

**Biology Unit 2 (Modular)
Mark Scheme**

Question Number	Answer	Additional guidance	Mark
1(a)	<u>lymphocytes</u> / eq	Ignore white blood cells Reject phagocytes	1

Question Number	Answer	Additional guidance	Mark
1(b)(i)	An answer that makes reference to one of the following: <ul style="list-style-type: none"> • both alleles expressed (1) • both alleles affect the phenotype (1) • both alleles show their characteristics / traits (1) 	Accept both alleles work together / both alleles work together to form a third phenotype / phenotype depends upon both alleles	1

Question Number	Answer	Mark
1(b)(ii)	The only correct answer is D (A, B, AB and O) <i>A is incorrect as the cross could also produce AB and O</i> <i>B is incorrect as the cross could produce also AB and O</i> <i>C is incorrect as the cross could also produce A, and B</i>	1

Question Number	Answer	Additional guidance	Mark
1(c)	$4.7(4) \times 10^7$ (2)	one mark for 47400000 or 47.4 million or 47 million or other incorrect standard forms using 47(4) Correct answer gains all marks	2

Question Number	Answer	Additional guidance	Mark
1(d)	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> artificial cells are not (bi)concave / red blood cells are (bi)concave (1) artificial cells have smaller SA(:vol ratio) / red blood cells have larger SA (:vol ratio) (1) artificial cells absorb / bind / release less oxygen / red blood cells absorb bind more oxygen / release more oxygen / eq (1) artificial cells do not pass through capillaries easily / eq / red blood cells pass through capillaries more easily / eq (1) 	<p>Accept artificial cells carry less oxygen / red blood cells carry more oxygen</p> <p>Accept artificial cells have slower diffusion (of oxygen) / red blood cells have faster diffusion (of oxygen)</p>	3

Question Number	Answer	Additional guidance	Mark
1(e)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> no platelets (1) 	Allow no fibrinogen	1

Question Number	Answer	Additional guidance	Mark
1(f)	An answer that makes reference to two of the following: <ul style="list-style-type: none"> • (there are) no antigens (present) / eq (1) • so antibodies will not be produced / no rejection / no immune response / eq (1) • any recipient / more people can receive blood group O (1) 	<p>Accept no surface proteins</p> <p>Accept blood group A/ B / AB can receive the blood / O is the universal donor</p>	2

Question number	Answer	Additional guidance	Mark
1(g)	A description that makes reference to three of: <ul style="list-style-type: none"> • high blood pressure (1) • forces substances out of Bowman's capsule (1) • into the glomerulus (1) • small molecules pass through / large molecules can not pass through (1) 	<p>Accept renal capsule</p> <p>Accept named molecules, e.g. protein</p>	3

Question Number	Answer	Mark
2(a)(i)	The only correct answer is A - 2 <i>B is incorrect as there are not 3 secondary consumers</i> <i>C is incorrect as there are not 4 secondary consumers</i> <i>D is incorrect as there are not 5 secondary consumers</i>	1

Question Number	Answer	Mark
2(a)(ii)	Acacia / plant → (desert) rat → fennec / fox → monitor / lizard → hawk (1)	1

Question Number	Answer	Additional guidance	Mark
2(a)(iii)	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> • (energy is lost due to) indigestible parts / faeces / not absorbed / eq (1) • (energy is lost due to) excretion / metabolic waste / urine / eq (1) • (energy is lost due to) organisms/ parts of organisms that are not consumed /eq (1) • (energy is released) in respiration / by heat loss / in active transport / due to metabolism (1) • (energy is lost due to) movement (1) 	<p>Accept some organisms / food not eaten Accept loss to death / decay</p>	3

Question Number	Answer	Mark
2(b)	<p>An explanation that makes reference to four of the following:</p> <ul style="list-style-type: none"> • mutation / genetic variation (1) • (the fox has / ears have) large surface area to lose heat / keep body cool (1) • (which) enables survival (1) • breeding occurs / (fox) produces offspring (1) • passes on alleles / genes (for ear shape) (to next generation) (1) 	4

Question Number	Answer	Additional guidance	Mark
3(a)	A description that makes reference to two of the following points: <ul style="list-style-type: none"> • use random number tables / computer / eq (1) • to generate coordinates in field / place tape measures along edge of field / eq (1) 	Allow grid area / split area into squares (1)	2

Question Number	Answer	Mark
3(b)(i)	3 (1)	1

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	12 (1)	ECF from 3(b)(i)	1

Question Number	Answer	Additional guidance	Mark
3(c)	A description that makes reference to two of the following points: <ul style="list-style-type: none"> • more plants / named plants in field A / more plants per quadrat / more of each species (1) • more species in field A (1) • more species evenness in field A (1) / even distributions 	Allow converse for all mark points Allow A has 39 plants, B has only 16 Allow A has 4 species, B has only 2 Allow only dandelions (and 1 violet) in B / all species present in A	2

Question Number	Answer	Additional guidance	Mark
3(d)	<p>A description that makes reference to three of the following points:</p> <p style="text-align: center;">EITHER METHOD 1</p> <ul style="list-style-type: none"> • measure water content of soil / field / eq (1) • take repeated samples (1) • along a transect / at random locations (1) • count buttercups / compare number of buttercups to water content of soil (1) <p style="text-align: center;">OR METHOD 2</p> <ul style="list-style-type: none"> • plant buttercups in one field / pots with poor drainage and one with good drainage / eq (1) • • repeat (1) • control temperature / minerals / light / rainfall / water added / eq (1) • count number of buttercups (1) 	<p>Mark either of the two methods</p> <p>Allow calculate mean water content</p> <p>Allow plant in high soil water and low soil water</p>	3

Question Number	Answer	Mark
4(a)	<p>An answer that makes reference to one of the following.</p> <ul style="list-style-type: none"> • sterilised / unsterilised / eq (1) • presence of bacteria / absence of bacteria / eq (1) • heated / unheated soil / eq (1) • soil sample / soil used (1) 	1

Question Number	Answer	Additional guidance	Mark
4(b)(i)	<p>An answer that makes reference to two of the following.</p> <ul style="list-style-type: none"> remove / dissolve / wash away nitrate present / get rid of nitrates / eq (1) (so any) nitrate made must have been from the ammonium salt / are due to ammonium salts / eq (1) so a fair comparison is made / so the test is valid / so the test is fair (1) 	<p>Accept make sure no nitrate present</p> <p>Accept to see if the nitrates come from the ammonia Ignore accurate / reliable</p>	2

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	<p>An answer that makes reference to four of the following.</p> <ul style="list-style-type: none"> nitrates present in unsterilised soil (1) nitrates produced /made from ammonium / ammonia (1) nitrifying bacteria / nitrification (1) ammonium is converted into nitrite / nitrite is converted into nitrate (1) nitrates not present in sterilised soil because there are no bacteria / bacteria were dead / killed / removed (1) 	<p>Ammonium to nitrite to nitrate = 2 marks (mp2 and mp4)</p>	4

Question Number	Answer	Mark
5(a)(i)	<p>A description that makes reference to the following:</p> <ul style="list-style-type: none"> W or stigma / feathery / large surface area / W stigma outside flower / exposed (to catch pollen)/eq (1) X or anther outside flower/ exposed (to disperse pollen) / eq (1) Y or filament long / hinged / not rigid / can move (to disperse pollen)/eq(1) 	3

Question Number	Answer	Additional guidance	Mark
5(a)(ii)	<p>An answer that refers to two of the following</p> <ul style="list-style-type: none"> • smaller / dull / green flowers /petals / no petals / eq (1) • no nectar/ nectary (1) • no scent / eq (1) • smaller / lighter / smooth pollen grains / more pollen produced (1) 	<p>allow converse for insect pollinated</p> <p>larger/ coloured /eq</p> <p>nectar/nectary</p> <p>scent</p> <p>larger / sticky / have hooks pollen grains/ less pollen produced</p>	2

Question Number	Answer	additional guidance	Mark
5(b)	<p>An answer that makes reference to five the following:</p> <ul style="list-style-type: none"> • link between pollen number and symptoms /eq (1) • Person A allergic to tree pollen (only) / eq (1) • Person B allergic to (mainly) grass pollen / eq (1) • Person B some / mild allergy to tree and weed / eq (1) • Person C allergic to all pollen / tree and grass and weed/eq (1) • Person D no pollen allergy / eq (1) • Person E allergic to (mainly) grass and weed/ eq (1) • Person E some / mild allergy to tree / eq (1) • no species level data / eq (1) • only one year / eq (1) 	<p>allow hay fever/ allergic response/ for allergy</p>	5

Question Number	Answer	Additional guidance	Mark
6(a)(i)	<ul style="list-style-type: none"> • section / length / part / eq, of DNA / chromosome, that codes for a protein / polypeptide (1) 	<p>Ignore strand</p>	1

Question Number	Answer	Additional guidance	Mark
6(a)(ii)	FF <u>and</u> Ff	Allow FF and fF Allow FF, Ff, and ff Allow alternative letters	1

Question Number	Answer	Mark
6(b)(i)	The only correct answer is C - 4 <i>A is not correct as 1, 4, 5 and 6 must be heterozygous</i> <i>B is not correct as 2, 3 and 7 must be homozygous</i> <i>D because only 2, 3 and 7 are not heterozygous</i>	1

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	An answer that makes reference to: <ul style="list-style-type: none"> parental genotypes of Ff and ff (1) gametes as F + f <u>and</u> f (+ f) (1) correct F₁ genotypes (Ff, ff) in correct ratio (1) 0.5 / 50% / ½ (1) 	MP1-3 from Punnet square Allow ecf ONLY for MPs 2 and 3 with incorrect parental genotypes Allow different letters	4

Question Number	Answer	Additional guidance	Mark
6(b)(iii)	An explanation that makes reference to three from: <ul style="list-style-type: none"> feather is discontinuous / categoric / height is continuous / eq (1) height is <u>polygenic</u> (1) height depends on the combination of many/ several, genes / not just one gene / eq (1) height may have environmental effects (1) feather structure is due to one gene / monogenic (1) height depends on sex (1) 	Allow named factors e.g. nutrition	3

Question Number	Answer	Mark
7(a)(i)	An explanation that makes reference to the following points: <ul style="list-style-type: none"> • (have been given) genetic material/ gene/ allele/ DNA/ genetically alter (1) • From human/ different species (1) 	2

Question number	Answer	Mark
7(a)(ii)	The only correct answer is D (restriction enzyme) <i>A is incorrect as amylase digests starch</i> <i>B is incorrect as ligase attaches DNA</i> <i>C is incorrect as lipase digests lipids</i>	1

Question Number	Answer	Additional guidance	Mark
7(b)	An answer that makes reference to six of the following points: <ul style="list-style-type: none"> • use enucleated egg/ empty egg/ remove nucleus from egg/ eq (1) • nucleus from body cell/ diploid nucleus (placed into empty egg)/ fuse adult cell with empty egg (1) • use of electricity/ shock (1) • cell division/ mitosis (1) • embryo (1) • uterus/ womb (1) • surrogate mother (1) 	Ignore DNA	6

Question number	Answer	Mark
8(a)	An explanation that makes reference to: <ul style="list-style-type: none"> • prevents entry of oxygen (1) • to prevent aerobic respiration (1) 	2

Question number	Answer	Mark
8(b)(i)	An explanation that makes reference to: <ul style="list-style-type: none"> to reach temperature of water bath / eq (1) so that bubbling rate / respiration rate becomes constant / eq (1) 	2

Question number	Answer	Additional guidance	Mark
8(b)(ii)	<ul style="list-style-type: none"> Addition of readings: $10 + 12 + 11$ $+ 14 = 47$ Division by 4 = 12 (2) 	<p>Allow one mark for 47 or division by 4</p> <p>Award full marks for correct numerical answer without working</p>	2

Question number	Answer Additional guidance	Mark
8(b)(iii)	An explanation that makes reference to three of the following: <ul style="list-style-type: none"> faster rate of respiration (1) more kinetic energy (1) more collisions between substrate and enzyme (1) more E/S complexes form (1) 	3

Question number	Answer Additional guidance	Mark
8(c)	A description that makes reference to: <ul style="list-style-type: none"> measure volume of gas (1) using syringe / inverted measuring cylinder / burette / eq (1) 	2

Question number	Answer	Additional guidance	Mark
8(d)	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> • checks / monitor, temperature and lets (cooling) water in / open valve / water is pumped around / eq (1) • lowers temperature / removes heat / prevents over heating / stops temperature getting too high (1) • maintain optimal temperature / optimum temperature (1) • stop enzymes denaturing / stops enzyme shape changing / eq (1) 	Ignore cools it down alone	2

Question Number	Answer	Mark
9(a)(i)	<p>The only correct answer is B – cornea</p> <p><i>A is incorrect as X is not the conjunctive</i></p> <p><i>C is incorrect as X is not the lens</i></p> <p><i>D is incorrect as X is not the retina</i></p>	1

Question Number	Answer	Mark
9(a)(ii)	<p>The only correct answer A – contracted loose</p> <p><i>B is incorrect as the ligaments would be loose</i></p> <p><i>C in incorrect as the muscles would be contracted</i></p> <p><i>D in incorrect as the muscles would be contracted</i></p>	1

Question Number	Answer	Additional guidance	Mark
9(a)(iii)	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> • pupil widens / dilates / gets bigger (1) • radial muscles contract (1) • circular muscles relax (1) 	Ignore it / Y	2

Question Number	Answer	Additional guidance	Mark
9(b)(i)	27 m/s (3)	<p>One Mark: $2.5 \div 0.005$ or $25 \div 0.005$ or 0.25 (m) or 5000</p> <p>Two marks: 50 (m/s)</p> <p>Award full marks for correct answer</p>	3

Question Number	Answer	Additional guidance	Mark
9(b)(ii)	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> • (more) synapses are present / eq (1) • which transmit by (chemical) diffusion (1) • of neurotransmitters (1) 	A gaps / clefts present	2

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