

3(a)(i)	0.95 (no units) ; ;
3(a)(ii)	any two from: B, run for less time / stopped early ; - chlorophyll, converted / changed, to phaeophytin ; - AVP ;
3(a)(iii)	any one from: - different solvents ; - different, TLC plate / chromatogram / stationary phase (material) ; - different temperatures ;
3(b)	any four from: <i>similarities</i> - both absorb, blue / between 400 and 475 nm ; - both absorb, little / no, light between 525 and, 600 / 630, nm or both absorb, little / no, green / yellow, light ; - AVP ; <i>max three differences</i> - chlorophyll a absorbs, at more / a larger range of, wavelengths ; - chlorophyll a absorbs, more / better, between 400 and 445 nm ; - carotenoids absorb, more / better, between 445 and 525 nm ; - chlorophyll a absorbs between, 600 / 640, and, 680 / 690 nm, <u>and</u> carotenoids do not ; - chlorophyll a (blue absorption) peak / highest, at 425 / 430 nm <u>and</u> carotenoids (blue absorption) peak / highest, at 460 / 465 nm ; - 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)	any four from: - gibberellin, moves to / acts on / stimulates, <u>aleurone</u> layer ; - binds to, (gibberellin) receptor / GID(1) ; - breaks down <u>DELLA</u> (protein) ; - releases, PIF / transcription factor ; - switches on <u>gene</u> for, amylase / maltase / protease ; - amylase, breaks down / hydrolyses, starch to maltose ; - 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) - use / require, carbon dioxide / CO₂ ; - use / require, water / H₂O ; - use / require, (sun) light energy / source of energy is light ; - make an organic, molecule / product ; - produce / release, oxygen / O₂ ; - involve <u>transduction</u> of energy (from one form to another) ; - involve electron flow ;
4(b)	- starch, grain / granule ; - thylakoid (membrane) / lamella / granum ;
4(c)(i)	ATP <u>and</u> reduced NADP (and oxygen) ;
4(c)(ii)	any four from: - electron carriers / electron transport chain / to carry electrons ; - to release energy to, move / pump, protons (into, thylakoid space / lumen) or to release energy to generate proton gradient ; - oxygen-evolving, complex / enzyme ; (to catalyse) splitting / photolysis, of water ; - LHC / antenna complex / photosystem, <u>proteins</u> hold pigments ; - ATP synth(et)ase to make ATP ;
4(d)	triose phosphate ;
4(e)	any two plus one opposing arguments based on correct ref. to: - percentage / amount, of sunlight, absorbed / used ; - absorption / action, spectrum or wavelengths / colours of light, used ; - respiration of organism ; 4, 5 stage/transition, where, energy lost ; ; 6, 7 (named) limiting factor(s) ; ; - energy storage capability or night / dark, process ; - quality / nutrition in / palatability, of food product ; - proportion edible ; 11,12 additional energy inputs ; ; 13, 14 additional resources needed ; ; - labour / maintenance, needed ; - amount of space needed ; - plant, hormones / coordination ; - evolutionary adaptation ;