

Question	Expected answers	Mark	Additional Guidance												
1 (a)	<table border="1"> <tr> <td>pea plant</td> <td>D</td> <td>E</td> </tr> <tr> <td>substance transported</td> <td>sucrose</td> <td>pho ions</td> </tr> <tr> <td>transport tissue</td> <td>phloem ;</td> <td>xylem ;</td> </tr> <tr> <td>sink</td> <td>growing tip / flower / fruit / seed / stem / root ;</td> <td>growing tip / flower / fruit / seed / stem / leaves / chloroplasts ;</td> </tr> </table>	pea plant	D	E	substance transported	sucrose	pho ions	transport tissue	phloem ;	xylem ;	sink	growing tip / flower / fruit / seed / stem / root ;	growing tip / flower / fruit / seed / stem / leaves / chloroplasts ;	[4]	<p>ignore any vessels / tubes / etc</p> <p>A growing point / meristems / areas where growth occurs</p>
pea plant	D	E													
substance transported	sucrose	pho ions													
transport tissue	phloem ;	xylem ;													
sink	growing tip / flower / fruit / seed / stem / root ;	growing tip / flower / fruit / seed / stem / leaves / chloroplasts ;													
(b)	amino acids ; R proteins	[1]	A (named) plant hormones												
(c) 1 2 3 4 5	<p>1 photosynthesis ;</p> <p>2 light (energy) is, absorbed / trapped, by chlorophyll ;</p> <p>3 carbon dioxide reacts with water in the presence of light (energy) ;</p> <p>4 to make glucose (and oxygen) ;</p> <p>5 glucose used to make sucrose ; ignore fructose</p>	[max 3]	<p>A word equation / balanced equation if MP3 not written out do not award MP3 if 'broken down' A formula for glucose in an equation</p> <p>MP5 do not award if glucose is broken down unless already penalised in MP3</p>												
(d) 1 2 3 4 5	<p>1 respired / oxidised to provide energy / used to provide energy / energy for a suitable process ; R 'produce energy' A respiration unqualified</p> <p>2 converted to starch for (energy) storage ;</p> <p>3 converted to cellulose to make cell walls ;</p> <p>4 used to make nectar to attract, pollinators / AW ;</p> <p>5 stored in fruits to attract animals (for seed dispersal) ;</p>	[max 2]	<p>e.g. energy for, growth / active transpo</p> <p>R to make fruit / seed unqualified</p>												

Question	Expected answers	Mark	Additional Guidance
1 (e) 1 2 3 4 5 6	root hairs / root hair cells ; active transport ; against, concentration / diffusion, gradient A from low to high concentration ; using, energy / ATP ; R energy produced / production of energy from respiration ; ref to, proteins / carrier molecules (in membranes) ;	[max 3]	ignore diffusion / movement down a concentration gradient / osmosis ignore gradient in 'from low concentration gradient to high concentration gradient'

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2 (a)	<table border="1"> <thead> <tr> <th>function</th> <th>letter</th> </tr> </thead> <tbody> <tr> <td>peristalsis</td> <td>B</td> </tr> <tr> <td>protein digestion</td> <td>C / H / E ;</td> </tr> <tr> <td>insulin production</td> <td>D ;</td> </tr> <tr> <td>deamination</td> <td>J ;</td> </tr> <tr> <td>partially digested food is mixed with bile</td> <td>H ;</td> </tr> <tr> <td>most water is reabsorbed</td> <td>E ;</td> </tr> </tbody> </table>	function	letter	peristalsis	B	protein digestion	C / H / E ;	insulin production	D ;	deamination	J ;	partially digested food is mixed with bile	H ;	most water is reabsorbed	E ;	[5]
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(b) (i)	<table border="1"> <thead> <tr> <th>large molecule</th> <th>nutrients absorbed</th> </tr> </thead> <tbody> <tr> <td>protein</td> <td>acids ;</td> </tr> <tr> <td>glycogen</td> <td>/ $C_6H_{12}O_6$;</td> </tr> <tr> <td>fat</td> <td>fat acids and glycerol ;</td> </tr> </tbody> </table>	large molecule	nutrients absorbed	protein	acids ;	glycogen	/ $C_6H_{12}O_6$;	fat	fat acids and glycerol ;	[3]						
large molecule	nutrients absorbed															
protein	acids ;															
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fat	fat acids and glycerol ;															
(ii)	calcium / Ca^{2+} ; iron / Fe^{2+} ;	[2]														
(iii)	vitamins / named vitamin ;	[1]														

2 (c)	<p>MP1 platelets ;</p> <p>MP2 promote / cause / stimulate, clotting ;</p> <p>MP3 thrombin / enzyme ;</p> <p>MP4 (converts) fibrinogen to fibrin ;</p> <p>MP5 soluble to insoluble / fibrin is insoluble ;</p> <p>MP6 mesh / network / web, to trap blood (cells) / prevent blood loss ;</p> <p>MP7 forms scab / hardens ;</p> <p>MP8 phagocytes, engulf / destroy / AW, bacteria / pathogens ;</p> <p>MP9 cells divide by mitosis ;</p> <p>MP10 identical cells ;</p> <p>MP11 (tissues form to) make / grow, epidermis / capillary / new skin ;</p>	[max 5]
		[Total: 16]

3	(a)	(i)	transport of oxygen	[1]	
		(ii)	amino acids	[1]	A polypeptides, haem
		(iii)	iron / Fe / Fe ²⁺	[1]	

	(b)	<p>fewer red blood cells</p> <p>2 less elastic / less flexible / sickle-shaped, red blood cells</p> <p>3 haemoglobin is abnormal shape</p> <p>4 haemoglobin / blood, less efficient at transporting oxygen</p> <p>5 less respiration</p> <p>6 less energy / fatigues / exhaustion / less active / feeling faint / breathlessness</p> <p>7 death of tissues linked to oxygen supply</p> <p>8 <u>capillaries</u> are blocked</p> <p>9 pain</p> <p>10 'sickle cell crisis'</p> <p>11 slow / poor, growth</p> <p>12 susceptible to infections</p> <p>13 reduced life span</p> <p>14 AVP e.g. problems in pregnancy, kidney disease</p>	[max 3]	Ig ref to malaria
	(c)	<p>1 malaria is common in Africa</p> <p>2 people who are, heterozygous / Hb^AHb^S</p> <p>3 have, sickle cell trait / mild sickle cell</p> <p>4 protected / AW, against malaria</p> <p>5 description of sickle cells are less prone to infection</p> <p>6 Hb^S continues to appear due to selective advantage / AW</p>	[max 3]	<p>Mpt 4 R immune</p> <p>A description of selection</p>

3	(d)	<p>Hb^A is dominant / Hb^S is recessive / (both) parents are, carriers / heterozygous</p> <p>$Hb^A Hb^S \times Hb^A Hb^S$</p> <p>$Hb^A, Hb^S + Hb^A, Hb^S$</p> <p>$(Hb^A Hb^A, Hb^A Hb^S, Hb^A Hb^S) Hb^S Hb^S$</p>	[max 3]	<p>Note: Ig incorrect text if genetic diagram is correct</p> <p>ECF for Mpt 2 and 3 in diagram key.</p> <p>Mpt 3 linked to correct derivation in Mpt 2</p> <p><i>do not allow genotypes for parents or children that are single alleles</i></p>
	(e)	<p>1 ref to (ionising) radiation</p> <p>2 causes / increased risk, mutation</p> <p>3 change to DNA / genes</p>	[max 2]	A e.g. of radiation e.g. gamma rays
[Total: 14]				