	Mpt 2 <b>A</b> ecf from (i) / carbohydrase / enzyme to digest starch
	(b)		<ol style="list-style-type: none"> <li>1 other fungi / bacteria / virus / other microorganisms</li> <li>2 compete for nutrients</li> <li>3 reduce productivity / yield / quality</li> <li>4 contaminate the product / produce toxic <i>or</i> harmful product / ORA</li> <li>5 stop the process (early) and sterilise fermenter</li> </ol>	[max 2]	<b>R</b> contaminate unqualified

4	(c)	<p>energy is lost, between / within, trophic levels / along food chain</p> <p>2 animals are, at second trophic level / primary consumers OR plants are, autotrophs / producers / first trophic level</p> <p>3 (energy lost) in animal respiration / heat / (named) metabolic process / movement</p> <p>4 ref to (more) material that is inedible / not digestible (in longer food chains)</p> <p>5 ref to 10% energy transfer / ORA</p> <p>6 less pollution (from farm animal waste)</p>	[max 3]	<p><b>Ig</b> ref to healthy diet</p> <p>ref to 100→10→1</p> <p>Mpt 6 <b>A</b> plants use CO<sub>2</sub></p>
	(d)	<p>1 cheaper</p> <p>2 requires less energy as less is lost along food chain</p> <p>3 mycoprotein can be made anywhere / less land (in fermenters)</p> <p>4 less (animal) waste</p> <p>5 better for animal welfare / more ethical</p> <p>6 lower in fat / lowers risk of <u>heart</u> disease</p> <p>7 suitable for, vegetarians / vegans</p> <p>8 AVP e.g. quicker, contains fibre, disease free</p>	[max 3]	<p><b>Note:</b> Use list rule</p> <p><b>R</b> longer shelf life, help food shortages, more protein, more nutrients, easier to digest</p>
	(e)	<p>1 mycoprotein / fungus production requires supply of corn (starch)</p> <p>2 this comes from crop plants</p> <p>3 (fungus) still need to be grown</p> <p>4 (manufacture) requires energy</p> <p>5 rate of food supply cannot keep up due to overpopulation</p> <p>6 AVP e.g. does not contain all nec nutrients, may be consumer resistance to eating mycoprotein foods / needs flavourings / unbalanced diet</p>	[max 3]	<p><b>R</b> required machinery</p>
<b>[Total: 14]</b>				