A-LEVEL

Biology

BIOL2 – The variety of living organisms
Mark scheme

2410
June 2015

Version: 1 Final Mark Scheme

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Question	Marking Guidance	Mark	Comments
1(a)	1. (Carry) oxygen/glucose; 2. (To) heart muscle/tissue/cells/myocytes;	2	1. Accept: oxygenated blood 1. Ignore references to removing waste products 1. Ignore references to arteries 'pumping' blood 2. Must be supply to heart or cardiac
1(b)(i)	**A**;	1	Accept: A on its own even if outside box Reject if two (or more) letters given
1(b)(ii)	**H**;	1	Accept: H on its own even if outside box Reject if two (or more) letters given
1(b)(iii)	**E**;	1	Accept E on its own even if outside box Reject if two (or more) letters given
1(c)	(Aorta) 1. (is) close/directly linked to to the heart/ventricle / pressure is higher/is very high; 2. (Aorta has) elastic tissue; 3. (Aorta has) stretch/recoil;	3	2. Accept elasticity 2. Ignore reference to muscle 3. **Q** Reject: contracts/relaxes/pumps Accept: for mp 2 and mp 3, converse for small arteries if qualified by little/less

Question	Marking Guidance	Mark	Comments
2(a)	1. Females are (generally) longer/larger/bigger/up to 115(mm) / males are (generally) shorter/smaller/up to 100(mm); 2. Females show a greater range/variation / males show a narrower range/variation;	2	1. Ignore: tall 1. Accept: females have a larger/90 modal/peak/most common value and males have a smaller/80 modal/peak/most common value 1. Accept mean length of females greater/mean length of males shorter 1. Reject: use of mean in relation to 80mm or 90mm 1. Reject: Most of the females are 90 mm long/most of the males are 80 mm long 2. Accept: correct use of figures from the graph: the range of males is 50 to 100 and of females is 50 to 115 / the spread is 50 for males and 65 for females
2(b)(i)	**2.6** to **2.7** = 2 marks;; Incorrect answer but evidence of a numerator of **24180 OR 156 x 155**or denominator of **9014** = 1 mark;	2	
2(b)(ii)	(Fewer plant species) – no mark 1. (So) few(er) habitats/niches; 2. (So) lower diversity of insects / fewer insect species/fewer insect types; 3. (So) fewer food sources / less variety of food;	3	1. Ignore habitat size **1**. **Q** Neutral: fewer homes 2. **Q** Neutral: fewer insects 2. Accept less variety of insects 3. **Q** Neutral: less food Ignore references to pesticides, farmers' actions, competition between lizards and evolution

Question	Marking Guidance	Mark	Comments
3(a)(i)	***(Both)*** 1. Are polymers/polysaccharides/ are made of monomers/of monosaccharides; 2. Contain glucose/carbon, hydrogen and oxygen 3. Contain glycosidic bonds; 4. Have 1–4 links; 5. Hydrogen bonding (within structure);	2 max	Neutral: references to 'unbranched', insoluble, formed by condensation, flexible and rigid Are made of the monomer glucose = MP 1 and 2 = 2 marks 5. Ignore reference to H bonds between cellulose molecules
3(a)(ii)	(Starch) 1. Contains α/alpha glucose; 2. Helical/coiled/compact/branched/not straight; 3. 1,6 bonds/ 1,6 branching; 4. Glucoses/monomers same way up; 5. No H-bonds between molecules; 6. No (micro/macro) fibres/fibrils;	2 max	Assume 'it' refers to starch Accept: converse arguments only if linked directly to cellulose 1. Accept: forms α glycosidic bonds
3(b)(i)	1. No/few organelles / very little cytoplasm / cytoplasm at edge / more room/hollow/large vacuole/large space/thick walls; 2. (So) easier/more flow/ (thick/strong walls) resist pressure;	2	1. Accept strong walls for thick walls 2. Easier flow may be expressed in other ways e.g. lower resistance to flow
3(b)(ii)	1. Mitochondria release energy/ ATP/ site of respiration; 2. For active transport/uptake against concentration gradient; ***OR***: 3. Ribosomes/roughendoplasmic reticulum produce(s) proteins; 4. (Proteins) linked to transport eg carrier proteins/enzymes;	2	1. **Q** Reject: 'produce energy' but accept produce energy in form of ATP Note: no mark is awarded for simply naming an organelle 3. Concept of making proteins needed

4(a)(i)	Joins nucleotides (to form new strand);	1	Accept: joins sugar and phosphate/forms sugar-phosphate backbone Reject: (DNA polymerase) forms base pairs/hydrogen bonds
4(a)(ii)	(Prokaryotic DNA) 1. Circular/non-linear (DNA); 2. Not (associated) with proteins/ histones; 3. No introns / no non-coding DNA;	2 max	Accept converse for eukaryotic DNA Ignore: references to nucleus, binary fission, strands and plasmids 2. Accept does not form chromosomes/chromatin 3. Accept only exons 3. **Q** Neutral: no 'junk' DNA
4(b)(i)	1. Have different genes; 2. (Sobases/triplets) are in a different sequence/order; 3. (So) different amino acid(sequence/coded for) / different protein/different polypeptide/different enzyme;	2 max	1. Reject: different alleles 2. Accept: base sequence that matters, not percentage 3. Unqualified 'different amino acids' does not gain a mark 3. Reject: references to different amino acids formed Ignore: references to mutations/exons/non-coding/introns
4(b)(ii)	(Virus DNA) 1. A does not equal T / G does not equal C; 2. (So) no base pairing; 3. (So) DNA is not double stranded/is single stranded;	2 max	1. Accept: similar for equal 1. Accept: virus has more C than G/has more A than T

Question	Marking Guidance	Mark	Comments
5(a)	1. Recognise/identify/attract same species; 2. Stimulates/synchronises mating/production/release of gametes; 3. Recognition/attraction of mate/opposite sex; 4. Indication of (sexual) maturity/fertility/receptivity/readiness to mate; 5. Formation of a pair bond/bond between two organisms (to have/raise young);	3 max	1. Ignore: references to letting them produce fertile offspring 3. Accept finding a mate 3. Accept: gender
5(b)	1. Use a (real) male (with intact wings/no wing removed); 2. Determine (percentage) response (of females compared with**L)**;	2	Mark ignoring reference to birds/ or other types of animals 1. Accept: use a real cricket, since only males sing 2. Accept: compare results with**L**
5(c)	1. Lowest/only 30% courtship with no song/K/ (or) courtship still occurred when no song played/**K**; 2. Reducedcourtship when no ticks/M / there is some courtship when no ticks/M; 3. Reduced courtship when no chirps/N / there is some courtship when no chirps/N; 4. (So) courtship must involve a visual stimulus/other factor involved; 5. Chirps more important as lowest courtship when none/N / ticks less important as similar courtship when changed/M; 6. Data only show presence and absence of chirps/0 and 7 chirps;	4 max	Note: throughout, for courtship accept response/stimulation/reaction Neutral: references to methodology 1. Answer must make clear there is no song/version K Accept: use of figures from the table <u>in an explanation</u> 5. Must make comparison to gain mark Note: 'courtship still occurred when no sound played so a visual stimulus/other factor/something else (e.g. pheromone?) must be involved' = 2 marks

Question	Marking Guidance	Mark	Comments
6(a)	1. DNA replicated; 2. (Involving) specific/accurate/complementary base-pairing; 3. (Ref to) two identical/sister chromatids; 4. Each chromatid/ moves/is separated to(opposite) poles/ends of cell;	4	1. Reject: DNA replication in the wrong stage 2. Accept:semi conservative replication 4.Reject: meiosis/ homologous chromosomes/crossing over Note: sister chromatids move to opposite poles/ends = 2 marks for mp 3 and mp 4 Reject: events in wrong phase/stage
6(b)(i)	1. To allow (more) light through; 2. A single/few layer(s) of cells to be viewed;	2	1. Accept: transparent 2. Accept: (thin) for better/easier stain penetration
6(b)(ii)	1. More/faster mitosis/division near tip/at 0.2 mm; 2. (Almost) no mitosis/division at/ after 1.6 mm from tip; 3. (So) roots grow by mitosis/adding new cells to the tip;	2 max	Neutral: references to largest mitotic index Accept: cell division for mitosis Penalise once for references to meiosis 3. Accept: growth occurs at/near/just behind the tip (of the root) Accept: converse arguments

Question	Marking Guidance	Mark	Comments
7(a)(i)	Aves;	1	
7(a)(ii)	Gallicolumba kubaryi;	1	Must have both words and in this order Must be capital G If starts with k, award mark as impossible to recognise difference Ignore: underlining Accept: phonetic spelling Accept: G kubaryi (must be a capital/upper case G)
7(a)(iii)	No overlap;	1	
7(b)(i)	1. Genetic bottleneck; 2. Less genetic diversity / small(er) gene pool / less variety of alleles; 3. Individuals breed within group / do not breed with outsiders; 4. High(er) chance of inheriting allele/high(er) frequency of allele in offspring;	3 max	**Q**. Accept: converse arguments for the USA 1. Ignore: founder effect 2. Neutral: fewer alleles 2. Accept: fewer different alleles 3. Accept: inbreeding for 'individuals breed within group' 3. Accept: marry/mate within group 3. Accept: do not interbreed/no gene flow 4. Do not award for 'allele passed on' only, must be idea of more/greater/higher chance
7(b)(ii)	Answer of **32** (:1) = 2 marks;; Incorrect answer but populations calculated as **300** and **9636** = 1 mark;	2	Accept: **32.1** and **32.12** for 2 marks Accept: decimal places after 9636

Question	Marking Guidance	Mark	Comments
8(a)	1. Change/mutation in base/nucleotide sequence (of DNA/gene); 2. Change in amino acid sequence/primary structure (of enzyme); 3. Change in hydrogen/ionic/disulfide bonds; 4. Change in the tertiary structure/shape; 5. Change in active site; 6. Substrate not complementary/cannot bind (to enzyme/active site) / no enzyme-substrate complexes form;	6	Q. Ignore: references to changing base-pairing Accept: affect for change, if in correct context 1. Accept: changes triplets/codons 2. Accept: different amino acid(s) coded for 2. **Q** Reject: different amino acids produced/formed/made 3. Accept: references to sulfur bonds 4. Neutral: alters 3D structure/3D shape 6.Accept: no E S complexes form
8(b)	1. Non-SR strain falls more/SR strain falls less/up to 10(µg/cm–3); 2. Above 10(µg/cm^{-3}), SR strain levels out/offand non-SR strain continues to decrease; 3. Greater difference between strains with increasing concentration of antibiotic;	2 max	Must include 10 but only required once in either MP1 or MP2 Ignore: units or absence of 1. This must be a comparative statement 3. This must be a comparative statement
8(c)	1. Division stopped (of both strains by scientist); 2. SR strain still more resistant/fewer die/none die (at higher concentrations of antibiotic);	2	1. Reject:references to mitosis stopping 2. Accept: SR strain and non-SR strain would be similar if resistance is due to only stopping division 2. Need some comparison with non-SR

8(d)	1. Make a competitive/non-competitive inhibitor; 2. Competitive competes with/blocks active site/non-competitive inhibitor affects/changes <u>active site</u>; OR 3. (Make a drug) that inhibits/denatures/destroys enzyme/stringent response; 4. Give at the same time as/before an antibiotic;	2max	Mark in pairs either MP1 <u>and</u> MP2 OR MP3 <u>and</u> MP4 Do not mix and match 3. Accept: drug that 'knocks out'/destroys enzyme

8(e)	(SR strain) 1. Fewer free radicals (than non-SR); 2. Produces more catalase (than non-SR); 3. Catalase (might be) linked to production of fewer free radicals / breaking down/removing free radicals;	3	1. Note: has to be comparative statement Accept converse statements for non-SR. 3. Accept: hydrolysis of radicals by catalase.

Question	Marking Guidance	Mark	Comments
9(a)	1. Removes (main/largest) source of oestrogen / (different) mice produce different amounts of oestrogen; 2. (Allows) oestrogen to be controlled/oestrogen to be made by aromatase only / only oestrogen made in lungs to be involved;	2	1. Accept: so oestrogen from ovaries not a confounding variable – idea of. Reject: references to injection of aromatase.
9(b)	1. (Anastrozole) prevents/reduces oestrogen production; 2. (Fulvestrant) stops remaining oestrogen binding /less oestrogen binds to receptors;	2	Note: brackets around drug names.

9(c)	(Yes for Group T) 1. Least tumours per animal (from fig. 9) 2. Lowest (mean) tumour area/size (from fig. 10); 3. Lowest top of range; (But) 4. Means (tumour area) are similar; 5. Ranges overlap/share values so differences may not be real/treatments may be just effective in reducing tumour; 6. Range affected by outliers/ SD's would be better; 7. Done on mice / not done on women/humans; 8. Only 10 mice used per group/small sample size so may not be representative/reliable; 9. Might be side effects ; 10. Only did for 15 weeks somaximum effect of drugs may not have been seen;	5 max	Accept: 'mean values' for tumour area. Where candidates confuse range and standard deviation, do not give credit. 5.Ignore significance
9(d)	1. Tumours may be different depths / area does not take depth into account / tumours are 3-D/are not 2-D; 2. (Measure) tumour volume/mass/ weight;	2	1. Neutral: different sizes 1. Accept: height/thickness for depth
9(e)	1. Allows tumours to grow/develop/form; 2. (So) can investigate treatment rather than prevention (of tumours)/ when tumour/cancer is more advanced;	2	1. Neutral: gives drug more time to work. 2. Accept: to see whether it can destroy/treat/stop growth of a tumour (that already exists)/ to allow/assess treatment of a tumour

9(f)	1. Unethical (not to treat patients) / may increase probability of patients dying/getting more ill; 2. Use normal cancer drugs/treatment;	2	1. Reject: references to giving people tumours 2. Accept: named type of cancer treatment, e.. chemotherapy