Question Number	Answer	Mark
1(a) (i)	as a comparison / as a control / to show that it is {incubation temperature / not some other factor} affecting spindle fibre formation ;	**(1)**

Question Number	Answer	Mark
1 (a) (ii)	1. as temperature increases (from 25^{o}C) to 33°C the number of cells showing spindle fibre formation increases / positive correlation between 25^{o}C and 33°C ; 2. as temperature increases from 33°C (to 37°C) there is no effect on number of cells showing spindle fibre formation / same values at 33°C and 37°C ; 3. credit correct manipulation of the data e.g. with a rise in temperature of 5^{o}C (between 28 and 33^{o}C) the number of cells showing spindle formation rises by 3 ;	**(2)**

Question Number	Answer	Mark
1 (b) (i)	1. idea that (only) 35°C statement is supported ; 2. idea that data either side of 35^{o}C both show all 5 (cells undergoing spindle fibre formation) ; 3. idea that only from 33^{o}C do all 5 (cells show spindle fibre formation) ;	**(2)**

Question Number	Answer	Mark
1 (b) (ii)	1. idea that 31°C statement may not be supported ; 2. idea that it could be between 2 and 5 ;	**(2)**

Question Number	Answer	Mark
*** 1 (c) QWC**	Take into account quality of written communication when awarding the following points. **Mark as pairs** 1. shape qualified e.g. hydrodynamic, streamlined ; 2. idea of reduced resistance ; 3. {*acrosome* / *vesicle*} containing {*enzyme* / *acrosin*}; 4. involved in {digestion / break down} of the {*zona pellucida* / jelly layer} ; 5. {*haploid* / eq} *nucleus* ; 6. allows restoration of {diploid / full complement / 46 / eq} *chromosomes* at *fertilisation* ; 7. *mitochondria* qualified e.g. large number, correct location ; 8. to supply {ATP / energy} for {movement / eq} ; 9. {*flagellum* / eq} present ; 10. for propulsion / swimming / motility / eq ; 11. {markers / receptors} in cell surface *membrane* ; 12. to bind to egg cell surface *membrane* / detect chemicals released by *ovum* / eq ;	**(6)**

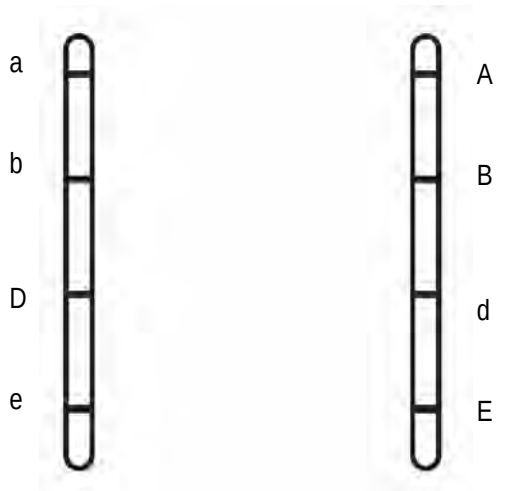
Question Number	Answer	Mark
2 (a)	It is a form of cell division that 1. halves the chromosome number / eq ; 2. so that at fertilisation the {full complement / eq} of chromosomes is restored / eq ; 3. allows genetic variation (in gametes) / eq ; 4. through independent assortment / eq ; 5. through crossing over / eq ;	**max (3)**

Question Number	Answer	Mark
2 (b)(i)	<table><tr><th>Statements</th><th></th><th>B</th><th>C</th><th>D</th><th>E</th><th>F</th><th>G</th></tr><tr><td>Site containing acrosin</td><td></td><td></td><td>☒</td><td></td><td></td><td></td><td></td></tr><tr><td>Site where acrosin works</td><td></td><td></td><td></td><td></td><td></td><td>☒</td><td></td></tr><tr><td>Site containing the haploid number of chromosomes</td><td></td><td>☒</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Site containing mitochondria</td><td></td><td></td><td></td><td></td><td></td><td></td><td>☒</td></tr></table>;;;;	**(4)**

Question Number	Answer	Mark
2(b)(ii)	1. idea of stimulus e.g. receptors, contact with {zona / eq} , presence of chemicals ; 2. reference to acrosome swells ; 3. reference to {vesicle / acrosome} fuses ; 4. with (sperm) cell (surface) membrane ; 5. exocytosis ;	**max (2)**

Question Number	Answer	Mark
2(c)(i)	idea that as the activity of acrosin increases so does fertilisation rate e.g. positive correlation ;	**(1)**

Question Number	Answer	Mark
2 c)(ii)	no data on {zero acrosin activity /zero percentage fertilisation} / cannot accurately extrapolate back from the data ;	**(1)**

Question Number	Answer	Mark
3 (a)		**(1)**

Question Number	Answer	Mark
3(b) (i)	P = crista ; Q = matrix ; R = outer (mitochondrial) membrane / envelope / double membrane ;	**(3)**

Question Number	Answer	Mark
3 (b)(ii)	1. (they carry out) (aerobic) respiration ; 2. provide {ATP / energy / eq} ; 3. to {move / drive the / eq} {flagellum / tail} ; 4. allows sperm to swim / eq ; 5. towards the {egg / eq} / {towards /along} the oviduct / eq ;	**max (3)**

Question Number	Answer	Mark
3 (c)(i)	0.065 (%) ;;	**(2)**

Question Number	Answer	Mark
3 (c)(ii)	16 ;	**(1)**

Question Number	Answer	Mark
4 (a)	Correct ref to: 1. flagellum / eq ; 2. overall shape e.g. streamlined / eq ; 3. fewer mitochondria / other organelles / eq ; 4. acrosome / eq ; 5. zona (pellucida) / jelly layer eq ; 6. cortical granules / eq ; 7. differences in food store types / eq ; 8. sperm cell has less cytoplasm / eq ;	**maximum (3)**

Question Number	Answer	Mark
4 (b)	1. enzyme {digest / eq}{ zona (pellucida) / eq} ; 2. idea that sperm can get through to egg {cell / nucleus / eq} ; 3. {contact with / receptor on} {zona pellucida / (glycoprotein) jelly coat / surface of ovum } ; 4. (causes) {acrosome / eq to {rupture / open / eq } ;	**maximum (2)**

Question Number	Answer	Mark
4 (c)	1. meiosis (II) is completed / eq ; 2. {male and female / eq } chromosomes come together / (both) nuclei fuse / eq ; 3. {cortical granules / enzymes/ chemicals} released (from cell surface membrane) / eq ; 4. {bind / eq } with { zona (pellucida) / eq } / {zona (pellucida) / eq } then {thickens /hardens / eq } ; 5. to form fertilisation membrane / to make cell impenetrable (to other sperm) / prevents polyspermy / egg cell membrane {changes its charge / becomes positive} / eq ;	**maximum (2)**

Question Number	Answer	Mark
4 (d)(i)	1. to produce a {zygote / eq} ; 2. to produce {original / full} complement of {DNA / chromosomes / genetic material } / diploid / 2n number / eq ; 3. to allow mixing of {genes / genetic material } / ref to { genetic variation / eq } ;	**maximum (2)**

Question Number	Answer	Mark
4 (d)(ii)	(triploid) endosperm nucleus ;	**(1)**