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Mark Scheme Summer 2009

GCE

GCE08 Biology (8BI01)

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GENERAL INTRODUCTION

Mark schemes are prepared by the Principal Examiners and revised, together with the relevant questions, by a panel of senior examiners and subject teachers. The schemes are further amended at the Standardisation meetings attended by all examiners. The Standardisation meeting ensures as far as possible that the mark scheme covers the candidates' actual responses to questions and that every examiner understands and applies it in the same way.

The schemes in this document are the final mark schemes used by the examiners in this examination and include the amendments made at the meeting. They do not include any details of the discussions that took place in the meeting, nor do they include all of the possible alternative answers or equivalent statements that were considered to be worthy of credit.

It is emphasised that these mark schemes are working documents that apply to these papers in this examination. Every effort is made to ensure a consistent approach to marking from one examination to another but each marking point has to be judged in the context of the candidates' responses and in relation to the other questions in the paper. It should not be assumed that future mark schemes will adopt exactly the same marking points as this one.

Edexcel cannot under any circumstances discuss or comment informally on the marking of individual scripts. Any enquiries about the marks awarded to individual candidates can be dealt with only through the official Enquiry about Results procedure.

Unit Codes and Unit Titles

These Mark Schemes cover the units offered in this examination for Advanced Subsidiary Biology (8BI01) and Advanced Biology (9BI01. The units available in this examination series for the complete qualifications are listed in the table below.

Level	Unit	Biology	
AS	1	**6BI01**	Lifestyle, Transport, Genes and Health
	2	**6BI02**	Development, Plants and the Environment
	3	**6BI03**	Practical Biology and Research Skills
A2	4	**6BI04**	The Natural Environment and Species Survival
	5	**6BI05**	Energy, Exercise and Coordination
	6	**6BI06**	Practical Biology and Investigative Skills

Cashing in

The following tables show the units that must be taken in order to obtain an award for AS or Advanced GCE Biology, or for AS or Advanced GCE Biology (Human).

Advanced Subsidiary

Level	Unit	8BI01 Biology
AS	1 2 3	**6BI01** **6BI02** **6BI03**

Advanced GCE

Level	Unit	9BI01 Biology
AS	1 2 3	**6BI01** **6BI02** **6BI03**
A2	4 5 6	**6BI04** **6BI05** **6BI06**

GENERAL INFORMATION

The following symbols are used in the mark schemes for all questions:

Symbol	Meaning of symbol
; semi colon	Indicates the end of a marking point
eq	Indicates that credit should be given for other correct alternatives to a word or statement, as discussed in the Standardisation meeting
/ oblique	Words or phrases separated by an oblique are alternatives to each other
{} curly brackets	Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion
() round brackets	Words inside round brackets are to aid understanding of the marking point but are not required to award the point
[] square brackets	Words inside square brackets are instructions or guidance for examiners
[CE] or [TE]	Consecutive error / transferred error

Crossed out work
If a candidate has crossed out an answer and written new text, the crossed out work can be ignored. If the candidate has crossed out work but written no new text, the crossed out work for that question or part question should be marked, as far as it is possible to do so.

Spelling and clarity
In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

No marks are awarded specifically for quality of language in the written papers, except for the essays in the synoptic paper. Use of English is however taken into account as follows:

- the spelling of technical terms must be sufficiently correct for the answer to be unambiguous
  e.g. for amylase, 'ammalase' is acceptable whereas 'amylose' is not
  e.g. for glycogen, 'glicojen' is acceptable whereas 'glucagen' is not
  e.g. for ileum, 'illeum' is acceptable whereas 'ilium' is not
  e.g. for mitosis, 'mytosis' is acceptable whereas 'meitosis' is not

- candidates must make their meaning clear to the examiner to gain the mark.

- a correct statement that is contradicted by an incorrect statement in the same part of an answer gains no mark – irrelevant material should be ignored

6BI01/01
Lifestyle, Transport, Genes & Health

Question Number	Answer	Mark
1(a)(i)	1 glycerol molecule and 3 fatty acid molecules ;	**(1)**

Question Number	Answer	Mark
1(a)(ii)	ester bond ;	**(1)**

Question Number	Answer	Mark
1(a)(iii)	condensation ;	**(1)**

Question Number	Answer	Mark
1(a)(iv)	have double bonds between carbon atoms and between carbon and oxygen atoms ;	**(1)**

Question Number	Answer	Mark
1(a)(v)	more hydrogen atoms than unsaturated lipids ;	**(1)**

Question Number	Answer	Mark
1(b)(i)	1. phosphate and base joined to pentose sugar ; 2. base correctly joined to sugar ; 3. phosphate correctly joined to two pentose sugars ;	**(3)**

Question Number	Answer	Mark
1(b)(ii)	(DNA) polymerase /(DNA) ligase / (DNA) helicase ;	**(1)**

Question Number	Answer	Mark
2(a)	**EITHER** 1. amniocentesis ; 2. amniotic fluid removed (from amniotic sac of mother) / eq ; 3. {fetal / embryonic} cells present in amniotic fluid /{fetal / embryonic} cells needed ; 4. DNA can be analysed / eq ; 5. to detect {defective / eq} gene(s) (in sample) / eq ; **OR** 1. chorionic villus sampling ; 2. placental tissue removed (from womb of mother) / eq ; 3. fetal cells present in {placenta / placental tissue / chorionic tissue} / fetal cells needed ; 4. DNA can be analysed / eq ; 5. to detect {defective / eq} gene(s) (in sample) / eq ;	**max (3)**

Question Number	Answer	Mark
2(b)	**Benefit:** 1. gives information about abnormalities (in fetus) / eq ; 2. {opportunity for choice / eq} / {consider termination / eq} / time for {preparation / treatment / eq } / {peace of mind / eq} ; **Risk:** 3. possibility of miscarriage (due to procedure) / eq ; 4. {potentially a healthy baby would be lost / eq} / {risk to mother / eq} ; **OR** 3. idea of {false positive / false negative} result ; 4. wrong decision made / description of wrong decision ;	**(2)**

	OR 3. {damage / harm} to fetus ; 4. subsequent health issues / miscarriages / eq ;	**(2)**

Question Number	Answer	Mark
2(c)	1. idea that a fetus is living ; 2. abortion is {wrong / murder} / eq ; **OR** 1. who has right to decide if tests should be performed / eq ; 2. implications of medical costs / disagreements over next step ; **OR** 1. issues relating to confidentiality of {parents / child} / eq ; 2. idea that {some other abnormality may be found / paternal DNA does not match / other family members have right to know results} ; **OR** 1. that or some other abnormality may be found ; 2. comment on possible problems with {future employment / insurance / what constitutes a serious condition} / eq ; **OR** 1. not fully understanding possible risks of prenatal testing; 2. possibility of {miscarriage / harm to child} / eq; **OR** 1. {who has the right to make the decision for the fetus / fetus has decision rights} (if the test is positive) ; 2. {denying them the opportunity to live / fetus should be allowed to live / fetus has a right to live} ;	**max (2)**

Question Number	Answer	Mark
3(a)	<table><tr><td>contracted</td><td>relaxed</td></tr><tr><td>relaxed</td><td>contracted</td></tr><tr><td>relaxed</td><td>relaxed</td></tr></table> **1 mark** for any two correct boxes ;;;	**(3)**

Question Number	Answer	Mark
3(b)	1. valves {separate / eq} atria from ventricles ; 2. open during atrial {systole / contraction } / eq ; 3. so that blood can pass through to ventricles / eq ; 4. closed during ventricular {systole / contraction} eq ; 5. to prevent {blood being forced back / backflow / eq} (up into atria) / to maintain pressure in ventricles ; 6. open during diastole / eq ; 7. so that ventricles can start to fill up (as atria are filling) ;	**max (4)**

Question Number	Answer	Mark
3(c)(i)	1. (time for complete cardiac cycle) = 0.96 to 0.98 (sec) ; 2. 60 ÷ cycle time ; 3. correct answer {beats per minute / bpm} ;	**(3)**

Question Number	Answer	Mark
3(c)(ii)	1. correct reference to <u>pressure</u> differences e.g. left is higher ; 2. left ventricle pumps blood {all around body / to rest of body / many arteries / systemic} / eq ; 3. right ventricle pumps blood to {lungs / pulmonary system / eq} ; 4. idea that if blood under high pressure there would be {damage / eq} to {lungs / capillaries / eq} ; 5. reference to lots of muscle (contracting in left ventricle) / reference to thick wall (of left ventricle) ;	**max (3)**

Question Number	Answer	Mark
4(a)	**Causation:** when a change in one variable is responsible for a change in another variable / eq ; **Correlation:** (relationship between two variables such that) a change in one of the variables is reflected by a change in the other variable / eq ;	**(2)**

Question Number	Answer	Mark
4(b)(i)	1. {no relationship / little difference} between ethnic group and cholesterol level / eq ; 2. {more / higher percentage of} black and African Americans have {highest / higher} blood pressure than both White and Mexican Americans / eq ;	**(2)**

Question Number	Answer	Mark
4(b)(ii)	not enough people surveyed / eq ;	**(1)**

Question Number	Answer	Mark
4(c)	1. idea that {other variables present / other variables need considering / no information available about other variables} (for a causal relationship) ; 2. named variable (e.g. genetics, ethnic group, mass of individuals, age of individuals, diet, smoking, exercise) ; 3. idea that cholesterol level of 204 mg dm^{-3} may not be significantly lower than 207 mg dm^{-3} ; 4. idea that {30% may not be significantly different from 26% / two values are not very different} ; 5. no information on how many tested / survey not repeated elsewhere ;	**max (3)**

Question Number	Answer	Mark
5(a)	1. both decrease ; 2. mortality rate in men is higher than that in women (throughout time period) / eq ; 3. this difference is greater at the start of the time period than at the end / eq ; 4. a valid comparison made about the difference in the changes e.g. between 1997 and 1998 the rate stays constant for males but falls for women / fall in mortality rate in men is steeper than the fall in women / decrease in mortality rate is greater in men than women / the decrease in men is less uniform than in women ; 5. correct manipulation of figures to quantify any of the above ;	**max (3)**

Question Number	Answer	Mark
5(b)	1. {people more aware of the dangers / better health education} / appropriate named example /eq ; 2. less stress /eq ; 3. {better / more} screening / eq ; 4. better treatments / eq ; 5. more exercise being taken / eq ; 6. changed diet / less obesity / eq ; 7. less alcohol intake / eq ; 8. decrease in smoking ; 9. change in population genetics / eq ;	**max (3)**

Question Number	Answer	Mark
5(c)	1. damage to {endothelial cells / epithelial cells /cells lining artery (wall)} ; 2. reference to inflammatory response ; 3. reference to (accumulation of) white blood cells in (damaged area) ; 4. {build up / eq} of cholesterol (in damaged area) ; 5. reference to build up of {calcium salts / fibrous tissue / fibrin / platelets} ; 6. reference to formation of {atheroma / plaque} ; 7. reference to {loss of elasticity (of artery) / narrowing of lumen} / eq ; 8. idea that this process is self-perpetuating ;	**max (4)**

Question Number	Answer	Mark
6(a)	1. vitamin C content decreases during first {145 / 150} days of storage / eq ; 2. no further decrease in vitamin C content (after first {145 / 150} days) / eq ; 3. idea that decrease is {fastest / greatest} up to 25 days ; 4. rate of decrease decreases with time / eq ; 5. correct manipulation of figures ;	**max (3)**

Question Number	Answer	Mark
6(b)	1. reference to DCPIP ; 2. reference to use of (camu-camu) juice ; 3. idea of titrating juice with DCPIP ; 4. correct reference to colour change e.g. from blue to {colourless / pink} ; 5. use of calibration curve to determine vitamin C concentration / comparison with standard vitamin C ; 6. reference to procedure being repeated at (regular) time intervals e.g. everyday ; 7. reference to replication ; 8. description of one controlled variable ; 9. reference to drawing graph of both sets of results ;	**max (5)**

Question Number	Answer	Mark
7(a)(i)	1. an allele is the {different form / eq} of a gene / eq ; 2. a gene is {a section of DNA / sequence of bases} that codes for a {polypeptide / eq} /occupies a particular {locus / eq} on a chromosome / eq ;	**(2)**

Question Number	Answer	Mark
7(a)(ii)	(allele) that is only expressed (in the phenotype of an organism) if the dominant allele is not present / eq ;	**(1)**

Question Number	Answer	Mark
7(b)(i)	alleles (of a particular gene) are the same / eq ;	**(1)**

Question Number	Answer	Mark
7(b)(ii)	1. Cara and Jasjeet ; 2. {Naveeda / one child} is an albino so must have inherited an albino allele from each parent / eq ; 3. Daniel ; 4. Cara must have inherited the albino allele from her father (as Susan was an unaffected homozygote) / eq ;	**(4)**

Question Number	Answer	Mark
7(c)	1. idea that {fewer albino squirrels survive / squirrels may not breed so frequently} ; 2. a suitable reason given (e.g. more predation, less camouflage) ; 3. idea of {frequency of albinism allele in squirrel (population) is lower / chances of two squirrels with the allele less likely to mate} ; 4. comment on the lower mutation rate (in squirrels) ;	**max (2)**

Question Number	Answer	Mark
7(d)	1. idea that dihydroxyphenyalanine cannot be synthesized from tyrosine if tyrosinase is absent ; 2. idea that precursor of melanin is dihydroxyphenylalanine / melanin only made if DHPA present ; 3. enzymes are (substrate) specific therefore no other enzyme will breakdown tyrosine / tyrosine does not breakdown on its own ;	**max (2)**

Question Number	Answer	Mark
8(a)	1. {movement / diffusion / eq} of water through a partially permeable membrane / eq ; 2. from a region with more free water to a region with less free water / down water concentration gradient / eq ;	**(2)**

Question Number	Answer	Mark
8(b)(i)	1. due to high uptake of more water / eq ; 2. as higher water concentration outside potato / eq ; 3. idea of largest difference in concentrations of solutions ;	**(3)**

Question Number		Mark
8(b)(ii)	**EITHER** 1. {mass increased / positive change} at 0.6 and {mass decreased / negative change} at 0.8 (mol dm^{-3}) ; 2. idea that concentration is closer to 0.8 than 0.6 mol dm^{-3} as the decrease in mass is greater than the increase in mass – 0.11 is closer to zero than + 0.31 ; 3. idea of no net movement of water ; **OR** 1. results were plotted onto a graph ; 2. the line crossed the x axis at 0.75 mol dm^{-3} eq ; 3. idea of no net movement of water ;	**max (2)**

Question Number	Answer	Mark
8(c)	**Any two from:** age, {type / variety / genotypes / country of origin / eq}, storage time, growth conditions, part of potato used, damage, sprouting, {storage conditions / temperature / humidity / light / eq} ;;	**(2)**

Question Number	Answer	Mark
8(d)	**Any two from:** potato pieces are not straight, potato widths are different, edges may not be cut straight, rulers are {subjective / analogues}, change in length is small, only measuring changes in one plane ;;	**(2)**

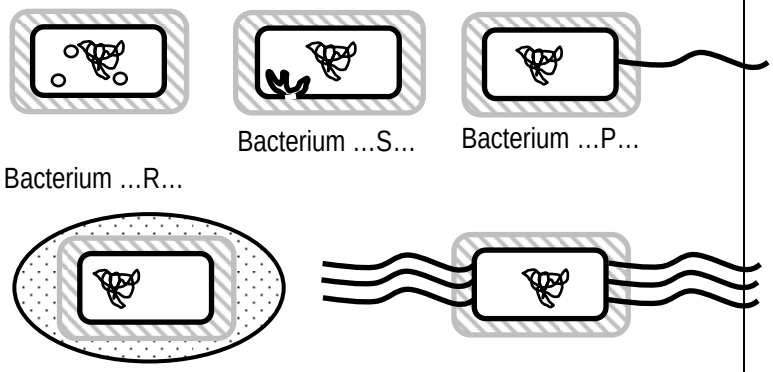
6BI02/01
Development, Plants & the Environment

Question Number	Answer	Mark
1(a)(i)	1. circular DNA box ; 2. small / 70s ribosomes box;	**(2)**

Question Number	Answer	Mark
1(a)(ii)		**(3)**

Features present in mitochondria	**Feature also present (✓) or absent (✗) in chloroplasts**
Surrounded by a double membrane	✓
Crista present	✗
Circular DNA	✓
Matrix	✗
Glycogen granule	✗
Stalked particles	✗

1 mark for any two correct ;;;

Question Number	Answer	Mark
1(b)		**(4)**

Question Number	Answer	Mark
2(a)(i)	organ has {many / eq} functions, tissue has {one / fewer / eq}, organ has {many / several / eq} {cell types / tissues}, tissue has {one / fewer / eq} ;	**(1)**

Question Number	Answer	Mark
2(a)(ii)	both have cells {working together / for the same function / eq} ;	**(1)**

Question Number	Answer	Mark
2(b)		**(3)**

Description of Organelle	**Name of Organelle**
Several curved membrane-bound sacs of decreasing size	golgi (apparatus / body) ;
A pair of cylinders arranged at right-angles to each other	{centrioles / centrosome / eq} ;
Small spheres with a single membrane that are filled with hydrolytic enzymes	lysosome(s) ;

Question Number	Answer	Mark
2(c)	**Drawing** (max 2): 1. {double membrane / nuclear envelope} obvious ; 2. nuclear pores shown ; 3. (1 or more) nucleoli present ; **Labels** (max 2): 4. (nuclear) envelope / double membrane / {inner / outer} (nuclear) membrane ; 5. (nuclear) pore ; 6. nucleolus ; 7. correct reference to chromatin / nucleoplasm ;	**max (4)**

Question Number	Answer	Mark
3(a)		**(4)**

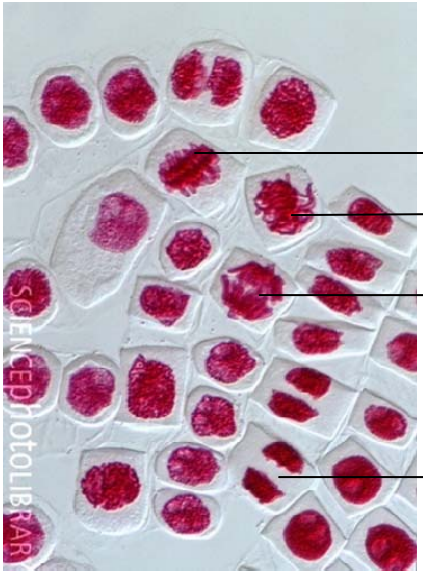
Name of adaptations	**Example**
physiological ;	Some metabolic reactions become less efficient in cold weather so the organism generates more heat to keep warm
behavioural ;	Sheep learn to ignore sounds that have no importance to them
anatomical ;	The ears of African elephants are larger than those of Asian elephants, due to differences in the environment
physiological ;	Formation of a sun tan when human skin is exposed to sunlight

Question Number	Answer	Mark
3(b)	**N.B. D = description; E = explanation** **Points to be paired i.e. cannot score three marks for three D points** 1D {haploid / 23 chromosomes / half set of chromosomes in } nucleus ; 1E so that {{diploid / eq} number / full complement / 46 chromosomes} restored(at fertilisation) ; 2D lipid droplets / food store / eq ; 2E supplies {energy / nutrients} for division / eq ; 3D large (cell) {size / surface area / eq} ; 3E increased chance of fertilisation / eq ; 4D reference to {cortical granules / lysosomes / zona pellucida} (in cytoplasm) ; 4E to prevent {more sperm entry / polyspermy / eq} ; 5D reference to {release / eq} of a {chemical / eq} ; 5E to attract sperm / chemotaxis / eq ; 6D membrane with '(sperm) receptors' on surface / eq ; 6E to allow sperm to {bind / eq} ; 7D {much / eq} mRNA present ; 7E to allow early translation of transcription factors / eq ;	**max (4)**

Question Number	Answer	Mark
3(c)	1. {pine needles /extract / filter paper soaked in extract} placed on {agar plate / in wells / eq} ; 2. with bacterial {lawn / eq} ; 3. reference to sterile/aseptic approach e.g. appropriate reference to sealing ; 4. reference to an appropriate time (for incubation) e.g. 24 hours, 1 week ; 5. (incubate at) a sensible temperature suggested e.g. 25°C ; **NOT** 37°C / human body temp 6. (looking for) {clear area / inhibition zone / loss of cloudiness /reduced cell number/ eq} (around pine needles, extract / filter paper / wells) ; 7. (clear area) shows no bacteria / eq ; 8. reference to suitable control ;	**max (5)**

Question Number	Answer	Mark
4(a)		**(2)**

Statements about cell division	**Meiosis is involved**
Required for both sexual and asexual reproduction	
Produces gametes	✓ ;
Crossing over can occur	✓;
Occurs in mammals but not flowering plants	

Question Number	Answer	Mark
4(b)	 A – metaphase ; B – prophase ; C – anaphase ; D – telophase ;	**(4)**

Question Number	Answer	Mark
4(c)(i)	site of {cell division / mitosis / actively dividing cells / meristem / eq);	**(1)**

Question Number	Answer	Mark
4(c)(ii)	to {soften the material / macerate / break middle lamella / eq};	**(1)**

Question Number	Answer	Mark
4(c)(iii)	{(acetic) orcein / lacto-propionic orcein / toluidine (blue) / Schiffs / eq} ;	**(1)**

Question Number	Answer	Mark
4(c)(iv)	each mark is for the risk + appropriate precaution 1. cut and appropriate precaution ; 2. acid and appropriate precaution ; 3. heat and appropriate precaution ; 4. stain and appropriate precaution ; 5. coverslip and appropriate precaution ;	**max (2)**

Question Number	Answer	Mark
5(a)(i)	reference to {chemical / air / gravity / light / eq} ;	**(1)**

Question Number	Answer	Mark
5(a)(ii)	1. idea of {breakdown / digestion / eq} of style ; 2. (breaks down) protein / pectin / middle lamella ; 3. reference to hydrolysis / eq ; 4. easier for pollen tube to grow / reduced resistance / eq ; 5. supplies {nutrients / named nutrient / energy} for (pollen tube) growth / eq ;	**max (3)**

Question Number	Answer	Mark
5(b)	1. photosynthesis ; 2. {component / eq} of {cytoplasm / sap} ; 3. water as a solvent /eq ; 4. water as a transport medium /eq ; 5. involved in thermoregulation / eq ; 6. reference to role in structural support ; 7. reference to involvement in hydrolysis ; 8. reference to turgor changes ;	**max (3)**

Question Number	Answer	Mark
6(a)(i)	1. A ; then any **two** from: 2. height controlled by {many / eq} genes / polygenic inheritance / eq ; 3. reference to continuous variation ; 4. reference to normal distribution / eq ;	**max (3)**

Question Number	Answer	Mark
6(a)(ii)	1. water / humidity ; 2. light ; 3. minerals / soil type / pH ; 4. CO_2 ; 5. temperature ; 6. altitude ;	**max (2)**

Question Number	Answer	Mark
6(b)(i)	height of bar must be at 50 i.e. 2 ½ little squares above 40 ;	**(1)**

Question Number	Answer	Mark
6(b)(ii)	1. height (of yarrow plant) decreases (as altitude increases) ; 2. non-linear /eq ; 3. correct manipulation of the data ;	**max (2)**

Question Number	Answer	Mark
6(c)(i)	{no change in / same} height of plants at 700m / reached their maximum height (of 50cm) / eq ;	**(1)**

Question Number	Answer	Mark
6(c)(ii)	{decrease in / lower / different} height of plants at 3000m / 25cm at 3000m and 50cm at 700m / eq ;	**(1)**

Question Number	Answer	Mark
6(c)(iii)	removal of genetic variation / they are all genetically identical / eq ;	**(1)**

Question Number	Answer	Mark
6(c)(iv)	to act as a control / to see if there is a difference at the other heights / as a comparison / to check that the clones grow the same as the parent plants / eq ;	**(1)**

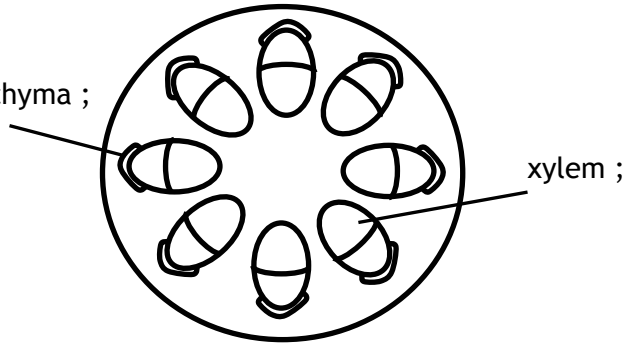
Question Number	Answer	Mark
7(a)	1. some people with (new) drug and some without (new) drug / eq ; 2. use placebo / description (e.g. sugar-coated dummy pill) /old drug ; 3. {doctors / eq} and {subjects / eq} do not know who is on (new) drug or who is not /eq ; 4. to see if new drug works better than {placebo / old drug}/eq ; 5. reduces bias /eq ;	**max (3)**

Question Number	Answer	Mark
7 (b)(i)	glycosidic ;	**(1)**

Question Number	Answer	Mark
7(b)(ii)	{ α / alpha} glucose ;	**(1)**

Question Number	Answer	Mark
7(b)(iii)	1. {bioplastic / starch} comes from {plants / eq} ; 2. {plants / starch} are renewable ; 3. oil-based plastic is from non-renewable resource / eq ;	**max (2)**

Question Number	Answer	Mark
7(b)(iv)	will not accumulate / not contribute to landfill / can be decomposed / eq ;	**(1)**

Question Number	Answer	Mark
7(c)		**(2)**

Question Number	Answer	Mark
8(a)	1. protein release from ribosome /eq ; 2. enter the rER {lumen / eq} ; 3. becomes packaged into (rER) vesicles ; 4. (vesicles / proteins) move to Golgi (apparatus) / {vesicles fuse with / protein enters} Golgi ; 5. protein {modified / carbohydrate added / named carbohydrate added} / eq ; 6. then become packaged into (secretory) vesicles / eq ; 7. glycoprotein becomes part of (vesicle) membrane ; 8. vesicles {move towards / fuse with} the cell (surface) membrane ;	**max (5)**

Question Number	Answer	Mark
8(b)(i)	1. totipotent (stem cells) can give rise to {all / any / 216} cell types / eq ; 2. (stem cells) are {undifferentiated / unspecialised} / eq ; 3. can keep dividing / eq ;	**max (2)**

Question Number	Answer	Mark
8(b)(ii)	they can {give rise to / eq} white blood cells / eq ;	**(1)**

Question Number	Answer	Mark
8(b)(iii)	possible route to {infection / eq} / rejection by recipient / increased chance of becoming cancerous /eq ;	**(1)**

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