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Detailed mark scheme

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2002

**XVIII**

1583

Time allowed

**53 Minutes**

Score

**/44**

Percentage

**%**

**Biology**

**AQA  
AS & A LEVEL**

**Mark Scheme**

**3.6 Organisms respond to changes in their internal and external environments (A-level only)**

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- 1 (a) 1. Causes sodium ion channels to open;  
*1. Reject if wrong sequence of events*
2. Sodium ions enter (cell and cause depolarisation);  
*Reject sodium on its own only once*
- 2
- (b) 1. (If not removed) keeps binding (to receptors);  
*Accept answers based on what happens if it is transported out – ie what should happen*
2. Keeps causing action potentials / depolarisation (in post-synaptic membrane);  
*2. Accept keeps Na<sup>+</sup> channels open(ing)*
- 2
- (c) 1. Movement in all groups (about) same before MDMA;  
**Q**
2. MDMA increases movement in Group **L**;
- 2. Accept normal mice for L*
3. Group **K** shows MDMA causes movement;  
*3. Accept K is a control*
4. No / little increase in mice without receptor / Group **M**;

3 max

[7]

2 (a) 0.32.

*Correct answer = 2 marks*

*Accept 32% for 1 mark max*

*Incorrect answer but identifying 2pq as heterozygous = 1 mark*

- (b)
1. Mutation produced *KDR minus* / resistance allele;
  2. DDT use provides selection pressure;
  3. Mosquitoes with *KDR minus* allele more likely (to survive) to reproduce;
  4. Leading to increase in *KDR minus* allele in population.

2

4

- (c)
1. Neurones remain depolarised;
  2. So no action potentials / no impulse transmission.

2

- (d)
1. (Mutation) changes shape of sodium ion channel (protein) / of receptor (protein);
  2. DDT no longer complementary / no longer able to bind.

2

[10]

- 3 (a) 1. (In myelinated) action potential / depolarisation only at node(s);
2. (In myelinated, nerve impulse) jumps from node to node / saltatory;
3. (In myelinated) action potential / impulse does not travel along whole length;

*The question is about speed of transmission, not repolarisation or related matters*

*Accept converse for non-myelinated*

3

- (b) 1. Probability of obtaining this difference by chance;  
*Reject 'results' once only*  
*This statement often split round 2.*
2. Is less than 5% / less than 0.05 / less than one in twenty;  
*Accept is 4.7% / 0.047 but reject less than 4.7% / 0.047*  
*Accept correct greater than 95% / greater than 0.95 arguments*
3. Difference is significant;  
*Reject 'results' once only*



2 max

- (c)
1. (All) dementia results lower (than control group) / non-dementia result higher;
  2. Error bars do not overlap so differences are (possibly) significant;  
*Neutral results*  
*Accept not due to chance / statistically significant*  
*In this context, accept references to standard deviation*
  3. Dementia may be due to other factors / not only due to a lack of myelin;  
*Accept suitable named factor e.g. genetic*
  4. (Because) big / significant differences in myelin in different dementia;  
*Not just 'different'*
  5. Only small sample sizes / only one study / more data required;

4 max

[9]

- 4 (a) 1. Membrane more permeable to potassium ions and less permeable to sodium ions;  
2. Sodium ions actively transported / pumped out and potassium ions in. 2
- (b) 1. (Pressure causes) membrane / lamellae to become deformed / stretched;  
2. Sodium ion channels in membrane open and sodium ions move in;  
3. Greater pressure more channels open / sodium ions enter. 3
- (c) 1. Threshold has been reached;  
2. (Threshold or above) causes maximal response / all or nothing principle. 2
- (d) 1. Less / no saltatory conduction / action potential / impulse unable to 'jump' from node to node;  
2. More depolarisation over length / area of membranes. 2
- [9]

5 (a) One suitable suggestion; explained;

E.g.

1. Action potentials travel more slowly / don't travel;

*Accept: fewer / no saltatory movement of potentials*

2. So delay in muscle contraction / muscles don't contract / muscles contract slow(er);

**OR**

3. Action potentials / depolarisation 'leaks' to adjacent neurones;

*Accept: neurones not insulated*

4. So wrong muscle (fibres) contract.

2 max

(b) Lipid-soluble / pass through phospholipid bilayer.

*Not just 'pass through membranes'*

1

(c) 1. Prevents influx of calcium ions (into pre-synaptic membrane);

*Need idea of moving into pre-synaptic membrane / synaptic knob*

*Accept  $Ca^{++}$  /  $Ca^{2+}$*

2. (Synaptic) vesicles don't fuse with membrane / vesicles don't release neurotransmitter;

*Accept vesicles don't release acetylcholine*

3. Neurotransmitter does not diffuse across synapse / does not bind to receptors (on post-synaptic membrane);

*Accept: sarcolemma / muscle membrane for post-synaptic membrane*

4. No action potential / depolarisation (of post-synaptic membrane) / sodium (ion) channels do not open / prevents influx of sodium ions.

*Accept  $Na^{+}$*

*Accept prevents depolarisation of muscle cell*

*Ignore: descriptions of events at post-synaptic membrane involving calcium ions and muscle contraction*

4

(d) 1. They won't affect synapses in brain;



2. They won't cause problems with the brain's function / won't damage brain;

*Accept: suitable named problem e.g. hallucination*

*Ignore: unqualified references to 'side effects'*

*Accept: reference to addiction / harm of smoking (cannabis)*

3. (So only the) muscle / neuromuscular junctions treated / affected.

2 max

[9]