Sec 4 Exp Bio Preliminary Exam 2016

Marking Scheme

Paper 2

Mark schemes will use these abbreviations:

;	separates marking points
1	alternatives
0	contents of brackets are not required but should be implied
R	reject
Α	accept (for answers correctly cued by the question, or guidance for
	examiners)
AW	alternative wording (where responses vary more than usual)
AVP	alternative valid point (where a greater than usual variety of responses
	is expected)
ORA	or reverse argument
<u>underline</u>	actual word underlined must be used by candidate (grammatical
	variants excepted)
max	indicates the maximum number of marks that can be given
+	statements on both sides of the + are needed for that mark

Sec A

No.	Expected Answer	Mark	Remarks
1a	P: Epidermal cell	Max 3	R: Stomata
	Q: Guard cell		
	R: Stoma		
Bi	Open: potassium ions lowers the water	1	
	potential of the cell Q,		
	causing water molecules to move into the	1	
	guard cell by osmosis.	I	
	This causes the guard cells to be turgid and	1	
	hence opening the stoma.		
	Close: Potassium ions leaving the cell Q		
	increases the water potential,	1	
	causing water molecules to move out of the	1	
	cell by osmosis . This causes the guard cells to be plasmolysed and hence closing the stoma	1	
		Max 2	
		each	

		Total 4	
Bii	Cell Q has cell wall of unequal thickness . / Thicker on the inside , thinner on the outside. Cell wall is a rigid structure that does not	1	Must state one property and how it helps
	change shape easily. This allows the cell to expand more on the	1	Allow for large
	outside and less on the inside when it is turgid, causing the stomata to be open or close.	1	central vacuole, allowing the changes in water
		Max 2	potential
biii	Both have the ability to respond to a stimulus . Animals have a nervous system that transmit nerve impulses to effector for response, but plants do not have a nervous system and response to changes by changing the turgor	1 1 1	A: Speed of responses Complexity of coordination
	pressure in their cells.	Max 2	
	Total	10	
2(a)	Inhaled – $CO_2 0.03 \%$ and $O_2 21\%$ Exhaled – $CO_2 4\%$ and $O_2 16\%$	1	Either 1 or 2 marks only. Allow 3 – 4% for CO ₂
(b)	O ₂ diffuses from the alveoli into the haemoglobin of RBC at the blood capillaries surrounding the alveoli Oxygen rich blood is transported to the heart and Then blood pumped by the heart to the muscles At the muscles, (aerobic) respiration; release energy from glucose; for contraction;	Max 4	R produce AW energy
С	anaerobic (respiration); less energy released; (produces) lactic acid; (muscle) becomes fatigued / tired / ref. cramp / pain;	Max 2	
d	rapid breathing mechanism / deeper breathing; modified lung structure or described; more (efficient) haemoglobin/increase O ₂ carrying capacity more efficient blood supply to organs / tissues or e.g.; larger heart/thicker heart muscles/ more red blood cells; faster heart rate / faster circulation of blood;	Max 4	
	Total	12	

3a	no chlorophyll ;		ORA for vein
	no photosynthesis ;		
	cannot make carbohydrates/		
	Carbonydrates obtained from other organism /;		
	Fundi function as a link for nutrients to reach		
	ghost plant		
		Max 3	
В	how the flower is pollinated:		
	reason (insect).	1	
	1. stigma / carpel + enclosed ;	1	
	2. anthers / stamens + enclosed ;		
	3. anthers / stamens + small ;		
	4. white colour may attract (insects) ;		
	reason (self)		
	5. anthers and stigma close ;	1	
	6. white / not brightly coloured +		
	doesn't attract (insects);		
		Max 2	
С	sucrose transported (to underground stems);		
	through phloem/ translocation ;		
	stem swells ·	Max 2	
	I OTAI	8	
4(a)	More black moths are consumed by their	1	
	predators; This is because the black moths are not able to	1	
	camouflage / blend in with the tree bark		
Bi	Both moths have a beterozygous genotype. Ga:	1	
		ц. I	4
	(i) Parental phenotype pale speckled mot	LT 1	
	pale speckled motin		
	Parental genotype Gg	Gg	1
		^	
		N	
	Gametes G d	4	
	Gametes G g	G	
	Gametes G g g	G	1
	Gametes g G G G G G G G G G	G	1
	Gametes g Random fertilisation	G	1
	Gametes g Random fertilisation Offspring genotype GG G	G G G G G G G	1
	Gametes g Random fertilisation Offspring genotype gg	G g Gg	1
	Gametes g Random fertilisation Offspring genotype GG G gg Offspring phenotype black speckled black	G g Gg speckled	1
	Gametes g Random fertilisation Offspring genotype gg Offspring phenotype black speckled black	G g Gg speckled	1

C	The trees were blackened with soot air pollution; White moth more easily seen Get eaten by predators Black moth adapt better to the environment survive to reproduce and pass on their alleles to the next generation. Frequency of alleles for black pigment increases as natural selection selects for these alleles		Reverse argument applies
	Increasing number of black moth	Max 3	
	Total	10	
5a	A – tongue; B – larynx/voice box;	2	
b	peristalsis;	1	
С	closes/covers; trachea/windpipe/air passage/larynx/voice box/B; helped by raising of larynx AW; preventing the entry of food / preventing food going to lungs or respiratory system / prevents choking AW / allows food to enter oesophagus	Max 3	
d	High blood pressure might damage the vessels of		
	the kidney and causes the kidney to be unable to carry out ultrafiltration	1	
	Lowering water intake, will lower the blood pressure,	1	
	As volume of blood decreases	1	
	This reduces the pressure of the blood flowing to	1	
	the kidney, hence reducing damage of		
	glomerulus at kidney		
	Salt reduces the water potential of the cells,	1	
	hence causing more ADH to be released to		
	Increase reabsorption of water, causing the		
	volume of blood to increase and hence salt intake	Maria	
	snoula be reducea.	Max 4	
		i otal 10	

Sec B			
No.	Expected Answer	Mark	Remarks

6a	A labelling of axes; [Time : temperature/°C; Y		
	heat loss/production		max, 5m
	S scale. Ineeds to be even and to fill more than		
	half of the printed grid]		
	D plot: [+/ half a small printed square]		
	F plot, [17- hair a small printed square]		
	joined point to point by a ruled line and no		
	extrapolation		
В	During vigorous exercise, from 0 min to 20	1	
	min respiration occurs at a higher rate to		
	release large amounts of energy.		
	Some of the operative last as heat operative		
	causing the body temperature to rise	1	
	causing the body temperature to fise		
	This cause the thermoreceptor send a		
	nervous impulse to the hypothalamus which	1	
	starts a corrective mechanism for heat loss to	1	
		1	
	decrease body temperature back to normal	1	
	Vecedilation of exterial as near the align		
	Vasodilation of artenoles hear the skin	1	
	- Increase blood now to the skill	I	
	convection & radiation		
	Production of sweat	4	
	- Removes heat through latent heat of	1	
	vapourisation		
		1	
	As the heat production is higher than heat	I	
	loss, as the person stop exercising, heat		
	production decrease and heat loss continues		
	to be higher than heat production to bring	N.4	
	body temperature back to normal.	Max 5m	
		Total 10	
7a	Mesophyll cells uses the carbon dioxide For	1	
	nhotocynthosic		
	photosynthesis		

	Lower concentration of carbon dioxide in the	1	
	intercellular air space of leaf and higher		
	concentration of carbon dioxide in the		
	atmosphere		
	Carbon dioxide diffuse the leaf through the		
	stomata into the intercellular air space	1	
	Dissolve in the thin film of moisture and enter		
	into the mesophyll cells	1	
	Glucose is formed by photosynthesis and stored		
	as starch in the leaf	1	
	Caterpillar ingest the leaf and takes in the starch		
	Starch is digested by the caterpillar and used to	1	
	build new body cells, or stored.	1	
	Caterpillar is ingested by the bird, protein is		
	digested to amino acids	1	
	Excess amino acid is deaminated and converted		
	to urea and glucose, glucose is stored as	1	
	glycogen.		
		Max 7	
5b	Mercury is taken in by the fish/organisms/ plants	1	
	found in the river		
	Fish eats the plants/ other fish		
	Mercury cannot be excreted	1	
	is stored in tissues of fish		
	Passed down via food chains	1	
	The concentration of mercury increases as we	1	
	move along the trophic level.		
	Results in the bioaccumulation of mercury in	1	
	people who are the top consumers and hence		
	they suffer from mercury poisoning as the		
	concentration is high	Max 3	
		Total: 10M	
8either a	Mitosis maintains chromosome number /diploid AW; whereas for meiosis chromosome number halved / haploid AW;	ne	

	Mitosis produces 2 daughter cells meiosis produces 4 daughter cells		
	Mitosis occurs in all organs/body cells whereas meiosis is only in gamete producing cells		
	Mitosis is for growth / asexual reproduction whereas meiosis is for production of gametes		
	Mitosis produces genetically identical offspring / clones/ whereas meiosis results in genetic variation	[max. 4]	
(b)	For asexual reproduction, always an exact copy	1	
	for production of a named crops(e.g. rice/maize)		
	known characteristics / flavour AW ;	1	
	not reliant on pollination (agent) ;	1	
	only one parent needed ;	1	
	quick(er) ;	1	
	Although variations increase the chances of	1	
	survival of the species during changes in the		
	environment.		
	asexual reproduction allows for more controlled	1	
	production of crops which less expensive /	1	
	greater profit / higher yield / more offspring in a		
	controlled environment.	Max 8	
		Total 10 M	
8a	Molecular genetics can be used to		
	Mass produce insulin for patients suffering	1	
	from Type 1 diabetes		
	The insulin gene is isolated, cut using	1	
	restriction enzymes.	1	
	Inserted the gene into the vector DNA	1	
	the recombinant plasmids is inserted into	1	
	bacteria		
	The transgenic bacteria is cultured in large	1	
	amounts in fermenters		
	Insulin produced through this method is better	1	
	as previously used animal insulin is different		
	from human insulin.		

	Development of antibodies against the animal	1	
	insulin after prolonged treatment will not occur.		
	Prevent diseases may be transferred from	1	
	animals to humans	Max 5	
8b	Artificial selection is the deliberate breeding of	1	
	organisms with desirable traits.		
	Aims to improve the qualities of plants and	1	
	animals		
	Select the organisms with the desired	1	
	characteristics		
	Allow the plants to self-fertilize or fertilize other	1	
	plants with desired characteristics,		
	Animals to be mated with another of desired		
	characteristics		
	Select another round of plants/animal from the	1	
	next generation		
	After many generations, we may get the	1	
	plant/animal with the desired traits.		
	Advantages of selective breeding	1	
	farmers can afford it, unlike GE where the		
	modified plants/animals are more expensive and		
	not affordable for the poorer farmers.		
	Lesser risk of genes that code for antibiotic	1	
	resistance may be accidentally incorporated into		
	bacteria that cause human diseases.		
	Disadvantages		
	Possibility that defective genes will be	1	
	transmitted to offspring whereas selection of		
	gene before transfer eliminates the risk of		
	transferring a defective gene.		
	Artificial breeding is a slow process that involves several generations whereas GE is a process which uses individual cells that reproduce rapidly in a small container in a laboratory.	1	
	grow more slowly and may require more food		
1		1	1

While GE is more efficient as transgenic organisms grow faster and may require less food Selective / artificial breeding can also result in inbreeding, and an accumulation of recessive alleles in the population. The recessive alleles are not expressed in the heterozygous parents. They are more likely to be passed down to the offspring. If the recessive alleles code for a genetic disease, the homozygous offspring will suffer from the disease	1 Max 5	
suffer from the disease.		

trendyline

Sec 4 Exp Bio Preliminary Exam 2016

Markers' Report for Paper 2

Sec A

No.	Expected Answer	Remarks
1a	P: Epidermal cell	Many candidates wrote in
	Q: Guard cell	plural form which is not
	R: Stoma	accepted. The line is only
		pointing to one cell.
Bi	Open: potassium ions lowers the water	Most candidates were able to
	potential of the cell Q,	get some marks, however,
	causing water molecules to move into the	some confused this with the
	guard cell by osmosis.	reverse process having not
	This causes the guard cells to be turgid and	read the question properly.
	hence opening the stoma.	Question stated that in the
		day, K⁺ is pumped into Cell Q
	Close: Potassium ions leaving the cell Q	whereas at night it is pumped
	increases the water potential,	out.
	causing water molecules to move out of the	
	cell by osmosis . This causes the guard cells to	
	be flaccid and hence closing the stoma	
Bii	Cell Q has cell wall of unequal thickness. /	Must describe one property
	Thicker on the inside, thinner on the outside.	and how it helps
	Cell wall is a rigid structure that does not	Allow for large central
	change shape easily.	vacuole, allowing the
	This allows the cell to expand more on the	changes in water potential.
	outside and less on the inside when it is	Many candidates gave
	turgid, causing the stomata to be open or close.	incomplete answers and did
		not describe properly.
biii	Both have the ability to respond to a stimulus .	Speed of responses
	Animals have a nervous system that transmit	and complexity of
	nerve impulses to effector for response, but	coordination also accepted.
	plants do not have a nervous system and	
	response to changes by changing the turgor	
	pressure in their cells.	
2(a)	Inhaled – CO ₂ 0.03 % and O ₂ 21%	Either 1 or 2 marks. No half
	Exhaled – CO_2 4% and O_2 16%	marks awarded
(b)	O ₂ diffuses from the alveoli into the	Produce energy not
	haemoglobin of the red blood cells at the blood	acceptable.
	capillaries surrounding the alveoli to form	Most candidates were able to
	Oxygen rich blood is transported to the heart	with baemoglobin but were
	and then blood pumped by the heart to the	not able to link from the lungs
	muscles	to the heart to the muscles.
	At the muscles, (aerobic) respiration;	
	release energy from glucose for contraction of	
	muscies	

C	Anaerobic respiration would occur and less energy released. Lactic acid would be produced and the muscle becomes fatigued / tired / ref. cramp / pain;	Most candidates were able to explain that anaerobic respiration, but many did not make the comparison of how LESS energy is released.
d	There might be faster breathing, or deeper breathing. There could be bigger lung capacity (or other described modified structures that) that could allow more air to be taken in, for higher oxygen intake. More (efficient) haemoglobin/increase O ₂ carrying capacity and also more efficient blood supply to organs / tissues such as larger heart/thicker heart muscles/ more red blood cells; faster heart rate / faster circulation of blood;	Common mistake made by candidates includes - more blood could be transported. Idea is for more oxygen to be transported more quickly instead of volume of blood increasing.
3a	The ghost plant has no chlorophyll and therefore could not carry out photosynthesis and cannot make carbohydrates. Carbohydrates has to be obtained from other organism and nutrients from the nearby green plants. Fungi function as a link for nutrients to reach ghost plant.	Most candidates were able to draw the link that there were no chlorophyll but many candidates focused on how fungi are decomposers instead of how it could link to the neighbouring tree as seen in the diagram.
В	Insect / self ; reason (insect): Stigma and anthers are enclosed within the flowers and the insect helps to transfer the pollen grain when they brush past the stigma after the anther. Anthers / stamens are small unlike those pollinated by wind. White colour may attract (insects) ; reason (self): Anthers and stigma close together allowing pollen grain to reach stigma easily. Flowers are not brightly coloured and might not attract (insects);	There could be either self- pollination or insect- pollination. Diagram clearly shows that stigma and anthers are enclosed within flowers but some candidates still see that anthers are pendulous to fit description of wind-pollinated flowers. Candidates need to refer more closely to the diagram.
C	Sucrose is transported to underground stems through phloem via translocation. Sucrose is converted to starch and stored, causing the stem to swell and form tubers.	Candidates again need to refer to diagram and to read the question properly on what exactly forms tubers. Clue is that it is formed from underground stems

4(a)	More black moths are consumed by their predators and hence not caught by the scientists. This is because the black moths are not able to camouflage / blend in with the tree bark.	Most candidates w wrong, did not refe diagram and expla the black moth is l camouflaged. Blac less camouflaged speckled accordin diagram.	vho got it er to the ained how better ck moth is than the g to the
Bi	Both moths have a heterozygous genotype, Gg;		
bii	(i) Parental phenotype pale speckled mot	h pale speckled moth	Need to have the
	Parental genotype Gg	Gg	labels in order to
	Gametes G g	G g	gain the full marks, including the
	Random fertilisation		proportion.
	Offspring genotype GG Gg Offspring phenotype pale speckled pale s speckled black	Gg gg speckled black	
	Proportion of black moth: 1/4 or	25%	
С	The trees were blackened with soot air pollution; White moth more easily seen and get eaten by predators. Black moth adapt better to the environment as they are better camouflaged. Black moths survive to reproduce and pass on their alleles to the next generation. Frequency of alleles for black pigment increases as natural selection selects for these alleles causing an increasing number of black moth over many generations.	Reverse argumen Many candidates explain up till the r able to reproduce, explain how the nu increase due to ar in the frequency of over generations. necessary as it sh the proportion of the population change Note that the diffe the moth colours of a result of an earli and not due to the Furthermore, the s covering the moth cause the moth to permanently black produce offspring	t applies. were able to moths were but did not umbers n increase f the alleles This is ows how he es. rences in occurred as er mutation e soot. soot , does not be and to that are

		not have alleles that codes for
		black pigment.
5a	A – tongue;	
h	B – larynx/voice box;	
	The englettic elegendation the trached/oir	Maat aandidataa wara ahla ta
	nassage/larvnx/voice box/B	Most candidates were able to
	It is helped by raising of larynx AW. This helps to	
	prevent the entry of food / preventing food	
	going to lungs or respiratory system and this	
	prevents choking AW / allows food to enter	
d	High blood pressure might damage the	Many candidates were unable
, a		to gain full marks because
	vessels/glomerulus/basement memorane of the	they did not link the points
	kidney and causes the kidney to be unable to	together.
	carry out ultrafiltration	Key point in this question is
	Lowering water intake, will lower the blood	that blood pressure is
	pressure, as volume of blood decreases	affected by volume of blood.
	This reduces the pressure of the blood flowing to	When volume increase, blood
	This reduces the pressure of the blood howing to	Condidates also pood to link
	the kidney, hence reducing damage of	bow it is that high blood
	glomerulus at kidney	pressure damages the
	Salt reduces the blood water potential, hence	kidney.
	causing more ADH to be released to increase	
	reabsorption of water, causing the volume of	
	blood to increase and increase pressure. Hence	
	salt intake should be reduced.	

trendyline

Section B

No.	Answer	Marker's remarks
6a	Refer to graph attached	
b	Exercise occurs from 0 to 20 minutes.	Many candidates focused on
	Respiration occurs at a higher rate	describing the graph (w data) but
	during this period, releasing large	did not explain the changes as
	amounts of energy as seen by the	asked in the qn.
	increase of heat production from 20	Common mistakes:
	to 300 units.	- 'temperature change detected
	Some of the energy is lost as heat	by skin receptors'. This is
	energy, causing the body temperature	incorrect as exercise causes an
	to rise.	internal body temperature
	This causes the thermoreceptor (in the	increase detected by the
	hypothalamus) to send nerve impulses	hypothalamus. Skin receptors
	to the effectors to carry out corrective	detect external changes in
	mechanisms to promote heat loss to	temperature.
	decrease the body temperature to	- candidates incorrectly
	normal.	mentioned mechanisms that
	Some of the corrective mechanisms	reduce heat gain (e.g. decrease
	carried out are vasodilation of the	in metabolic rate, relaxation of
	arterioles near the skin to increase	hair erector muscles)
	blood flow to the skin so that heat can	- Several candidates did not
	be lost via conduction, convection	emphasise vasodilation of
	and radiation.	arterioles, hence did not score
	Production of sweat also occurs which	of the mark.
	removes heat through latent heat of	- Candidates need to be more
	vaporisation.	careful in their phrasing to
	As the person stops exercising, both	describe heat loss via
	heat production and heat loss	evaporation of sweat.
	decreases.	- many failed to mention that heat
	From 45 – 50 min, the heat loss	loss occurs until temperature
	continues to be nigner than neat	returns to normal.
	production to bring the body	- Negative feedback is not
	temperature back to normal.	relevant in this qn as body
		temperature has not returned to
7-	Carbon stans suists in the stress sub-sus	normal yet.
7a	Carbon atom exists in the atmosphere	Many candidates did not
	There is a lower concentration of	describe the intake of carbon
	arbon diovide in the intercollular	
	carbon dioxide in the intercentiar	Common mistakes:
	spaces of the lear and a nigner	- many students locused their
	atmosphere	answer on starch in the leaf and
	aunosphere.	stated that the glucose, that is
		stored as glycogen in the

	Carbon dioxide diffuses into the	caterpillar, is digested by the
	intercellular spaces of the leaf via the	bird.
	stomata.	This is untrue as the carbon atom
	It dissolves in the thin film of	is passed from the caterpillar to
	moisture and diffuses into the	the bird in the form of protein.
	mesophyll cells.	- Some candidates did not state
	Glucose is form during	specific carbon compounds.
	photosynthesis in the mesophyll cells.	- Glucose cannot be digested as
	Glucose reacts with the nitrates to form	it is in its simplest form.
	amino acids/proteins.	- Starch cannot be stored in the
	The amino acids are used for form	caterpillar/bird; only in plants.
	protoplasm/ new cells and for growth	- Candidates that focused their
	in the tree.	answer on energy transfer did
	The caterpillar ingests the leaf and	not gain marks.
	takes in the protein .	- Some candidates failed to state
	Protein is digested by the caterpillar to	that excess glucose is converted
	amino acids and is used to build new	to starch
	body cells.	
	The bird ingests the caterpillar and the	
	protein is again digested to amino	
	acids.	
	Excess amino acids are deaminated	
	and converted to urea and glucose.	
	The excess glucose is converted to	
	glycogen.	
b	Mercury is absorbed by the aquatic	Candidates who simply
	plants in the river. These plants are	mentioned terms such as
	eaten by the fish, which are then	bioaccumulation and
	eaten by humans.	bioamplification without
	Mercury is non-biodegradable and	explaining the process were not
	cannot be excreted, thus is stored in	awarded marks.
	fatty tissues of organisms.	
	The mercury is passed down the food	
	chain and this is known as	
	bioaccumulation.	
	The concentration of moreury	
	increases as it moves up the trophic	
	increases as it moves up the trophic levels and it results in bioamplification	
	increases as it moves up the trophic levels and it results in bioamplification in the top consumers, in this case the	
	increases as it moves up the trophic levels and it results in bioamplification in the top consumers, in this case the people causing them to suffer from	
	increases as it moves up the trophic levels and it results in bioamplification in the top consumers, in this case the people causing them to suffer from mercury poisoning.	
	increases as it moves up the trophic levels and it results in bioamplification in the top consumers, in this case the people causing them to suffer from mercury poisoning.	
	increases as it moves up the trophic levels and it results in bioamplification in the top consumers, in this case the people causing them to suffer from mercury poisoning.	
	increases as it moves up the trophic levels and it results in bioamplification in the top consumers, in this case the people causing them to suffer from mercury poisoning.	
	increases as it moves up the trophic levels and it results in bioamplification in the top consumers, in this case the people causing them to suffer from mercury poisoning.	lina

8E a	Mitosis maintains chromosome number /diploid whereas for meiosis chromosome number halved / haploid. Mitosis produces 2 daughter cells meiosis produces 4 daughter cells Mitosis occurs in all organs/body cells whereas meiosis is only in gamete producing cells Mitosis is for growth / asexual	Mitosis and meiosis are cellular processes/ nuclear divisions. Hence description of processes should be done in terms of daughter/parent cells, not offspring. Candidates should compare one difference at a time, not group multiple differences into a single point. The phrase ' <i>Genetically similar</i> ' should be avoided as it is not the
	Mitosis produces genetically identical cells / clones/ whereas meiosis results in genetically different cells.	same as genetically identical.
b	For asexual reproduction, offspring are genetically identical to the parent, hence will always express the advantageous traits of the parent plant. Unlike genetic variation where offspring may or may not exhibit the advantageous traits of the parent plant. For example, maize which are disease resistant, when reproduced asexually will produce offspring that are also resistant to the disease. However, offspring produced by sexual reproduction will show genetic variation and may not be disease resistant. (provide one e.g. of a viable commercial plant for both scenarios) Asexual reproduction also requires only one parent plant, however genetically variable offspring may require more than one parent plant for sexual reproduction. Asexual reproduction is a faster process as it is not dependent on pollination, however genetic variation in plants produced by sexual reproduction require pollination to occur.	Candidates who did not compare the processes with focus on how asexual reproduction is advantageous over genetic variation did not gain marks. Some candidates confused asexual reproduction with self- pollination.

	However, genetic variation is plants	
	increases their survival when there	
	are changes in the environment.	
	Thus asexual reproduction allows for	
	more controlled production of crops	
	which is less expensive/ allows	
	greater profit/ produces higher yield/	
	produces more offspring in a	
	controlled environment.	
80	Molecular genetics can be used to	Most candidates were able to
а	mass produce insulin for patients	provide the steps to produce
	suffering from Type 1 diabetes .	transgenic bacteria, although
	The human insulin gene is isolated	some were lacking specific terms
	and cut using restriction enzymes to	such as recombinant plasmid ,
	produce sticky ends.	DNA ligase, restriction
	A plasmid/ vector DNA from bacteria	enzymes, transgenic bacteria
	is cut using the same restriction to	in their answers.
	produce complementary sticky ends .	
	The human insulin gene is inserted into	Most students were unable to
	the plasmid and the ends are joined	describe how this benefitted
	together by DNA ligase .	humans.
	The recombinant plasmid is inserted	
	into bacteria.	Students who provided other
	The transgenic bacteria are cultured	commercial applications (other
	in mass quantities in fermenters .	than insulin which is prescribed
	Insulin produced through this method is	in the syllabus) were unable to
	better as previously used animal insulin	provide specific details to gain
	is different from human insulin.	marks.
	Development of antibodies against the	
	animal insulin after prolonged treatment	Bacteria is plural, Bacterium is
	will not occur. This method will also	the singular term.
	prevent diseases may be transferred	
	from animals to humans.	Some candidates stated that
		insulin produces would be
		cheaper, but this must be
		accompanied by the idea that it is
		because it is produced in mass
		quantities, thus making is
		affordable and available. The
		process itself is expensive.
b	In artificial selection, organisms with	Most candidates were unable to
	desired traits are selected by	appropriately describe the
	humans for selective breeding.	process of artificial selection.
	Alleles that code for desired traits are	
	passed to offspring.	Some candidates general gave
	Traits of the offspring may vary due to	differences without specifying if it
	different allele combinations. Offspring	

with the desired traits are selected	was an advantage or
again for breeding and this process is	disadvantage.
repeated over many generations until	Also some focused on GE
all the organisms express the desired	without providing the advantages
trait.	of artificial selection. as required
	by the an.
The advantages of selective breeding	- ,
are that farmers can afford it, unlike	When comparing affordability.
genetic engineering (GE) where the	some students had the
modified plants/animals are more	misconception that GE was a
expensive and not affordable for the	cheaper process: this is untrue
poorer farmers.	as the technology involved is
There is also lesser risk of genes that	expensive.
code for antibiotic resistance may be	
accidentally incorporated into	Stating differences without
bacteria that cause human diseases.	description/ explanation did not
which may occur in GE organisms.	gain marks.
The disadvantages are that there is a	
possibility that defective genes will be	
transmitted to offspring in artificial	
selection. Artificial selection can also	
result in inbreeding , and an	
accumulation of recessive alleles in	
the population. The recessive alleles	
are not expressed in the heterozydous	
parents.	
They are more likely to be passed	
down to the offspring. If the	
recessive alleles code for a genetic	
disease, the homozygous offspring	
will suffer from the disease.	
Whereas in GE, selection of the	
desired gene before transfer	
eliminates the risk of transferring a	
defective gene.	
Artificial breeding is a slow process	
that involves several generations	
whereas GE is a process, which uses	
individual cells that reproduce rapidly	
in a small container in a laboratory.	
Artificial breeding is less efficient as	
organisms grow more slowly and may	
require more food.	
While GE is more efficient as transgenic	
organisms grow faster and may	
require less food.	