Rewarding Learning

General Certificate of Secondary Education
2013

Biology

Unit 2

Higher Tier

[GBY22]

TUESDAY 18 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	(a)	(i)	Head/nucleus;	[1]	
		(ii)	Contains half the number of chromosomes/haploid; **Accept**: Contains enzymes to help entry into egg	[1]	
		(iii)	Tail/flagellum;	[1]	
		(iv)	Some are further away (from camera) than others/reference to 3D image;	[1]	
	(b)		Zygote;	[1]	5
2	(a)	(i)	Bar workers' respiratory health has improved; Any **one** from: Eye irritation from 82% to 51%/31% less; Sneezing from 75% to 34%/41% less; Coughing from 87% to 67%/20% less;	[2]	
		(ii)	Sneezing;	[1]	
	(b)		Reduces passive smoking/the amount of smoke in the air they are forced to breathe in;	[1]	
	(c)		Freedom of choice/rights of the smoker/fall in revenue;	[1]	5
3	(a)		D; B;	[1] [1]	
	(b)		**Artificial** – Injected/infected by man/Jenner; **Active** – body/patient/person (who is being vaccinated) **produces own antibodies**;	[1] [1]	
	(c)		Engulf bacteria/viruses; Digest bacteria/viruses;	[2]	6

4 **Indicative content:**

Maximum of **two** from points 1, 2, 3.

1 **Y**;

2 Larger (diameter of) clear zone/correct (comparative) measurement of **Y** clear zone (diameter);

3 More **bacteria** are killed/affected/the less resistant the bacterium is to the antibiotic;

Maximum of **two** from points 4, 5, 6 in context of fair test.

4 Water is control/for comparison with the antibiotic solutions;

5 Concentration of antibiotic solution/size of filter paper/incubation time/ nutrient agar/type or amount of bacteria/temperature (kept constant [controlled/same]);

6 Only one variable/changed/investigated;

Maximum of **two** from points 7, 8, 9 in context of safety precautions.

7 Incubated at 20 °C **or below**;

8 Seal plates/don't open plates;

9 Sterile [/sterilise] apparatus [/equipment/agar]/aseptic techniques described;

Response	**Marks**
Candidates must use appropriate, specialist terms throughout to explain which of the bacteria is least affected **using at least FIVE of the points above.** They use **good** spelling, punctuation and grammar and the form and style are of a **high** standard.	[5]–[6]
Candidates **use some** appropriate, specialist terms throughout to explain which of the bacteria is least affected **using at LEAST THREE of the points above.** They use **satisfactory** spelling, punctuation and grammar and the form and style are of a **satisfactory** standard.	[3]–[4]
Candidates make **little use** of specialist terms throughout to explain which of the bacteria is least affected **using at LEAST ONE of the points above.** The spelling, punctuation and grammar, form and style are of a **limited** standard.	[1]–[2]
Response not worthy of credit	[0]

[6] 6

5 Any **four** from:

Animal taller;

Data reference years/height;

Neck/tail longer;

Longer legs/cannon bone;

4 toes to 1/middle toe larger/develops hoof; [4] 4

AVAILABLE MARKS

				AVAILABLE MARKS
6	**(a)**	Narrow/blocked oviducts;	[1]	
	(b)	Stimulates production (release) of multiple ova;	[1]	
	(c)	Ova and sperm are **mixed** in dish/test tube; **Nuclei** fuse;	[2]	
	(d)	Any **two** from: Reduced risk of multiple births/ More risk of babies dying (in multiple pregnancy)/reduce risk of premature birth; more risk of mother dying (in multiple pregnancy)/more difficult/stressful/ expensive for parents to bring up children from multiple births/more expense to NHS to care for multiple pregnancy; If it fails spare embryos are available;	[2]	
	(e)	Any **two** from: Low sperm count/no sperm produced/poor quality; Bacterial infection/blocked [twisted] sperm ducts [epididymis]/inflamed testes [Orchitis]; Impotence; Contact with dangerous chemicals/radiation/drug treatment/surgery;	[2]	8
7	**(a)**	Any **two** from: Same potato; Same temperature; Same time (in solution); Calculate **percentage change** (in mass);	[2]	
	(b)	[0.47 ×100] ÷ 4.28; = +11% [10.98%];	[2]	
	(c)	Any **three** from: Cylinder/potato loses weight [/mass]; Water leaves potato; Osmosis; Water diffuses from dilute solution to more concentrated solution, through the selectively permeable membrane;	[3]	
	(d)	Accurate plots [×2]; Line drawn;	[3]	
	(e)	0.44 (Accept 0.44–0.46); No (percentage) change in mass/no osmosis;	[2]	12

AVAILABLE MARKS

8 **(a)** Any **one** from:
From 1998 to 2005 the percentage [of adults with high blood cholesterol] falls/higher percentage of women have high cholesterol; [1]

(b) Any **four** from:
Consumption of total fats falls; (total fats) from 204(±3)/to 182(±3)/ by 22(±6);
Fats high in cholesterol/increase concentration of cholesterol in blood;
Consumption of chicken/fish rises; (chicken) from 227(±3)/to 262(±3)/ 35(±6)/(fish) from 143(±3)/to 166(±3)/23(±6);
Chicken/fish **low** in cholesterol/fat; [4]

(c) **Indicative content:**
1 A build-up of cholesterol reduces/blocks/stops (blood flow);
2 [Both] reduce/stop transport of O_2/sugar/glucose;
3 Stops cell respiration/energy production;
4 Heart muscle/tissue cells die;
5 Causes heart attack;
6 Brain cells/tissue die;
7 Causes stroke;
8 Reduces brain function/coordination/example described;
9 Both can cause death;

Response	Marks
Candidates **must use** appropriate, specialist terms throughout to compare the effect of cholesterol build-up in arteries in the heart and brain **using at least 5 of the above points.** They use **good** spelling, punctuation and grammar and the form and style are of a **high standard**.	[5]–[6]
Candidates **use some** appropriate, specialist terms throughout to compare the effect of cholesterol build-up in arteries in the heart and brain **using at least 3 of the above points.** They use **good** spelling, punctuation and grammar and the form and style are of a **satisfactory standard**.	[3]–[4]
Candidates **make little use** of specialist terms throughout to compare the effect of cholesterol build-up in arteries in the heart and brain **using some or all of the above points.** The spelling, punctuation, grammar, form and style are of a **limited standard**.	[1]–[2]
Response not worthy of credit	[0]

[6] 11

					AVAILABLE MARKS
9	**(a)**	Right atrium;		[1]	
		Left ventricle;		[1]	
	(b)	Prevent backflow of blood;			
		into right ventricle;		[2]	
	(c)	Jugular vein;		[1]	5
10	**(a)**	**(i)**	Correct **number** of chromosomes;		
			Correct **shapes** of chromosomes;	[2]	
		(ii)	Growth;	[1]	
			Repair/replace worn out cells;	[1]	
	(b)	**(i)**	Prevent infection;	[1]	
		(ii)	Genetically identical;	[1]	
		(iii)	**Advantage**:		
			Cheap/Many plants produced (in short time);	[1]	
			Disadvantage:		
			Any **one** from:		
			Sterile/specialist equipment/specialist technicians required;		
			No variation/whole crop susceptible to same disease;	[1]	8
11	**(a)**	Ben/Patrick (haemophiliac) gets **Y** from his **father**/Andrew/David;			
		$\mathbf{X^h}$ from his mother/grandmother/Amy;		[2]	
	(b)	David's gametes $\mathbf{X^H}$, **Y**;			
		Emma's gametes $\mathbf{X^H}$, $\mathbf{X^h}$;			
		Offspring; Two lines of genotypes correctly filled in;		[4]	
		Phenotypes			
		Patrick – sufferer/haemophiliac;		[1]	
		Peter – normal;		[1]	
		Anne either carrier;			
		or normal;		[2]	10

				AVAILABLE MARKS
12	**(a)**	Restriction;	[1]	
	(b)	Any **two** from: Will cut at same **sequence** of bases; Produces sticky ends; Gene and plasmid **complementary**; Base pairing can occur/described;	[2]	
	(c)	Insulin gene has not been taken up/inserted;	[1]	
	(d)	Nutrients/O_2 added; Bacteria reproduce; Form bacteria containing insulin gene; (Bacteria) produce human insulin;	[4]	
	(e)	Any **three** from: Extraction; Purification; Modification of insulin; Packaging;	[3]	
	(f)	**Advantage**: Any **two** from: No risk of transferring animal diseases; No harm to animals; No shortage/plentiful supply; No (allergic) reactions to GE insulin; Concentration/dosage known;	[2]	
	(g)	Any **two** from: Safety concerns to human; More expensive; More difficult to obtain/skilled workers required; Ethical concerns; Legislation considerations; Environmental issues;	[2]	15

AVAILABLE MARKS

13 **(a)** X – (deoxyribose) sugar; [1]
Y – Phosphate; [1]

(b) Double helix; [1]

(c) **Indicative content**:
1 Chargaff used chemical analysis;
2 showed base pairing/A = T/G = C;
3 Franklin/and Wilkins used X-ray (crystallography/diffraction);
4 to work out overall shape of DNA;
5 Crick and Watson used modelling;
6 to show the arrangement of bases/3D/helix/double strands;
7 Collaborative nature of science/research described;
Allow double helix only once;

Response	**Mark**
Candidates **must use** appropriate, specialist terms throughout to describe how using different lines of evidence led scientists to the discovery of the structure of DNA **using at least 5 of the above points.** They use **good** spelling, punctuation and grammar and the form and style are of a **high standard**.	[5]–[6]
Candidates **use some** appropriate, specialist terms throughout to describe how using different lines of evidence led scientists to the discovery of the structure of DNA **using at least 3 of the above points.** They use **good** spelling, punctuation and grammar and the form and style are of a **satisfactory standard**.	[3]–[4]
Candidates make **little use** of specialist terms throughout to describe how using different lines of evidence led scientists to the discovery of the structure of DNA **using some or all of the above points.** The spelling, punctuation, grammar, form and style are of a **limited standard**.	[1]–[2]
Response not worthy of credit.	[0]

[6]

(d) **(i)** 20.3; [1]

(ii) Five repeats/samples used; [1]

(iii) Any **two** from:
Most T;
Least C;
A/T greater than G/C;
A = T/C = G;
A + G = T + C/= 50%;
Each person has a similar proportion of bases; [2]

				AVAILABLE MARKS
(e)	**(i)**	Any **two** from: (Amino acid 3) changes to amino acid 1; Produce a different protein; Protein may not function (in same way/properly);	[2]	
	(ii)	Mutation;	[1]	
	(iii)	**Cause** – Ultraviolet/UV light; **Effect** – (Skin) cancer;	[1] [1]	
	(iv)	Any **two** from: Occurs in production of sperm/egg cell/gamete; Inherited by/passed to next/following generations; Gamete may not grow/develop/fertilise/cause a **genetic** disorder;	[2]	20
			Total	**115**