



Rewarding Learning

**General Certificate of Secondary Education
2016**

GCSE Biology

Unit 2

Higher Tier

[GBY22]

FRIDAY 17 JUNE, MORNING

**MARK
SCHEME**

General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

			AVAILABLE MARKS
1	Virus; [1] Vaccination; [1] Fungus; [1] Salmonella; [1] Sexual intercourse; [1]	[5]	5
2	(a) $8 \div 5$; [1] 1.6; [1]	[2]	
	(b) Any two from: Wind [speed]; Temperature; Light; Humidity; Size of plant/number of leaves/surface area of leaves;	[2]	
	(c) B has highest rate of water loss – 2g per day/10g in 5 days; [1] B – more stomata – 74; [1] (B – more) water transpires/diffuses/evaporates; [1] Through/via/out of stomata; [1] (Accept converse for C)	[4]	8
3	(a) (i) Amniotic fluid;	[1]	
	(ii) Cushions the foetus;	[1]	
	(b) (i) Large surface area/villi/good blood supply/thin membrane;	[1]	
	(ii) Carbon dioxide/nitrogen wastes;	[1]	4

4 Indicative Content

1. Chemical;
2. Implant less chance of pregnancy than mechanical type;
3. Implant more chance of pregnancy than surgical types; } ECT
- 4 and 5. **Maximum of two** from:

Convenient;

Reversible;

Reduces bleeding;

Less risk than surgery;

6. Disadvantages – **one** from:

May increase risk of blood clotting/May cause headaches/May cause tender breasts/Other appropriate answer;

Accept: bullet points which start with capital letter, contain a verb and end in full stop as sentences.

Band	Response	Mark
A	Candidates must use appropriate, specialist terms throughout using five of the above points . They use good spelling, punctuation and grammar and the form and style are of a high standard .	[5]–[6]
B	Candidates use some appropriate, specialist terms throughout using three of the above points . They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard .	[3]–[4]
C	Candidates make little use of specialist terms throughout using some or all of the above points . The spelling, punctuation and grammar, form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit.	[0]

- 5 (a) Health improved; [1]
Fewer adults treated for **both** diseases; [1]
Lung cancer: 2700 → 2000/by 700; [1]
or heart disease: 4000 → 2800/by 1200;
or totals 6700 → 4800/1900; [3]
- (b) Time lag between time of ban and diagnosis of lung cancer/not enough time for smoking ban to take effect; [1]
- (c) Surgery/chemotherapy/radiotherapy; [1]

AVAILABLE
MARKS

6

5

		AVAILABLE MARKS
6	<p>(a) Nucleus; [1] Accept: Head; Tail; [1]</p> <p>(b) (i) Sperm [head] entering/touching egg; Accept: Described, e.g. Sperm attached to egg;</p> <p style="padding-left: 20px;">(ii) nucleus/nuclei; [1] of sperm and egg fuse; [1]</p> <p>(c) Oviduct;</p> <p>(d) Zygote;</p> <p>(e) Any two from: Divide/by mitosis; form a ball of cells/embryo; Travels down oviduct;</p>	<p>[2]</p> <p>[1]</p> <p>[2]</p> <p>[1]</p> <p>[1]</p> <p>[2]</p> <p>9</p>
7	<p>(a) Antigen;</p> <p>(b) Active/acquired (not artificial unqualified);</p> <p>(c) Produced in response to different/previous bacterial infections;</p> <p>(d) Any three from: Shape of antibody matches antigens/specific/complementary; [1] Antibody attaches/binds to antigen/bacterium; [1] Binds/clumps bacteria together; [1] Prevents spread/reproduction/easier for phagocytes; [1]</p> <p>(e) Phagocyte; [1] Reject: <i>white blood cell</i> Engulfs bacteria/clumps of bacteria; [1] Digests; [1]</p> <p>(f) Any two from: Skin; Hairs/cilia; Mucous membranes; Tears/lysozyme; Stomach/vaginal acid; Blood clotting;</p>	<p>[1]</p> <p>[1]</p> <p>[1]</p> <p>[3]</p> <p>[3]</p> <p>[2]</p> <p>11</p>

			AVAILABLE MARKS	
8	(a) (i)	Transport oxygen; [1] Platelet; [1] Plasma; [1] Transport; [1]	[4]	
	(ii)	Any two from: RBC – no nucleus, WBC – nucleus; [1] RBC smaller, WBC larger; (comparison required) [1] RBC is biconcave/WBC is not; [1] More RBCs (than WBC); [1]	[2]	
	(iii)	Any one from: Haemoglobin; Biconcave disc/large surface area; No nucleus;	[1]	
	(b)	Carries less oxygen; [1] Reduced (cell) respiration ; [1]	[2]	
	(c)	Any three from: Only one RBC passes at a time/single file; [1] Slow flow/movement [in capillary]; [1] More time for exchange [of oxygen]; [1] By diffusion; [1]	[3]	12
9		Chargaff; [1] Chemical analysis; [1] X-ray diffraction [crystallography]; [1] Crick and Watson; [1] Double helix; [1]	[5]	5
10	(a) (i)	Any three from: Backbone same; [1] Double helix; [1] Made of sugar/deoxyribose and phosphate; [1] A pairs with T/C with G; [1]	[3]	
	(ii)	Different sequences/order of bases;	[1]	
	(b) (i)	C;	[1]	
	(ii)	Glycine replaced by arginine; [1] Different protein; [1]	[2]	7

		AVAILABLE MARKS
11	<p>(a) More yellow 135 v 127/8; [1]</p> <p>(b) Any two from: More yellow snails on grassland; [1] More dark banded snails in woodland; [1] More in total in grassland; Accept converse: Less in total woodland; [1] Number of yellow in woodland similar to dark in grassland; [1] [2]</p> <p>(c) Yellow better camouflaged in grassland/dark banded better camouflaged in wood; [1] Less eaten by thrush/predation; [1] More survive; [1] Reproduce; [1] Pass yellow/dark-banded gene on; [1] [5]</p>	8
12	<p>(a) (i) One similar plasmid with insulin gene drawn inside bacterium; [1]</p> <p>(ii) Restriction [enzyme]; [1]</p> <p>(iii) Exposed [DNA] bases on sticky ends (of gene); [1] Complementary/match to (bases in) cut in plasmid; [1] bind/bond together by base pairing; [1] [3]</p> <p>(iv) Any two from: Bacterium is grown/cultured/reproduces/in fermenter/biodigester; Bacteria all/each produce insulin; [2]</p> <p>(b) X; [1] Activity reaches a maximum quickly; [1] Max = 7.1 arbitrary units in 96 minutes/1 hour 36 minutes/active for 5.4 hours; [1] [3]</p>	10
13	<p>(a) Carried on X chromosome/sex chromosome; [1]</p> <p>(b) (i) Grandson; [1]</p> <p>(ii) Chris receives normal X chromosome (X^H) from his mother; [1] Receives Y chromosome from his father; [1] [2]</p> <p>(iii) Any two from: ♂ would have to receive only 1 recessive/X^h allele; Y chromosome does not carry the haemophilic gene; ♀ would have to receive 2 recessive/X^h alleles; [2]</p> <p>(c) (i) Mary's gametes: X^H X^h; [1] Genotype of children: $X^H X^H$ $X^H X^h$; [1] $X^H Y$ $X^h Y$; [1] [3]</p> <p>(ii) Any three from: Test would have shown Mary is a carrier; [1] Half her daughters could be carriers/25% chance of (girl) carrier; [1] Half her sons would be haemophiliacs/25% chance of having haemophilic son; [1] Could have decided to adopt/not have children [1] [3]</p>	12

- 14 (a) Any **four** from:
 Water enters into/absorbed by cell/cell swells/fills;
 by diffusion;
 Down concentration gradient/described;
 By osmosis/through selectively permeable membrane;
 Causes **lysis**;
- [4]
- (b) Any **three** from:
 Cell wall;
 Resists outwards force (movement) of cell membrane/vacuole;
 Causes pressure increase/cell becomes **turgid/turgor**;
 Stops water entering/limits water uptake;
- [3]
- (c) **Indicative content:**
1. Water level in dish falls because water moves from dish into potato tissue/cells;
 2. Water level in hollow of potato rises/sugar solution rises because water moves from the potato tissue;
 3. Osmosis;
 4. Sugar solution becomes more dilute;
 5. Correct description of one of the concentration gradients involved:
 From water to dilute/weak/low concentration solution in the potato tissue/cells/vacuole **or**
 From dilute/weak/low concentration solution in the potato tissue/cells/vacuole to concentrated/strong/high concentration of sugar [solution];
 6. Boiled potato damages membranes/loses selective permeability;
(Accept: bullet points which start with capital letter, contain a verb and end in full stop as sentences.)

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[6]

TotalAVAILABLE
MARKS

13

115