

3(a)(i)	0.95 (no units) ; ;
3(a)(ii)	<i>any two from:</i> 1 B, run for less time / stopped early ; 2 chlorophyll, converted / changed, to phaeophytin ; 3 AVP ;
3(a)(iii)	<i>any one from:</i> 1 different solvents ; 2 different, TLC plate / chromatogram / stationary phase (material) ; 3 different temperatures ;
3(b)	<i>any four from:</i> <i>similarities</i> 1 both absorb, blue / between 400 and 475 nm ; 2 both absorb, little / no, light between 525 and, 600 / 630, nm or both absorb, little / no, green / yellow, light ; 3 AVP ; <i>max three differences</i> 4 chlorophyll a absorbs, at more / a larger range of, wavelengths ; 5 chlorophyll a absorbs, more / better, between 400 and 445 nm ; 6 carotenoids absorb, more / better, between 445 and 525 nm ; 7 chlorophyll a absorbs between, 600 / 640, and, 680 / 690 nm, <u>and</u> carotenoids do not ; 8 chlorophyll a (blue absorption) peak / highest, at 425 / 430 nm <u>and</u> carotenoids (blue absorption) peak / highest, at 460 / 465 nm ; 9 chlorophyll a has blue peak and red peak but carotenoids have two blue peaks and no red peak or chlorophyll a has two peaks but carotenoids have three peaks ;
3(c)	<i>any four from:</i> 1 gibberellin, moves to / acts on / stimulates, <u>aleurone</u> layer ; 2 binds to, (gibberellin) receptor / GID(1) ; 3 breaks down <u>DELLA</u> (protein) ; 4 releases, PIF / transcription factor ; 5 switches on <u>gene</u> for, amylase / maltase / protease ; 6 amylase, breaks down / hydrolyses, starch to maltose ; 7 sugars / glucose, for, respiration / growth, of embryo ;

10(a)	any three from: <table><tr><td></td><td>cyclic</td><td></td><td>non-cyclic</td><td></td></tr><tr><td>1</td><td>photosystem I (only)</td><td>vs</td><td>photosystems I <u>and</u> II</td><td>;</td></tr><tr><td>2</td><td>electrons return to, same photosystem / PSI / P700</td><td>vs</td><td>electrons do not return to same photosystem</td><td>;</td></tr><tr><td>3</td><td>ATP made</td><td>vs</td><td>ATP and reduced NADP made</td><td>;</td></tr><tr><td>4</td><td>no photolysis</td><td>vs</td><td>photolysis</td><td>;</td></tr><tr><td>5</td><td>no oxygen produced</td><td>vs</td><td>oxygen produced</td><td>;</td></tr></table>		cyclic		non-cyclic		1	photosystem I (only)	vs	photosystems I <u>and</u> II	;	2	electrons return to, same photosystem / PSI / P700	vs	electrons do not return to same photosystem	;	3	ATP made	vs	ATP and reduced NADP made	;	4	no photolysis	vs	photolysis	;	5	no oxygen produced	vs	oxygen produced	;
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10(b)	1 carbon dioxide ; 2 Rubisco ; 3 NADPH ; 4 glucose / hexose / starch / cellulose / glycerol / fatty acids / lipids / amino acids / proteins ;																														

4(a)	any three from: (both processes) 1 use / require, carbon dioxide / CO₂ ; 2 use / require, water / H₂O ; 3 use / require, (sun) light energy / source of energy is light ; 4 make an organic, molecule / product ; 5 produce / release, oxygen / O₂ ; 6 involve <u>transduction</u> of energy (from one form to another) ; 7 involve electron flow ;
4(b)	A starch, grain / granule ; B thylakoid (membrane) / lamella / granum ;
4(c)(i)	ATP <u>and</u> reduced NADP (and oxygen) ;
4(c)(ii)	any four from: 1 electron carriers / electron transport chain / to carry electrons ; 2 to release energy to, move / pump, protons (into, thylakoid space / lumen) or to release energy to generate proton gradient ; 3 oxygen-evolving, complex / enzyme ; 4 (to catalyse) splitting / photolysis, of water ; 5 LHC / antenna complex / photosystem, <u>proteins</u> hold pigments ; 6 ATP synth(et)ase to make ATP ;
4(d)	triose phosphate ;
4(e)	any two plus one opposing arguments based on correct ref. to: 1 percentage / amount, of sunlight, absorbed / used ; 2 absorption / action, spectrum or wavelengths / colours of light, used ; 3 respiration of organism ; 4, 5 stage/transition, where, energy lost ; ; 6, 7 (named) limiting factor(s) ; ; 8 energy storage capability or night / dark, process ; 9 quality / nutrition in / palatability, of food product ; 10 proportion edible ; 11,12 additional energy inputs ; ; 13, 14 additional resources needed ; ; 15 labour / maintenance, needed ; 16 amount of space needed ; 17 plant, hormones / coordination ; 18 evolutionary adaptation ;