CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the May/June 2015 series

9700 BIOLOGY

9700/51 Paper 5 (Planning, Analysis and Evaluation), maximum raw mark 30

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;	separates marking points
/	alternatives answers for the same point
R	reject
A	accept (for answers correctly cued by the question, or extra guidance)
AW	alternative wording (where responses vary more than usual)
underline	actual word given must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument
ecf	error carried forward
I	ignore
mp	marking point (with relevant number)

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Question	Expected answer	Extra guidance	Mark
1 (a)	*any 2 from:* 1 *idea of* difficult to identify the end point / AW ; 2 (because) gel, disappears / falls off / is digested / AW, gradually / AW ; 3 (because) the dye colours the solution / solution becomes, cloudy / murky / AW **or** solution might not be, clear enough / AW ;	*accept ref. to contact lenses as opposed to simulated ones* 1 **A** in context of when all gelatin digested away / plastic becomes transparent / AW ; 2 **A** *idea that* colour fades gradually **A** *idea of* non-uniform removal of gelatin 3 **A** ref. to needing to lift out the plastic (because the dye colours the water)	[max 2]
(b) (i)	*any 3 from:* 1 dilution of, stock solution / 1mg / cm^3 solution, $\times$10 to give 100μg / cm^3 solution ; 2 ref. to, method of dilution / serial dilution / series dilution / proportional dilution ; 3 ref. to correct volume of **saline** (containing EDTA) **and** of stock solution to give stated subtilisin concentration **and** a volume of 50 cm^3 ; 4 range of 5 concentrations or more stated between 20 μg / cm^3 and 100 μg / cm^3 (allow 0.02 mg / cm^3-0.1 mg / cm^3) ;	*max 2 if no conversion from mg to μg* 1 **A** other methods of achieving the conversion see hand out 2 **A** use $C_1 V_1 = C_2 V_2$ to make... **or** $M_1 V_1 = M_2 V_2$ **A** simple dilution **A** description of methods written or diagrammatic 3 **A** if correct volume (50 cm^3) achieved once **A** if correct volume achieved by removal after dilution **I** type of concentration units given **R** dilution with water alone 4 range must cover 20 μg / cm^3 and 100 μg / cm^3 but could extend below / above **A** in mg / cm^3 (below 0.02 mg / cm^3 and 0.1 mg / cm^3)	[max 3]

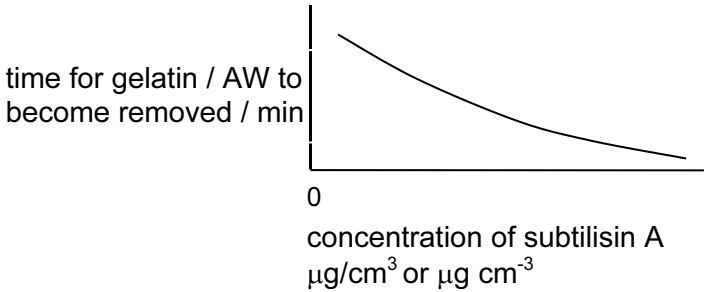
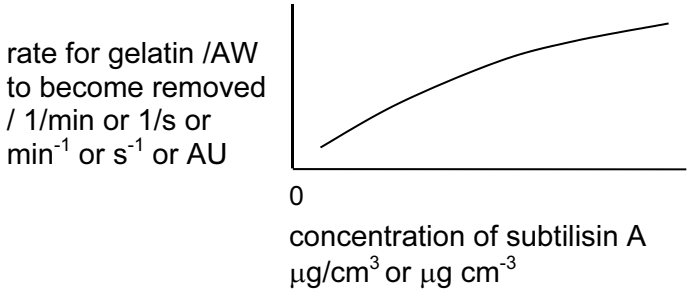
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Question	Expected answer	Extra guidance	Mark
(ii)	*solution:* boiled (cleaning) solution / (cleaning / saline) solution without, enzyme / subtilisin A / protease ; *reason:* *idea that* other components of the (cleaning) solution do not, digest / remove / break down the, gelatin / protein / layer **or** it is the, enzyme / subtilisin A, that, digest / remove / break down the, gelatin / protein / layer ;	**I** water alone / immobilised enzyme **A** denatured / inactive, enzyme **A** sodium chloride / NaC*l* (solution) / saline (and EDTA) **I** film alone **I** ref. to removal of colour **A** ref. to, other substances / saline / EDTA, having **no** effect *If water is given as the solution* **A** to show that enzyme, digests gelatin / AW **I** ref. to the **enzyme** having an effect – needs digests, etc. **or** 'lacks the enzyme that digest gelatin' / AW **R** 'it shows the other components do not digest gelatin' / AW	[2]
(c) (i)	*independent*: <u>concentration</u> of, subtilisin / enzyme (solution) ; *dependent:* time for, disappearance / breakdown / removal / AW, of, gelatin / protein / layer / colour (change) **or** rate of, disappearance / breakdown / removal / AW, of, gelatin / protein / layer / colour ;	**I** rate / time, of breakdown unqualified **I** film alone **A** time (for simulated lens) to go transparent	[2]

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Question	Expected answer	Extra guidance	Mark
(ii)	*any 6 from:* *independent variable* 1 ref. to using 10 cm^3 of each, enzyme / cleaning solution / AW, concentration in, each pot / all pots ; 2 method of measuring volume ; *dependent variable* 3 incubate the, subtilisin / enzyme, solutions to, equilibrate / reach the test temperature (before adding the simulated contact lens) ; 4 use, stopwatch / timer, to record end point / AW ; s*tandardising variables (max 3):* 5 ref. to method of keeping incubation temperature, constant / controlled ; 6 *idea of* standardising the (coloured) gelatin (thickness / mass / coverage / distribution) ; 7 use of, buffer / named buffer, to keep pH constant / to control pH ; 8 ref. to using same, size / area, of (simulated) contact lens / plastic ;	1 **A** other stated volumes between 7 cm^3–12 cm^3 **A** fixed / same, volume of each concentration used / AW 2 e.g. graduated pipette / syringe / measuring cylinder / burette *filled to line (on the pot) = mp 1 & 2* 3 if incubation time stated minimum value of 2 minutes 4 **I** timing the rate 5 e.g. incubator, water-bath, temperature-controlled room. **I** air conditioning *if temperature given must be 35 °C* 6 **I** concentration / amount / volume 7 If pH stated must be a single value between 7.0–7.5 or the range 7.0–7.5 8 **A** 10 mm × 10 mm pieces or any other sensible size	

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Question	Expected answer	Extra guidance	Mark
	safety: 9 ref. to, low risk investigation / hazard **and** suitable safety precaution ; *reliability* 10 ref. to minimum number of replicates and mean ;	9 e.g. allergy / sensitivity / to, enzyme / chemical **and** wearing, goggles / gloves / mask e.g. (chemical) irritant / toxic (chemical) **and** wearing, goggles / gloves / mask **R** no risk/ no safety implications 10 **A** 3 (original plus 2) / several / many, replicates **and** mean. **or** 3 replicates to, identify / remove, anomalies / outliers	[max 6]
(d) (i)	1 axes correctly orientated with labels ; 2 axes have units ; 3 line shows decrease as subtilisin A increases ;  	1 *x*-axis, concentration of subtilisin A **and** *y*-axis, time for / rate of, gelatin / protein / layer / colour / AW, removal / digestion / breakdown 2 *x*-axis μg / cm^3 **A** *x*-axis mg / cm^3 **and** y axis s **or** min **or** if rate mm^2 s^{-1} / AW **A** *x*-axis mol / dm^3 **I** figures on axes 3 **A** linear curve **A** rate plotted against concentration  	[3]

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Question	Expected answer	Extra guidance	Mark
(ii)	*idea of:* find the time for the gelatin to disappear (using the cleaning solution) on the *y*-axis and read the concentration from the *x*-axis ;		[1]
		[Total: 19]	
2 (a)	exposure (and non-exposure) to alcohol, before birth / during pregnancy / prenatal ;	**A** in context of baby or mother. **R** concentration / volume of alcohol **I** alcohol unqualified	[1]
(b) (i)	*sensory conduction: max 1 from* 1 pre-natal alcohol exposure / group 1 / first group, is faster at 20 days (than no pre-natal exposure) / AW **ora** **or** pre-natal alcohol exposure / group 1 / first group, is slower at 400 days (than no pre-natal exposure) / AW ; **ora** 2 increase in conduction speed for group 1 between 20 and 400 days is less (than that for group 2) ; **ora** 3 In both groups 1 and 2 sensory neurone conduction speed increases with age ; *motor conduction: max 1 from* 4 pre-natal alcohol exposure / group 1 / first group, is slower at 20 days (than no pre-natal exposure) / AW **ora** **or** pre-natal alcohol exposure / group 1 / first group, is slower at 400 days (than no pre-natal exposure) / AW ; **ora**	*for faster / slower accept AW throughout* 1 specific days need to be given not just 'earlier / later' 2 stated raw speed figures alone are not enough **A** 'increase over the time period is less...' 3 **A** in terms of increases over, the time period / the age period / from 20 days to 400 days / with the days / growth / AW 4 **A** pre-natal alcohol exposure / group 1, is slower (than no pre-natal alcohol exposure / group 2) **ora**	

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Question	Expected answer	Extra guidance	Mark
	5 increase in conduction speed between 20 and 400 days is similar for group 1 and group 2 ; 6 In both groups 1 and 2 motor neurone conduction speed increases with age ;	5 raw speed figures must be qualified 6 **A** in terms of increases over, the time period / the age period / from 20 days to 400 days / with the days / growth / AW	[max 2]
(b) (ii)	*max 1 from*: 1 motor conduction is faster than sensory at 20 days, in group 2 / with no pre-natal alcohol exposure **ora** **or** motor conduction slower than sensory at 400 days, in group 2 / with no pre-natal alcohol exposure ; **ora** 2 sensory conduction is faster than motor at 20 days, in group 1 / for pre-natal alcohol exposure **ora** **or** sensory conduction is slower than motor at 400 days, in group 1 / for pre-natal alcohol exposure ; **ora** 3 (conduction speed) increases with age (of the infant) ;	*must be idea of the whole nerve / motor **and** sensory neurones* 1 and 2 specific days needed not earlier / later 3 *mp not awarded if mp3 or mp6 given in **b (i)*** **A** increases over, the time period / the age period / from 20 days to 400 days / with the days / growth / AW	[1]

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Question	Expected answer	Extra guidance	Mark
(c)	*most reliable:* group 2 / no pre-natal alcohol exposure, at 400 days, motor (velocity) ; *reason:* the standard deviation is, the smallest / (very) small / least / lowest ;	*mp not awarded if more than one group selected* **A** standard deviation, less than 1 / 0.38 **A** less / lower if qualified **I** standard error	[2]
(d) (i)	there is no overlap in the <u>standard deviations</u> ;	**I** error bars / data / results **A** descriptions of no overlap, e.g. 'ranges of the standard deviations don't have anything in common'	[1]
(ii)	the data, is continuous / has a normal distribution / are comparing (two) means ;	**R** continuous variable / change is continuous	[1]
(iii)	there is no significant difference between the sensory conduction, velocity / speed (of the median nerve), in, group 1 (babies) / babies with pre-natal exposure to alcohol, and, group 2 (babies) / babies with no pre-natal exposure to alcohol ;	**A** the difference in the sensory conduction velocity / speed (of the median nerve), between, group 1 (babies) / babies with pre-natal exposure to alcohol, and, group 2 (babies) / babies with no pre-natal exposure / between the two groups (of babies), to alcohol is not significant **A** there is no significant difference between the, sensory conduction velocity / speed (of the median nerve), between the two groups (of babies) **I** ref. to just nerve conduction – must mention sensory	[1]

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Question	Expected answer	Extra guidance	Mark
(e)	*max 2 from:* 1 small sample size ;	**I** ref. to 'some babies not affected' 1 **I** replicate / repeats unqualified, but **A** if explained in terms of sample size. *quoted numbers must be qualified*	
	2 groups 1 and 2 of different sizes ;		
	3 different numbers of males and females in each group ;	3 **A** more females than males **ora** **I** stated figures unqualified	
	4 does not include mothers, who drink less than 32 mg of alcohol / who drink alcohol occasionally ;		
	5 does not include the full age range of mothers / AW ;	5 **A** only has mothers of age 23–25 years / small age range of mothers	
	6 body mass / weight, of the, mothers / babies ;		
	7 medication / illegal drugs , taken by mother during pregnancy ;	7 **A** smoking qualified	
	8 ethnicity of the, mother / baby ;		[max 2]
		[Total: 11]	

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mp marking point (with relevant number)

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Question	Expected answer	Extra guidance	Mark
1 (a)	*independent*: <u>concentration</u> of amylase / enzyme ; *dependent:* diameter / area of brown zone ;	**I** amount **R** (amylase) extract **A** radius of brown zone **A** starch free / digested starch / clear zone **A** area of brown zone minus well **R** blue zone	[2]
(b)	any 8 from: *independent variable* 1 ref. to method of diluting the 0.5 g dm^{-3} amylase / stock amylase solution **and** to give a minimum of **5** dilutions ; 2 ref. to concentrations from 0.5 g dm^{-3} downwards with correct units ; 3 use of a <u>control</u> with example ; *dependent variable* 4 ref. to a suitable method of measuring diameters / width / radius / area of brown zones ;	1 0.0 and 0.5 g dm^{-3} can be included in the number of dilutions **A** serial / series / simple / proportional / dilution as method **OR** a description. Use the formula $C_1V_1 = C_2V_2$ to make… **A** If the fungal extract is diluted instead of amylase but **R** mp5 2 minimum of 3 other stated values between 0.5 g dm^{-3} and 0.0 g dm^{-3} must correspond to dilution method chosen **ecf** if no method given **A** 10 fold or a 50% reduction serial dilution 3 **A** water / 0.0 g dm^{-3} / boiled or denatured extract / enzyme 4 e.g. using (suitable) ruler / callipers / string and ruler **R** metre ruler **I** graticules **OR** use a (transparent) grid / graph paper **and** count the number of squares **OR** take a photograph and measure using one the methods for finding area **NOTE**: method of measuring must match what they have stated they are measuring.	

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	5 ref. to testing the (fungal) extract / fungal amylase / fungal enzyme ;	5 **R** if dilute the fungal extract	
	6 plot a calibration curve of known concentrations **and** use it to determine extract concentration ;	6 **A** compare extract result with results of known concentrations to identify extract concentration **OR** find approx. range of concentration and then do more at smaller intervals to identify extract concentration	
	standardising variables (max. 3) 7 ref. to suitable stated volume / same volume of amylase (in each well) ;	7 If a volume is stated – max 1 cm^3 **I** amount / known	
	8 leave (all plates) for same period of time ;	8 if time stated, minimum 30 min / max 24 hours	
	9 method of maintaining at same / constant / optimum / stated temperature ;	9 e.g. incubator / constant temp. room **A** water bath if temp. stated, any **single** temp. in range 15–65 °C **I** air conditioning	
	10 use a buffer to keep the pH of the agar same ;	10 e.g. making or adding buffer to agar or starch (solutions) A adding buffer to the amylase solution before using it **A** if stated, any single pH	
	11 same concentration of starch (in the agar plates) ;	11 **I** ref. to other nutrients in agar, **I** amount	
	12 same depth / volume of agar in Petri dish ; 13 cover to prevent contamination / evaporation ;	12 **A** depth of agar plate **I** mass of agar / depth of wells	
	safety 14 ref. to low risk investigation / hazard and suitable safety precaution ;	14 fungal / enzyme allergy or fungus / enzyme / iodine / agar is irritant and wearing gloves / eye protection / mask **I** iodine as an allergen **R** no risk	
	reliability 15 ref. to a minimum of three replicates and calculate a mean or identify / eliminate / remove anomalies ;	15 **A** original and 2 more / several / many / multiple **A** outliers for anomalies **R** reduce anomalies	[max 8]

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(c)	use a (glucose) biosensor / glucose dipstick or test-strip / named test strip, e.g. clinistix / uristix ; (because) γ-amylase will produce glucose **only** / β-amylase will produce maltose (mainly) ;	**A** use Benedict's test **and** **EITHER** weigh precipitate **OR** use colorimeter to find the intensity of blue solution left **OR** time the first appearance of a colour change **A** chromatography and stain (to show sugars) **A** Barfoed's test for monosaccharides **I** *idea that* γ-amylase produces more glucose than β-amylase **R** ora	[2]
(d) (i)	1963 shown on extract **B**, plate 5 ; 1809 shown on extract **D**, plate 3 ;		[2]
(ii)	reject / eliminate / ignore / leave out (affected data from calculations) ;	**A** repeat until consistent results obtained **I** repeat unqualified **OR** repeat to find a mean	[1]

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(iii)

correct values for Σx =1820

and $\bar{x} = 303 / 303.3 / 303.3^{\bullet}$

and $(x-\bar{x})^2$;

$(x-\bar{x})^2$ allowed	341	341.3	341.34	341.4	342
$(x-\bar{x})^2$ not allowed	341.32	341.2			

correct value of ***s*** from table ;

correct values of ***s*** (±)	8.(0)	8.26	8.27	8.3

e.g.

Σ	**1820**		**342**
$\bar{x}$	**303**		

allow ecf for ***s*** from wrong value of $\sum (x-\bar{x})^2$

[max 2]

(iv)

any 3 from:

1 the larger / AW the brown area the more amylase / more enzyme activity ora

OR the larger / AW the brown area the more gene copies ;ora

2 (person or extract) **A** had the highest / AW concentration of amylase / (person or extract) **F** has lowest AW concentration of amylase ;

3 (person) **A** has the highest number of gene copies / (person) **F** has the lowest number of gene copies ;

4 ref. to genetic variation in population (for the production of amylase) ;

Ignore ref. to proportionality / positive correlation between enzyme concentration and gene copies

A strongest / largest / most /
ora weakest / smallest / least
A A>B>C>D>E>F
I copying results without any conclusion about rank order

[3]

Total: **[20]**

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2 (a)	any 3 from: *variation in volunteers* 1 body mass / weight ; 2 ref. to use of drugs e.g. medication / self-inflicted ; 3 alcohol consumption ; 4 smoking status ; 5 ref. to ethnicity ; 6 volunteer all have the same 'handedness' ; 7 no medical / named medical condition affecting nerve conduction ; *variation in method of applying test* 8 same arm tested ; 9 idea of volunteer not moving (during the test) ; 10 electrical charge / coulombs / voltage / potential difference ; 11 same number of volunteers in each age category ;	***Mark the first three given.*** ***I*** *environmental factors, e.g. temperature / light / noise in room / time of day* ***I*** *diet* ***I*** *ref. to distance between or position of electrodes / time of charge application* 7 e.g. Multiple Sclerosis(MS), Myalgic Encephalitis(ME), Muscular Dystrophy(MD), Motor Neurone Disease (MND),spinal bifida, polio **A** disease of the nervous system 9 e.g. at rest / sitting / lying down 10 **A** electrical stimulus **I** current	[max 3]

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<table>
<tr>
<td>(b)</td>
<td>
<table>
<tr><td rowspan="2">age / years</td><td rowspan="2">mean conduction velocity ± S_M</td><td colspan="2">confidence limits</td></tr>
<tr><td>lower limit</td><td>upper limit</td></tr>
<tr><td>60–69</td><td>52.2 ± 0.675</td><td><u>50.85</u></td><td><u>53.55</u> ;</td></tr>
</table>
</td>
<td>note: must have both numbers correct for one mark</td>
<td>[1]</td>
</tr>
<tr>
<td>(c) (i)</td>
<td>30–39 and 70–79

OR 40–49 and 70–79

OR 50–59 and 70–79 ;

there is no overlap of (confidence) limits / S_M ;</td>
<td>A descriptions, e.g. upper limit of 70–79 does not reach lower limit of 30–39
I error bars overlapping / range(bars) not overlapping
I ref. to mean conduction velocity</td>
<td>[2]</td>
</tr>
<tr>
<td>(ii)</td>
<td>test: t test ;

reason: comparing (two) <u>means</u> / normal distribution / continuous data ;</td>
<td>R continuous variation</td>
<td>[2]</td>
</tr>
<tr>
<td>(iii)</td>
<td>there is no <u>significant</u> difference between the (mean) conduction velocities / NCV of (individuals from) different age groups ;</td>
<td>needs to be clear that the significant difference is in the conduction velocity and the not the ages
A the difference in (mean) conduction velocities of individuals from different age groups is not <u>significant</u>

A stated age categories / women of different ages / young(er) and old(er) women / with age</td>
<td>1</td>
</tr>
<tr>
<td>(d)</td>
<td>large sample size /number of people tested ;</td>
<td>A tested 394 individuals / many people / lots of people ;
I sufficient / enough people tested
I number of different age categories / ref. to standard error</td>
<td>[1]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total:</td>
<td>[10]</td>
</tr>
</table>

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(b) (i)	*any 3 from:* 1 dilution of, stock solution / 1mg / cm^3 solution, $\times$10 to give 100μg / cm^3 solution ; 2 ref. to, method of dilution / serial dilution / series dilution / proportional dilution ; 3 ref. to correct volume of **saline** (containing EDTA) **and** of stock solution to give stated subtilisin concentration **and** a volume of 50 cm^3 ; 4 range of 5 concentrations or more stated between 20 μg / cm^3 and 100 μg / cm^3 (allow 0.02 mg / cm^3- 0.1 mg / cm^3) ;	*max 2 if no conversion from mg to μg* 1 **A** other methods of achieving the conversion see hand out 2 **A** use $C_1 V_1 = C_2 V_2$ to make... **or** $M_1 V_1 = M_2 V_2$ **A** simple dilution **A** description of methods written or diagrammatic 3 **A** if correct volume (50 cm^3) achieved once **A** if correct volume achieved by removal after dilution **I** type of concentration units given **R** dilution with water alone 4 range must cover 20 μg / cm^3 and 100 μg / cm^3 but could extend below / above **A** in mg / cm^3 (below 0.02 mg / cm^3 and 0.1 mg / cm^3)	[max 3]

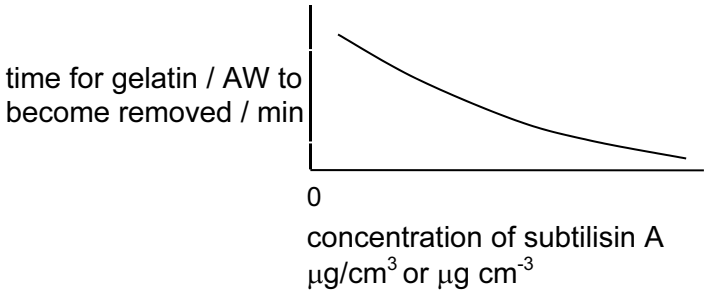
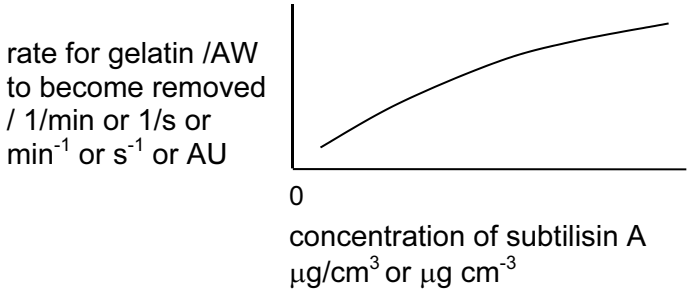
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(ii)	*solution:* boiled (cleaning) solution / (cleaning / saline) solution without, enzyme / subtilisin A / protease ; *reason:* *idea that* other components of the (cleaning) solution do not, digest / remove / break down the, gelatin / protein / layer **or** it is the, enzyme / subtilisin A, that, digest / remove / break down the, gelatin / protein / layer ;	**I** water alone / immobilised enzyme **A** denatured / inactive, enzyme **A** sodium chloride / NaC*l* (solution) / saline (and EDTA) **I** film alone **I** ref. to removal of colour **A** ref. to, other substances / saline / EDTA, having **no** effect *If water is given as the solution* **A** to show that enzyme, digests gelatin / AW **I** ref. to the **enzyme** having an effect – needs digests, etc. **or** 'lacks the enzyme that digest gelatin' / AW **R** 'it shows the other components do not digest gelatin' / AW	[2]
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Question	Expected answer	Extra guidance	Mark
(ii)	*any 6 from:* *independent variable* 1 ref. to using 10 cm^3 of each, enzyme / cleaning solution / AW, concentration in, each pot / all pots ; 2 method of measuring volume ; *dependent variable* 3 incubate the, subtilisin / enzyme, solutions to, equilibrate / reach the test temperature (before adding the simulated contact lens) ; 4 use, stopwatch / timer, to record end point / AW ; s*tandardising variables (max 3):* 5 ref. to method of keeping incubation temperature, constant / controlled ; 6 *idea of* standardising the (coloured) gelatin (thickness / mass / coverage / distribution) ; 7 use of, buffer / named buffer, to keep pH constant / to control pH ; 8 ref. to using same, size / area, of (simulated) contact lens / plastic ;	1 **A** other stated volumes between 7 cm^3–12 cm^3 **A** fixed / same, volume of each concentration used / AW 2 e.g. graduated pipette / syringe / measuring cylinder / burette *filled to line (on the pot) = mp 1 & 2* 3 if incubation time stated minimum value of 2 minutes 4 **I** timing the rate 5 e.g. incubator, water-bath, temperature-controlled room. **I** air conditioning *if temperature given must be 35 °C* 6 **I** concentration / amount / volume 7 If pH stated must be a single value between 7.0–7.5 or the range 7.0–7.5 8 **A** 10 mm × 10 mm pieces or any other sensible size	

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Question	Expected answer	Extra guidance	Mark
	safety: 9 ref. to, low risk investigation / hazard **and** suitable safety precaution ; *reliability* 10 ref. to minimum number of replicates and mean ;	9 e.g. allergy / sensitivity / to, enzyme / chemical **and** wearing, goggles / gloves / mask e.g. (chemical) irritant / toxic (chemical) **and** wearing, goggles / gloves / mask **R** no risk/ no safety implications 10 **A** 3 (original plus 2) / several / many, replicates **and** mean. **or** 3 replicates to, identify / remove, anomalies / outliers	[max 6]
(d) (i)	1 axes correctly orientated with labels ; 2 axes have units ; 3 line shows decrease as subtilisin A increases ;  	1 *x*-axis, concentration of subtilisin A **and** *y*-axis, time for / rate of, gelatin / protein / layer / colour / AW, removal / digestion / breakdown 2 *x*-axis μg / cm^3 **A** *x*-axis mg / cm^3 **and** y axis s **or** min **or** if rate mm^2 s^{-1} / AW **A** *x*-axis mol / dm^3 **I** figures on axes 3 **A** linear curve **A** rate plotted against concentration  	[3]

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Question	Expected answer	Extra guidance	Mark
(ii)	*idea of:* find the time for the gelatin to disappear (using the cleaning solution) on the *y*-axis and read the concentration from the *x*-axis ;		[1]
		[Total: 19]	
2 (a)	exposure (and non-exposure) to alcohol, before birth / during pregnancy / prenatal ;	**A** in context of baby or mother. **R** concentration / volume of alcohol **I** alcohol unqualified	[1]
(b) (i)	*sensory conduction: max 1 from* 1 pre-natal alcohol exposure / group 1 / first group, is faster at 20 days (than no pre-natal exposure) / AW **ora** **or** pre-natal alcohol exposure / group 1 / first group, is slower at 400 days (than no pre-natal exposure) / AW ; **ora** 2 increase in conduction speed for group 1 between 20 and 400 days is less (than that for group 2) ; **ora** 3 In both groups 1 and 2 sensory neurone conduction speed increases with age ; *motor conduction: max 1 from* 4 pre-natal alcohol exposure / group 1 / first group, is slower at 20 days (than no pre-natal exposure) / AW **ora** **or** pre-natal alcohol exposure / group 1 / first group, is slower at 400 days (than no pre-natal exposure) / AW ; **ora**	*for faster / slower accept AW throughout* 1 specific days need to be given not just 'earlier / later' 2 stated raw speed figures alone are not enough **A** 'increase over the time period is less...' 3 **A** in terms of increases over, the time period / the age period / from 20 days to 400 days / with the days / growth / AW 4 **A** pre-natal alcohol exposure / group 1, is slower (than no pre-natal alcohol exposure / group 2) **ora**	

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Question	Expected answer	Extra guidance	Mark
	5 increase in conduction speed between 20 and 400 days is similar for group 1 and group 2 ; 6 In both groups 1 and 2 motor neurone conduction speed increases with age ;	5 raw speed figures must be qualified 6 **A** in terms of increases over, the time period / the age period / from 20 days to 400 days / with the days / growth / AW	[max 2]
(b) (ii)	*max 1 from*: 1 motor conduction is faster than sensory at 20 days, in group 2 / with no pre-natal alcohol exposure **ora** **or** motor conduction slower than sensory at 400 days, in group 2 / with no pre-natal alcohol exposure ; **ora** 2 sensory conduction is faster than motor at 20 days, in group 1 / for pre-natal alcohol exposure **ora** **or** sensory conduction is slower than motor at 400 days, in group 1 / for pre-natal alcohol exposure ; **ora** 3 (conduction speed) increases with age (of the infant) ;	*must be idea of the whole nerve / motor **and** sensory neurones* 1 and 2 specific days needed not earlier / later 3 *mp not awarded if mp3 or mp6 given in **b (i)*** **A** increases over, the time period / the age period / from 20 days to 400 days / with the days / growth / AW	[1]

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Question	Expected answer	Extra guidance	Mark
(c)	*most reliable:* group 2 / no pre-natal alcohol exposure, at 400 days, motor (velocity) ; *reason:* the standard deviation is, the smallest / (very) small / least / lowest ;	*mp not awarded if more than one group selected* **A** standard deviation, less than 1 / 0.38 **A** less / lower if qualified **I** standard error	[2]
(d) (i)	there is no overlap in the <u>standard deviations</u> ;	**I** error bars / data / results **A** descriptions of no overlap, e.g. 'ranges of the standard deviations don't have anything in common'	[1]
(ii)	the data, is continuous / has a normal distribution / are comparing (two) means ;	**R** continuous variable / change is continuous	[1]
(iii)	there is no significant difference between the sensory conduction, velocity / speed (of the median nerve), in, group 1 (babies) / babies with pre-natal exposure to alcohol, and, group 2 (babies) / babies with no pre-natal exposure to alcohol ;	**A** the difference in the sensory conduction velocity / speed (of the median nerve), between, group 1 (babies) / babies with pre-natal exposure to alcohol, and, group 2 (babies) / babies with no pre-natal exposure / between the two groups (of babies), to alcohol is not significant **A** there is no significant difference between the, sensory conduction velocity / speed (of the median nerve), between the two groups (of babies) **I** ref. to just nerve conduction – must mention sensory	[1]

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Question	Expected answer	Extra guidance	Mark
(e)	*max 2 from:* 1 small sample size ; 2 groups 1 and 2 of different sizes ; 3 different numbers of males and females in each group ; 4 does not include mothers, who drink less than 32 mg of alcohol / who drink alcohol occasionally ; 5 does not include the full age range of mothers / AW ; 6 body mass / weight, of the, mothers / babies ; 7 medication / illegal drugs , taken by mother during pregnancy ; 8 ethnicity of the, mother / baby ;	**I** ref. to 'some babies not affected' 1 **I** replicate / repeats unqualified, but **A** if explained in terms of sample size. *quoted numbers must be qualified* 3 **A** more females than males **ora** **I** stated figures unqualified 5 **A** only has mothers of age 23–25 years / small age range of mothers 7 **A** smoking qualified	[max 2]
		[Total: 11]	

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