Question Number	Answer	Additional guidance	Mark
1(a)	1. idea of enzymes being {produced / released / secreted / eq} ; 2. idea of these enzymes being used to {digest / break down / eq} (tissues of style) ; 3. idea of forming a pathway ;	2. A EPT digest it	(2)

Question Number	Answer	Mark
1(b) (i)	B embryo sac ;	(1)

Question Number	Answer	Mark
1(b) (ii)	C the egg cell and the polar nuclei ;	(1)

Question Number	Answer	Mark
1(b) (iii)	B diploid zygote and triploid endosperm ;	(1)

Question Number	Answer	Additional guidance	Mark
1(c)	1. pollen grain does not possess flagellum / eq ; 2. pollen grain does not have an acrosome ; 3. idea of {more / 2 / 3} nuclei in pollen grain ; 4. idea of difference in outer boundary e.g. exine in pollen grains ;	ALLOW converse points 1. ACCEPT tail or undulipodium 2. GNORE lysosome 4. ACCEPT cell wall	(2)

Question Number	Answer	Additional Comments	Mark
2(a)(i)	1. Idea that temperature is a controll variable / idea that temperature could affect {results / length of pollen tube} ; 2. dea that (pollen tube) { growth / enzymes / proteins /eq } affected by temperature ; 3. idea that the investigation is valid ;	1. N as a control 3. NOT reliable IGNORE fair test, accurate, precise	**(2)**

Question Number	Answer	Additional Comments	Mark
2(a) (ii)	1. idea of increase from { 0/1 } to 10 (µg dm^{-3}) ; 2. greatest length at 10 (µg dm^{-3})/ greatest increase between 1 and 10 (µg dm^{-3}) ; 3. idea of decrease between { 10/50 } and 200 (µg dm^{-3}) ; 4. shorter at 200 (µg dm^{-3}) compared with 0 / eq ; 5. idea of greatest {change / drop} between 100 and 200 (µg dm^{-3}) ; 6. credit correct manipulation of the data (e.g. change in length in µm calculated by subtraction), e.g. decreases by 76 µm between 100 and 200 µg dm^{-3} ;	IGNORE UNITS 2. 'Greatest increase betwe 1 and 10' scores mp1 as well as mp2 6. Other example Conc. change / Difference (µm) 0-1 / 0-1 / 1-1 / 10-50 / - 10-200 / -13 50-100 / -2 100-200 / -7 0-200 / -	**(3)**

Question Number	Answer	Additional Comments	Mark
2 (a) (iii)	mitosis / nuclear division / DNA synthesis ;		**(1)**

Question Number	Answer	Additional Comments	Mark
2 *(b)	QWC– Spelling of technical terms must be correct and the answer must be organised in a logical sequence 1. idea that generative nucleus divides to form two male gametes ; 2. by mitosis ; 3. pollen tube fuses with embryo sac / eq ; 4. reference to double fertilisation ; 5. (one) male { gamete / nucleus } fuses with egg (cell) <u>nucleus</u> ; 6. to produce diploid zygote; 7. other male nucleus fuses with two polar nuclei ; 8. to produce triploid endosperm ;	QWC emphasis on logical sequence 1. CCEPT 'haploid' for 'male' and 'nuclei' for 'gametes' 5. NOT ov e 7. CCEPT fusion nucleus, NOT polar bodies	**(4)**

Question Number	Answer	Additional Comments	Mark
2(c)	1. reference to both { independent / random } assortment and { crossing-over/chiasma(ta) } ; 2. independent assortment gives rise to {new / different / eq} combinations of (paternal and maternal) chromosomes ; 3. crossing over involves swapping of {sections / eq} of {chromatids /chromosomes} ;	3. N swapping genes ACCEPT new combinations of alleles (on a chromosome) / correct reference to recombinants	**(2)**

Question Number	Answer	Mark
3 (a)(i)	1. line drawn correctly e.g. from pollen grain, down style to start of ovary ; 2. to micropyle (around the edge) ;	**(2)**

Question Number	Answer	Mark
3 (a) (ii)	<table><tr><th>Labelled structure</th><th>Tick (✓) if chromosome number increases at fertilisation</th></tr><tr><td>A</td><td></td></tr><tr><td>B</td><td></td></tr><tr><td>C</td><td></td></tr><tr><td>D</td><td>✓</td></tr><tr><td>E</td><td>✓</td></tr></table> Comments given if more than 2 ticks and if use cross or crosses and ticks	**(2)**

Question Number	Answer	Mark
3 (b)(i)	1. both {increase / positive correlation / eq} ; 2. (pollen tube) length (always) {greater/ eq} when boron present / eq ; 3. idea of rate of growth greater with boron ; 4. linear without boron (for 25 / 30 hours) and not linear with boron / eq ; 5. correct comparative manipulation of the data ;	**max (3)**

Question Number	Answer	Mark
3 (b)(ii)	idea that pollen tube does grow even in the absence of boron ;	**(1)**

Question Number	Answer	Mark
3 (b)(iii)	boron {increases / speeds up / eq} rate ;	**(1)**

Question Number	Answer	Mark
3 (b)(iv)	1. more likely to reach the ovule /eq ; 2. fertilisation more likely to occur /eq ; 3. idea of fertilisation in shorter time period ;	**max (2)**

Question Number	Answer	Mark
4(a)(i)	reference to {chemical / air / gravity / light / eq} ;	**(1)**

Question Number	Answer	Mark
4(a)(ii)	1. idea of {breakdown / digestion / eq} of style ; 2. (breaks down) protein / pectin / middle lamella ; 3. reference to hydrolysis / eq ; 4. easier for pollen tube to grow / reduced resistance / eq ; 5. supplies {nutrients / named nutrient / energy} for (pollen tube) growth / eq ;	**max (3)**

Question Number	Answer	Mark
4(b)	1. photosynthesis ; 2. {component / eq} of {cytoplasm / sap} ; 3. water as a solvent /eq ; 4. water as a transport medium /eq ; 5. involved in thermoregulation / eq ; 6. reference to role in structural support ; 7. reference to involvement in hydrolysis ; 8. reference to turgor changes ;	**max (3)**

Question Number	Answer	Additional Guidance	Mark
5(a)	1. idea that cellulose is a {polymer / polysaccharide} of β glucose ; 2. reference to 1-4 glycosidic {bonds / eq} ; 3. idea that every other glucose is inverted ; 4. idea of cellulose molecules arranged {parallel /as microfibrils} ; 5. joined by hydrogen bonds / eq ;	**1 ACCEPT** made of β glucose monomers **3 ACCEPT** 180° angle between each glucose	**(4)**

Question Number	Answer	Additional Guidance	Mark
5(b)	1. idea of {lack of / very slow} decomposition ; 2. due to lack of {microorganisms / bacteria / fungi / named decomposer} (involved in decomposition) / eq ; 3. as a result there are fewer enzymes / eq ; 4. low pH {reduces enzyme activity / kills microorganisms /eq} ; 5. low oxygen affects respiration (of microorganisms) / eq ; 6. idea that bacteria cannot produce enzymes to breakdown sporopollenin ;	**1 ACCEPT** breakdown, decay **2 ACCEPT** cannot survive **4 ACCEPT** acidic	**(4)**

Question Number	Answer	Additional Guidance	Mark
5(c)	1. reference to double fertilisation ; 2. idea that one (haploid) male {gamete / nucleus } fuses with (haploid) {egg cell / egg nucleus / female gamete / female nucleus} ; 3. to produce a {diploid / 2n} {zygote / embryo} ; 4. idea that one (haploid) male {gamete / nucleus} fuses with { polar nuclei / diploid endosperm nucleus / fusion nucleus} ; 5. to produce a {triploid / 3n} endosperm (nucleus) ;	**2 ACCEPT** sperm nucleus **NOT** generative nucleus **IGNORE** ovum / egg unqualified **4 NOT** generative nucleus / polar bodies	**(4)**