

Question	Marking Guidance	Mark	Comments
01.1	1. Equilibrium reached; 2. Allow for expansion/pressure change in apparatus; 3. Allow respiration rate of seeds to stabilise;	3	1. Accept equilibrate 3. Ignore seeds acclimatise
01.2	1. Optimum temperature/temperature for normal growth of seeds; 2. (Optimum temperature) for enzymes involved in respiration;	2	
01.3	1. Oxygen taken up/used by seeds; 2. CO ₂ given out is absorbed by KOH (solution); 3. Volume/pressure (in B) decreases;	3	
01.4	0.975/0.98;	2	If incorrect, 0.26 × 6 / or incorrect numbers divided by 1.6 for 1 mark

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02.1	<ol style="list-style-type: none"> 1. Calcium ions diffuse into myofibrils from (sarcoplasmic) reticulum; 2. (Calcium ions) cause movement of tropomyosin (on actin); 3. (This movement causes) exposure of the binding sites on the actin; 4. Myosin heads attach to binding sites on actin; 5. Hydrolysis of ATP (on myosin heads) causes myosin heads to bend; 6. (Bending) pulling actin molecules; 7. Attachment of a new ATP molecule to each myosin head causes myosin heads to detach (from actin sites); 	5 max	
02.2	<ol style="list-style-type: none"> 1. Releases relatively small amount of energy / little energy lost as heat; 2. Releases energy instantaneously; 3. Phosphorylates other compounds, making them more reactive; 4. Can be rapidly re-synthesised; 5. Is not lost from/does not leave cells; 	2 max	<ol style="list-style-type: none"> 1. Key concept is that little danger of thermal death of cells 2. Key concept is that energy is readily available

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03.1	(Genes/loci) on same chromosome;	1	
03.2	1. GN and gn linked; 2. GgNn individual produces mainly GN and gn gametes; 3. Crossing over produces some/few Gn and gN gametes; 4. So few(er) Gggn and ggNn individuals;	4	
03.3	(Grey long:grey short:black long:black short) =1:1:1:1	1	
03.4	1. Chi squared test; 2. Categorical data;	2	

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04.1	<ol style="list-style-type: none"> 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	
04.2	<ol style="list-style-type: none"> 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	
04.3	<ol style="list-style-type: none"> 1. Threshold has been reached; 2. (Threshold or above) causes maximal response / all or nothing principle; 	2	
04.4	<ol style="list-style-type: none"> 1. Less/no saltatory conduction / action potential/impulse unable to 'jump' from node to node; 2. More depolarisation over length/area of membranes; 	2	

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05.1	1. (If injected into egg), gene gets into all/most of cells of silkworm; 2. So gets into cells that make silk;	2	
05.2	1. Not all eggs will successfully take up the plasmid; 2. Silkworms that have taken up gene will glow;	2	
05.3	Promoter (region/gene);	1	
05.4	1. So that protein can be harvested; 2. Fibres in other cells might cause harm;	2	

Question	Marking Guidance	Mark	Comments
06.1	0.32;	2	Correct answer = 2 marks Accept 32% for 1 mark max Incorrect answer but identifying 2pq as heterozygous = 1 mark
06.2	<ol style="list-style-type: none"> 1. Mutation produced <i>KDR minus</i>/resistance allele; 2. DDT use provides selection pressure; 3. Mosquitoes with <i>KDR minus</i> allele more likely (to survive) to reproduce; 4. Leading to increase in <i>KDR minus</i> allele in population; 	4	
06.3	<ol style="list-style-type: none"> 1. Neurones remain depolarised; 2. So no action potentials / no impulse transmission; 	2	
06.4	<ol style="list-style-type: none"> 1. (Mutation) changes shape of sodium ion channel (protein) / of receptor (protein); 2. DDT no longer complementary / no longer able to bind; 	2	

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07.1	Hypothalamus;	1	
07.2	<ol style="list-style-type: none"> 1. Water potential of blood will decrease; 2. Water moves from osmoreceptor into blood by osmosis; 	2	
07.3	<ol style="list-style-type: none"> 1. Permeability of membrane/cells (to water) is increased; 2. More water absorbed from/leaves distal tubule/collecting duct; 3. Smaller volume of urine; 4. Urine becomes more concentrated; 	4	
07.4	115.2/115.3 (cm ³ minute ⁻¹);	1	
07.5	<p>Any two of the following for 1 mark;</p> <p>Muscle/body mass</p> <p>Ethnicity</p> <p>Exercise</p> <p><u>Kidney</u> disease – do not accept 'health'</p>	1	

Question	Marking Guidance	Mark	Comments
08.1	1. Oxygen produced in light-dependent reaction; 2. The faster (oxygen) is produced, the faster the light-dependent reaction;	2	
08.2	35–36 ($\mu\text{mol O}_2 \text{ mg}^{-1}$);;	2	Correct difference at 500 $\mu\text{mol photons m}^{-2} \text{ s}^{-1}$ or incorrect difference but division by 4 shown = 1 mark
08.3	At all light intensities, chloroplasts from mutant plants: 1. Have faster production of ATP and reduced NADP; 2. (So) have faster/more light-independent reaction; 3. (So) produce more sugars that can be used in respiration; 4. (So) have more energy for growth; 5. Have faster/more synthesis of new organic materials;	4 max	Accept converse points if clear answer relates to non-mutant plants

Question	Marking Guidance	Mark	Comments
09.1	<ol style="list-style-type: none"> 1. Methylation prevents transcription of gene; 2. Protein not produced that prevents cell division/ causes cell death/apoptosis; 3. No control of mitosis; 	3	
09.2	<ol style="list-style-type: none"> 1. Scatter graph; 2. Fat on x axis and death rate on y axis; 3. (Because) looking at relationship between two discrete/independent variables; 	3	
09.3	<ol style="list-style-type: none"> 1. (Trend) shows positive correlation / shows the more fat in diet, the higher death rate from breast cancer; 2. But number of points off line/anomalies; 	2	

Question	Marking Guidance	Mark	Comments
10.1	<ol style="list-style-type: none"> 1. Reduction in ATP production by aerobic respiration; 2. Less force generated because fewer actin and myosin interactions in muscle; 3. Fatigue caused by lactate from anaerobic respiration; 	3	
10.2	<p>Couple A,</p> <ol style="list-style-type: none"> 1. Mutation in mitochondrial DNA/DNA of mitochondrion affected; 2. All children got affected mitochondria from mother; 3. (Probably mutation) during formation of mother's ovary/eggs; <p>Couple B,</p> <ol style="list-style-type: none"> 4. Mutation in nuclear gene/DNA in nucleus affected; 5. Parents heterozygous; 6. Expect 1 in 4 homozygous affected; 	4 max	
10.3	<ol style="list-style-type: none"> 1. Change to tRNA leads to wrong amino acid being incorporated into protein; 2. Tertiary structure (of protein) changed; 3. Protein required for oxidative phosphorylation/the Krebs cycle, so less/no ATP made; 	3	
10.4	<ol style="list-style-type: none"> 1. Mitochondria/aerobic respiration not producing much/any ATP; 2. (With MD) increased use of ATP supplied by increase in anaerobic respiration; 3. More lactate produced and leaves muscle by (facilitated) diffusion; 	3	
10.5	<ol style="list-style-type: none"> 1. Enough DNA using PCR; 2. Compare DNA sequence with 'normal' DNA; 	2	