

3(a)(i)	0.95 (no units) ; ;
3(a)(ii)	any two from: 1 B, run for less time / stopped early ; 2 chlorophyll, converted / changed, to phaeophytin ; 3 AVP ;
3(a)(iii)	any one from: 1 different solvents ; 2 different, TLC plate / chromatogram / stationary phase (material) ; 3 different temperatures ;
3(b)	any four from: <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 3 both absorb, little / no, green / yellow, light ; 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)	any four from: 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 ;

5(a)	<table><tr><th>feature</th><th>ADH</th><th>glucagon</th><th>insulin</th><th></th></tr><tr><td>binds to receptors on cell surface membranes</td><td>✓</td><td>✓</td><td>✓</td><td>;</td></tr><tr><td>results in molecules moving from cells into the blood</td><td>✓</td><td>✓</td><td>×</td><td>;</td></tr><tr><td>is secreted as a result of detection by osmoreceptors</td><td>✓</td><td>×</td><td>×</td><td>;</td></tr></table>	feature	ADH	glucagon	insulin		binds to receptors on cell surface membranes	✓	✓	✓	;	results in molecules moving from cells into the blood	✓	✓	×	;	is secreted as a result of detection by osmoreceptors	✓	×	×	;
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5(b)	any four from: 1 impulses / action potentials / neurotransmitters, in nervous system <u>and</u> hormones in endocrine system ; 2 electrical in nervous system <u>and</u> chemical in endocrine system ; 3 neurones / nerve cells, in nervous system <u>and</u> blood in endocrine system ; 4 effects are / target is, specific / localised, in nervous system <u>and</u> (can be) widespread in endocrine system ; 5 effect / response, happens quickly in nervous system and slowly in endocrine system ; 6 effect / response, lasts a short time in nervous system <u>and</u> long time in endocrine system ; 7 AVP ;																				
5(c)(i)	C ;																				
5(c)(ii)	B ;																				
5(c)(iii)	1 (D / it), shortens / contracts / decreases ; and any three from: 2 calcium ions / Ca²⁺, bind to troponin ; 3 tropomyosin, moves / shifts position / exposes binding sites on actin ; 4 myosin (head) binds to actin / myosin-actin cross-bridges form ; 5 power stroke / myosin head, pulls actin ; 6 more actin, enters / overlaps with, A band / B or more overlap between actin and myosin ;																				

1(a)	any one from: (presence of) juglone (with a concentration of $1.0 \times 10^{-3} \text{ mol dm}^{-3}$) <u>and</u> control (treatment) / absence of juglone ; concentration, of juglone ;
1(b)(i)	5 cm³ of (original / 0.1 mol dm⁻³) juglone (solution) ; 495 cm³ of the (mixture of) solvents ;
1(b)(ii)	any one from: use, syringe / graduated pipette / micropipette / burette ; use, volumetric flask ; use larger (stated) volumes (of both juglone and mixture of solvents) ;
1(c)(i)	1 (mixture of) solvents / solution, with no juglone ; 2 <i>idea that</i> to show that any <i>effects</i> observed (on the, germination / growth, of seeds) are a result of <u>juglone</u> ;

- 1(c)(ii) *any **seven** from:*
- 1 ~~method~~ for standardising the exposure of the seeds to juglone ;
 - 2 ~~ref. to~~ use, same / stated, (cucumber) seeds ;
 - 3 ~~method~~ to maintain a, constant / stated, temperature ;
 - 4 ~~method~~ to maintain a, constant / stated, light intensity ;
 - 5 ~~ref. to~~ standardise another key variable ;
 - 6 ~~idea of~~ reapply juglone (to seedlings) after germination ;
 - 7 count / note / record / AW, number of seeds planted ~~and count~~ number of seeds that germinate, after a, set / stated, time ;
 - 8 ~~method~~ for measuring growth ~~at 10 days~~ (after the appearance of the seedling above the soil) ;
 - 9 ~~for juglone solution and control treatment~~, use a large number of seeds ~~and~~ calculate the mean (growth) ~~for each group~~ ;
 - 10 safety comment with hazard ~~and~~ risk ~~and~~ precaution ;

hazard	risk	precaution
juglone	irritant / toxin / allergy	gloves / mask / PPE
solvents	irritant / toxin / allergy	gloves / mask / PPE
cucumber seeds / plants	irritant / allergy	gloves / mask / PPE
soil	biohazard / pathogens / allergy / irritant	gloves / mask / PPE

- 1(d)(i) *any **two** from:*
- 1 data is continuous ;
 - 2 comparing means (from the two groups) ;
 - 3 data is (from populations that are) normally distributed ;
 - 4 standard deviations (approximately) the same (between the two groups) ;

- 1(d)(ii) *any **three** from:*
- 1 (the critical value at 18 d.f. and $p = 0.05$ is) 2.101 ;
 - 2 calculated value of $t / 2.090$, is less than, critical value / 2.101 (at $p = 0.05$) ; **ora**
 - 3 null hypothesis is accepted (at $p = 0.05$) ;
 - 4 there is no significant difference (at $p = 0.05$) ;