OCR
Oxford Cambridge and RSA

GCE

Biology

Unit **F215:** Control, Genomes and Environment

Advanced GCE

Mark Scheme for June 2015

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

1. Annotations used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
	Correct answer
	Incorrect response
BOD	Benefit of Doubt
NBOD	Not Benefit of Doubt
ECF	Error Carried Forward
GM	Given mark
	Underline (for ambiguous/contradictory wording)
^	Omission mark
I	Ignore
	Correct response (for a QWC question)
BP	Blank Page
CON	Response that contradicts previous correct response

Question			Answer	Marks	Guidance
1	(a)	(i)	*division type 1* mitosis **and** *division type 2* meiosis **;**	1	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** correct spelling only **ACCEPT** correct spelling only **CREDIT** meiosis I **and** II **DO NOT CREDIT** meiosis I / meiosis II alone
1	(a)	(ii)	**A** (DNA) replication **;** **B** cytokinesis **;**	2	**Mark the first answer on each prompt line.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** stages of cell division **IGNORE** cell division / stages of cell division

Question			Answer	Marks	Guidance
1	(b)		**A1** independent assortment / random segregation **,** of (homologous) chromosomes / bivalents; **A2** in **,** metaphase I / meiosis I **;** **A3** *of* chromatids in **,** metaphase I I / meiosis I I **;** **A4** (so) homologous chromosomes , have different alleles / come from different parents **;** **A5** produces large number of allele combinations **;** **C1** crossing over / (formation of) chiasma(ta) **;** **C2** in **,** prophase I / meiosis I **;** **C3** (so) chromatids will have new combination of alleles **;** **C4** amount of variation depends on distance between crossover points **;** **M1** mutation **;** **M2** changes the (DNA) nucleotide/ base, sequence **;** **M3** DNA checks (during duplication) did not recognise damage **;** **M4** *idea of* differences in (named) protein(s) **;** **N1** non-disjunction **;** **N2** homologous chromosomes do not separate (in metaphase I) **;** **N3** one **,** more / less **,** chromosome present **;** **F1** random, mating / fusion of gametes/ fertilisation **;** **F2** gametes are not genetically identical; **F3** produces large number of (allele) combinations **;**	**8 max**	**A1 ACCEPT** Random assortment / independent segregation **A2 /A3 DO NOT CREDIT** metaphase /meiosis, I **and** II **A2 /A3 ACCEPT** correct anaphase stage linked to segregation **A2** must be in context of independent assortment / random segregation **A4/ A5 DO NOT CREDIT** genes **A4 ACCEPT** pairs of chromosomes / maternal **and** paternal chromosomes, have different alleles/ come from different parents **A5 ACCEPT** different combinations of, chromatids /chromosomes, in gametes **CREDIT** figures e.g. for humans 2^{23} possible combinations **C1 DO NOT CREDIT** between sister chromatids **C2 DO NOT CREDIT** prophase / meiosis, I **and** II **C2** must be in context of crossing over **C3 ACCEPT** shuffles / swaps/exchanges, alleles on chromatids **C4** e.g. more variation the further apart the crossovers occur **M2 IGNORE** **'**pairs' **M2 CREDIT** deletion,/substitution/ addition, of, base / nucleotide **M3 ACCEPT** proof reading did not recognise damage **M4** e.g. change in, amino acid sequence/primary structure **N1 CREDIT** inversion / translocation (chromosome mutation) **N2 CREDIT** description of inversion / translocation **N3 CREDIT** examples of chromosome changes e.g. Trisomy 21 **F2 ACCEPT** gametes are genetically different **F3 DO NOT CREDIT** produce large number of gene combinations

Question			Answer	Marks	Guidance
			QWC ;	1	**Awarded for one change and consequence of that change** **Award if ONE of the following has been awarded** mp **A1 or A2 or A3** **and** mp **A4 or A5** **OR** mp **C1 or C2** **and** mp **C3 or C4** **OR** mp **M1 or M2** **and** mp **M3 or M4** **OR** mp **N1 or N2** **and** mp **N3** **OR** mp **F1 or F2** **and** mp **F3**
			Total	**12**	

Question			Answer	Marks	Guidance
2	(a)	(i)	**1** peak in **,** 1988 / 1994 **;** **2** trend decrease after 1994 **;** **3** ref. decrease and then increase **,** 1988 to 1994 **;** **4** fluctuations (within pattern) **;** **5** overall increase from 1965 to 2002 **;**	**3 max**	**IGNORE** ref to population figures **1 ACCEPT** increases until / highest number in, 1988/1994 **4 ACCEPT 'goes up and down' / oscillates**
2	(a)	(ii)	*accurate because* *idea that* actual number of elk shot is recorded **;** *method not valid because* *idea that* number of elk shot / hunting success **,** varies independently of population size **;**	**2**	**ACCEPT** elks shot are counted / reported **CREDIT** suitable reason e.g. numbers of licences issued / number of hunters set quotas to hunt illegal hunting if weather suitable for hunting only younger / older / diseased / larger**,** elk killed **IGNORE** length of time spent hunting

Question			Answer	Marks	Guidance
2	(b)	(i)	**1** *idea that population size is determined by* <u>limiting</u> <u>factor</u>(s) **;** *Before 1995, population increases due to* **2** example of factor that is not limiting population **;** *Before 1995, population levels off because* **3** reaches <u>carrying capacity</u> **;** *Before 1995, population becomes limited by* **4** intraspecific competition for named resource; **5** interspecific competition for named resource; *Population can decline at any time/ dips, due to* **6** severe weather / natural disaster ; **7** decrease before 1995 not due to wolves (as none present) **;** **8** decrease after 1995 (probably) due to wolves**;** **9** *idea that* effect of wolves on population may be debatable **;**	**6 max**	**IGNORE ref to abiotic / biotic factors throughout** **2** e.g. plenty of, enough, food Less / no predation Less / no overcrowding/ enough space less hunting **2 IGNORE** water / nutrients/ availability of food **4 CREDIT** description of intraspecific **5 CREDIT** description of interspecific **4 & 5 CREDIT** any suitable limiting factor eg competition for, food / space / mates/ overcrowding **6 CREDIT** ref to parasites/disease/ drought/floods/fires **9** e.g. lack of data in 1996 and 1997 makes it difficult to form conclusions
			QWC **;**	**1**	**Award if** **1 mark** awarded from **mps 1 to 6 (limiting factors)** **<u>and</u>** **1 mark** awarded from **mps 7 to 9 (effect of wolves)**

Question			Answer	Marks	Guidance
2	(b)	(ii)	*re-introduction of wolves is conservation because* **1** restoring the <u>ecosystem</u> (to its original form) **or** maintains <u>biodiversity</u> **;** **2** helps the (global) wolf population **;** **3** active / dynamic / sustainable, management / maintenance **;** **4** prevents over-population by the elk **;** **5** prevents over-grazing **or** damage to, habitat / ecosystem **;**	**2 max**	**ACCEPT** controls/ increases, <u>biodiversity</u> **ACCEPT** wolves do not become extinct / increase in number 'Actively maintains biodiversity' = **MP1 and 3** **ACCEPT** wolves, limit / control, elk population or lack of wolves causes elk population to grow **ACCEPT** if wolves absent, elk would damage habitat / other species may become extinct
			Total	**14**	

Question			Answer	Marks	Guidance
3	(a)		AAA TCT GGT **;**	1	
3	(b)	(i)	the correct bases inserted in **all** 3 rows before box **;** correctly identifying the last base in each sequence as the labelled base **;** 5 **T** **T** **T** 6 **T** **T** **T** **C** 7 **T** **T** **T** **C** **C**	2	
3	(b)	(ii)	electrophoresis **;** (negatively-charged DNA) moves towards **,** positive electrode / anode **;** smallest/smaller (fragments) move, fastest / faster **; ora** resolution on gel sufficient to register 1, nucleotide / base**;**	3 max	**ACCEPT** positive, end /terminal **IGNORE** ref to distance **ACCEPT** lightest / shortest **ACCEPT** description ' machine detects fragments to one base in length' **IGNORE** pair
3	(c)	(i)	contraction of smooth muscle **;** circular (muscle) **;** extra mucus production **;** inflammation **;**	2 max	**ACCEPT** involuntary muscle / non-striated muscle **ACCEPT** blocked by mucus / build-up of mucus **ACCEPT** swelling / oedema **IGNORE** scarring

Question			Answer	Marks	Guidance
3	(c)	(ii)	(reduced diameter means) increased **,** resistance to air flow / friction **;** *idea that* exhalation is passive / no (muscular) force behind exhalation / requires additional, force / pressure, to exhale**;**	**1 max**	**ACCEPT** 'breathes harder'
3	(d)		(mutation) change in (DNA) nucleotide/ base, sequence **;** (mutation causes) change in, amino acid sequence / primary structure (of protein) **;** change in **,** tertiary structure/ 3D shape / binding site **,** of <u>receptor</u> **;** salmeterol unable to bind **;** *idea that* no response triggered in cell / no second messenger system activated **;**	**3 max**	**IGNORE** triplet/codon/gene / frameshift **DO NOT CREDIT** active site **ACCEPT** salmetorol not complementary shape to <u>receptor</u> **ACCEPT** salmeterol cannot bind as easily e.g. adenyl cyclase not activated **IGNORE** 'has no effect'
3	(e)	(i)	(mutation resulted in) <u>receptor</u> having complementary shape to montelukast **;** montelukast able to bind **;** (whereas) salmeterol cannot **;** montelukast may have a different <u>receptor</u> **;**	**2 max**	**DO NOT CREDIT** active site **IGNORE** fit **ACCEPT** attach **ACCEPT** cannot bind as easily **ACCEPT** montelukast receptors not damaged
3	(e)	(ii)	not reliable because, sample size **too** small / **only** 62 children in study; **or** could be reliable because 31 is quite a large sample **;**	**1**	**<u>Note</u>** *31 is a suitable number for a phase 1 trial*
3	(e)	(iii)	(epithelial) cells lining cheek **;**	**1**	**ACCEPT** (named) white blood cells in saliva / salivary gland cells
			Total	**16**	

Question			Answer	Marks	Guidance
4	(a)	(i)	geographic(al) **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** ecological **IGNORE** physical / barrier
4	(a)	(ii)	genetic drift **;**	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
4	(a)	(iii)	*C because* has the greatest change in allele frequency / described**;** smaller population / fewer individuals **;** *idea that* more **,** subject to founder effect / unrepresentative at start **;** *(more subject to genetic change because)* each random mating more significant **or** each individual forms a greater proportion of gene pool **or** each individual has greater effects on gene pool (than in large population) **or** easier to lose allele from gene pool;	2 max	**If C not identified then no marks awarded** **Look for comparative points with other populations** **ACCEPT** p and q for allele eg 'frequency of allele in C changed by 0.20 whilst it changed by 0.02 in A and 0.14 in B' **ACCEPT** figs as % **ACCEPT** smallest /fewest

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>4</td><td>(b)</td><td>(i)</td><td>1401 ; ; ;</td><td>3</td><td>Correct answer = 3 marks

Award 2 max
if answer not given to the nearest whole number or is incorrect or missing,
then

CREDIT correct working in table columns as follows:
both figures in one column correct = 1 mark. (N.B. Minus sign required for column 1)

ALLOW ecf from any incorrect column to 2 max

<table>
<tr><th>Phenotype of fly</th><th>O - E</th><th>$(O - E)^2$</th><th>$\frac{(O - E)^2}{E}$</th></tr>
<tr><td>red eye, yellow body</td><td>- 354</td><td>125316</td><td>348 (348.100)</td></tr>
<tr><td>pink eye, yellow body</td><td>341</td><td>116281</td><td>323 (323.003)</td></tr>
<tr><td>red eye, ebony body</td><td>369</td><td>136161</td><td>378</td></tr>
<tr><td>pink eye, ebony body</td><td>- 356</td><td>126736</td><td>352</td></tr>
</table>
</td></tr>
<tr><td>4</td><td>(b)</td><td>(ii)</td><td>reject hypothesis because
calculated χ^2 value / 1401 , is
(much) larger than , critical value / 11.35 ;</td><td>1</td><td>ALLOW ecf for a correct explanation that corresponds to the candidate's incorrect calculation for (b)(i)

CREDIT idea that probability that these results are due to chance is (much) less than 1% / 0.01</td></tr>
</table>

Question			Answer	Marks	Guidance
4	(b)	(iii)	(autosomal) linkage **or** genes / alleles, are linked **;** on same chromosome **;** linked alleles inherited together **;** **Ry** and **rY** (on chromosomes in heterozygotes) **;** crossing-over produced (rare) recombinants **;** tight linkage / two genes close together **;**	**3 max**	**DO NOT CREDIT** sex linkage **IGNORE** epistasis **ACCEPT** annotated drawing **ACCEPT** recombinant phenotypes described **ACCEPT** loci close together **Note** '*The alleles R & y and r & Y are inherited together*' = 2 marks (mps 3 & 4) '*The alleles for red eyes and ebony body, and pink eyes and a yellow body, are inherited together*' = 2 marks (mps 3 & 4)
			Total	**11**	

Question			Answer	Marks	Guidance
5	(a)		**1** $\frac{\text{herbivore / primary consumer,energy}}{\text{producer energy}}$ x 100 **;**		**1 CREDIT** $\frac{\text{trophic level 2 energy}}{\text{trophic level 1 energy}}$ x 100 ; **CREDIT** sample figures. e.g. if producer energy 20 000 kJ m^{-2} and herbivore 2000 kJ m^{-2} calculation is 2000 / 20000 x 100 = 10% **CREDIT** $\frac{\text{Energy available after transfer}}{\text{Energy available before transfer}}$ x100 **IGNORE** ref to productivity
			Plus any 3 of the following:		
			2 (a sample of) producers collected **;**		**CREDIT named examples for 2 and 3**
			3 (a sample of) herbivores /primary consumers collected;		**ACCEPT '**organisms at each trophic level collected' for **1 mark**
			4 (collected from) the same area **;**		
			5 **(**measure) biomass / dry mass (of individual or population) **;**		**5 ACCEPT** wet / fresh,mass **5 IGNORE** mass unqualified / pyramids of biomass
			6 energy content calculated of producer **and** herbivore **;**		**6 ACCEPT** expressed as J/KJ/MJ, per gram **IGNORE** calories per gram
			7 use of calorimeter / described;		**7** e.g. burn sample, in oxygen / in measure temperature increase **ACCEPT** use of published tables for energy values of, fresh /wet, mass
				4 max	

Question			Answer	Marks	Guidance
5	(b)			6	**Mark the first answer in each box.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**

Goal	Letter	
improving soil that is low in nutrients for the growing of wheat	F	;
preventing the spoilage of fruits after picking	E	;
reducing the impact of a fungal disease on yields from cucumber plants	A / B	;
producing strawberry plants that grow quicker and fruit earlier	A / B	;
making sugar syrup from waste starch	D	;
producing large amounts of a fungus for food	C	;

ACCEPT A / B

ACCEPT C

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>5</td><td>(c)</td><td></td><td>
<table>
<tr><th>Description</th><th>Name</th><th></th></tr>
<tr><td>Sparrows initially fly away from fruit bushes on which shiny CDs are hung, particularly when the CDs move in the wind.</td><td>escape reflex</td><td>;</td></tr>
<tr><td>After a few days the sparrows start visiting the fruit bushes again, and do not fly away even when the CDs move.</td><td>habituation</td><td>;</td></tr>
<tr><td>Carrot flies move towards chemicals released by carrot plants.</td><td>(positive chemo-) taxis</td><td>;</td></tr>
<tr><td>Raccoons learn to remove lids from containers of grain in a barn.</td><td>operant conditioning / trial and error (learning)</td><td>;</td></tr>
<tr><td>A line of young chicks follow their mother into a cornfield.</td><td>imprinting</td><td>;</td></tr>
</table>
</td><td>5</td><td>Mark the first answer in each box. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks

IGNORE innate / instinctive / learnt (as stated in Q)

DO NOT CREDIT negative chemotaxis
ACCEPT taxes

CREDIT insight (learning) / latent (learning)/ intelligent learning / observational learning</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>15</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
6	(a)	(i)	**1** (hormone) binds to <u>receptor</u> **;** **2** causing **,** cascade of events / enzyme reactions **;** **3** may involve switching **,** on / off, genes **;** **4** only **,** present / needed **,** in small **,** concentrations / quantities (to have an effect) **;** **5** may have effect on more than one **,** location / target tissue **;** **6** *idea that* effect may involve interaction of more than one hormone **;**	**2 max**	**IGNORE** prompt lines and mark as prose **1 ACCEPT (**hormone) complementary shape to <u>receptor</u> **1 ACCEPT** attach **1 IGNORE** fit **3 CREDIT** ref to changing gene expression
6	(a)	(ii)	**1** (most) plant cells retain ability to differentiate / <u>totipotent</u> **;** **2** plants have **,** meristems / meristematic tissue **;** **3** *idea that* plant cells can de-differentiate and then differentiate into a different cell type; **4** (most) animal cells are **,** differentiated / not totipotent / not pluripotent / only able to differentiate into the same type(s) of cell / are multipotent;	**2 max**	**2 ACCEPT** named meristematic tissue e.g. shoot apex / root apex / cambium **4 ACCEPT** 'stem cells found in few (named) tissues' 'bone marrow cells only differentiate into blood cells'

Question			Answer	Marks	Guidance
6	(a)	(iii)	**1** (inter-species / triploid) hybrids **,** are sterile / cannot reproduce sexually;		**1** **CREDIT** hybrid from named examples e.g. einkorn (wheat) x **,** wild / goat **,** grass emmer (wheat) x wild grass
			2 polyploidy (in the hybrid) provides duplicate of each chromosome **;**		**2** **IGNORE** ref to 'more than two sets of chromosomes' as this is given in Q
			3 (polyploidy) allows the hybrid to **,** carry out meiosis / form gametes **or** (polyploidy) restores fertility / overcomes sterility **;**		**3** **ACCEPT** 'chromosome number doubling restores fertility' **3** **ACCEPT** can reproduce sexually
			4 (hybrids are) <u>reproductively isolated</u> (from other species);		**4** **ACCEPT** gametes incompatible with other species
			5 increased, cell size / grain size, increases yield;		**5** **ACCEPT** seed size
			6 sterile hybrids expensive for farming (especially in developing countries);		
			7 (plants) stronger/more vigorous/ healthier;		**7** must be a comparative statement **7 ACCEPT** less prone to disease / greater hybrid vigour **7 IGNORE** pest resistance
				2 max	

Question			Answer	Marks	Guidance
6	(b)		*cress seedlings* **C1** apical cells / apex/ tip(of shoot), produce **,** auxin / IAA **;** **C2** diffusion / active transport (down shoot / through parenchyma) **;** **C3** greater auxin (concentration) on shaded side of stem **;** **C4** auxin causes cell <u>wall</u> loosening **;** **C5** auxin causes cell **,** elongation / expansion **;** **C6** further detail of changes in cell **wall** ; *Human* **H1** retina / rods / receptors**,** detect light / AW **;** **H2** action potentials/ depolarisation/nervous impulse**,** along sensory neurone (membrane) **;** **H3** intermediate neurone (in brain) / (somatic) motor neurone / neuromuscular junction **;** **H4** correct ref to detail of synaptic transmission**;** **H5** depolarisation / contraction, of muscle fibre(s); **H6** correct ref to detail of muscle contraction;	**7 max**	**C1 ACCEPT** secretes /releases **C2 CREDIT** PIN (polar auxin transport) **C3 ACCEPT** auxin, moves to / collects on, shaded side **C3 IGNORE** found on shaded side **C4 ACCEPT** cell <u>walls</u> become,stretchy / less rigid **C4 IGNORE** weakened cell <u>walls</u> **C6** e.g. H^+ ions pumped into cell wall / low pH to allow enzymes to work / bonds broken within cellulose in wall **H1 IGNORE** ref to cones **H2** / **H3 DO NOT CREDIT signals** / **messages** **H2 IGNORE** ref to optic nerve **H3 CREDIT** ref to relay neurone **H5 ACCEPT** muscle cell **H6** e.g. actin and myosin slide over each other
			Total	**13**	

Question			Answer	Marks	Guidance
7	(a)	(i)	*increased blood pressure* **B1** (small) blood vessels / capillaries**,** burst / break **;** **B2** bleeding causes (localised) build up of pressure (leading to cell death) **or** blood / oxygen **,** supply **,** reduced / stopped **;** **B3** cells cannot <u>respire</u> (leading to cell death) **;** *thrombosis* **T1** thrombus / clot **,** interrupts / reduces, blood flow **;** **T2** (cells) deprived of **,** oxygen / glucose **;** **T3** cells cannot <u>respire</u> (leading to cell death) **;**	**4 max**	**B1 CREDIT** haemorrhage / aneurism / arterioles / arteries **B1 IGNORE** veins / venules **B1 IGNORE** destroys / damages blood vessels **B2** e.g. bleeding leads to cell compression **B2 ACCEPT** brain deprived of **,** oxygen / glucose **B3 DO NOT ACCEPT** <u>respire</u> less 'Clot results in less oxygenated blood to cells' = **T1** and **T 2** **T2 ACCEPT** brain deprived of **,** oxygen / glucose **T3 DO NOT ACCEPT** <u>respire</u> less
7	(a)	(ii)	*idea that* (if the stroke has been caused by a bleed) then the drug will, increase the bleeding / be ineffective as a treatment (to prevent bleeding) **;**	**1**	e.g. 'the drug makes the problem worse' **DO NOT CREDIT** 'not effective in reduction of blood pressure'
7	(a)	(iii)	*idea of* disruption of **,** oxygen / glucose **,** supply (to brain cells) for <u>aerobic</u> <u>respiration</u> **;** *lack of oxygen / glucose / blood / damage to* <u>cerebellum</u> resulting in problems with coordination / movement **;** <u>cerebrum</u> / <u>cerebral</u> <u>hemisphere</u>(s) / <u>cerebral cortex</u> **,** resulting in loss of **,** memory / speech **;** <u>medulla</u> (oblongata)/ <u>cerebrum</u> / <u>cerebellum</u>, resulting in paralysis (of body below the neck) **;**	**4**	**Can be awarded at any point in the answer.** **Effect must be correctly linked to the part of the brain responsible.** **ACCEPT** Broca's / Wernicke's, area / hippocampus **ACCEPT** cerebral hemisphere(s) / cerebral cortex / corpus callosum

Question			Answer	Marks	Guidance
7	(b)		*producing nicotine is (selectively) advantageous as* **A1** stops **,** plant being eaten / loss of leaf area **;** **A2** so plant **,** survives / does breed / (still) produces seeds; **A3** *idea that* gene must be advantageous to be selected for **or** gene is linked to another gene that is selected for **;** *producing nicotine is (selectively) disadvantageous* **D1** decreases **,** reproductive success / number of seeds **;** **D2** metabolic resources diverted to nicotine production**;**	**3 max**	**mp must be in correct context (ie advantage/ disadvantage) to be awarded** **A1 ACCEPT** deters / kills, grazers / insects
7	(c)	(i)	postsynaptic membrane(s) (in **,** neurone / neuromuscular junction) **;**	**1**	**ACCEPT** sarcolemma **DO NOT CREDIT** postsynaptic knob

Question			Answer	Marks	Guidance
7	(c)	(ii)	*Effect* Nicotine slows down rate of / stops, transmission of, action potentials / nervous impulses; **Plus any 2 of the following:** *Explain* binds to <u>receptor;</u> (nicotine) has the same response / opens Na^+ channels / causes depolarisation **;** nicotine remains in receptor for longer **;** *idea that* <u>receptor</u> **,** remains in refractory stage for longer / unable to return to standby condition / cannot be reactivated **;**	**3 max**	**IGNORE** 'nervous system slows down' / 'acts as a depressant' **ACCEPT** competes with acetylcholine for the <u>receptor</u> **DO NOT CREDIT** active site **DO NOT CREDIT** 'acts as competitive inhibitor' **DO NOT CREDIT** binds to receptor permanently **ACCEPT** causes action potential in next neurone / mimics, action / effects, of acetylcholine **IGNORE** 'mimics acetyl choline' alone **IGNORE** delays refractory stage **ACCEPT** permanently in refractory stage

Question			Answer	Marks	Guidance
7	(d)	(i)	in xylem (by),cohesion-tension / transpiration (stream); in phloem (by), translocation / mass flow **;**	2	**ALLOW** transport in phloem from roots **only if** clearly in the context of being associated with transport of (stored) assimilates from roots
7	(d)	(ii)	*idea that* neonicotinoids have **,** little / no **,** effect (on humans) **;**	1	e.g. they don't harm humans neonicotinoids, do not bind/ not complementary, to receptors neonicotinoids broken down in digestion concentrations used in insecticides **,** very low / not high enough, to affect humans neonicotinoids not present in part of plant consumed by humans neonicotinoids break down before plant consumed
			Total	**19**	

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