

GCE BIOLOGY - BY5
MARK SCHEME - SUMMER 2014

Question	Marking details	Marks Available
1	<p>(a) A – Corona radiata / follicle (cells)/ cumulus cells/ granulosa cells; B- Zona pellucida;</p>	2
	<p>(b) (i) Acrosome;</p>	1
	<p>(ii) {Releases/ contains} {enzymes/proteases/carbohydrase}; To {digest/ break down/ penetrate/ soften} {corona radiata/ zona pellucida};</p>	2
	<p>(c) (i) {Splitting/dividing} of {<u>zygote/early embryo</u>} cells to form new cells;</p>	1
	<p>(ii) Hollow ball of cells/ ball of {undifferentiated/ partly differentiated} cells;</p>	1
	<p>(iii) The {burying/ embedding/ implanting} of the {blastocyst/ embryo} into the {uterine lining/endometrium};</p>	1
Question 1 Total		[8]

Question	Marking details	Marks Available
2 (a) (i)	DNA molecule unwinds; Unzips/ breaks hydrogen bonds/ strands separate; (free) { <u>nucleotides</u> } {join/align} with {complementary bases/ A to T/ C to G};	3
(ii)	{To join the nucleotides together/ catalyses the addition of nucleotides} to form a {new strand/ backbone/ phosphodiester bonds};	1
(b)	Each new DNA <u>molecule</u> has one {original/ template} strand; And one new strand which has been { <u>made/ synthesised/ replicated</u> };	2
Question 2 Total		[6]

Question	Marking details	Marks Available
3 (a)	40;	1
(b) (i)	Correct diagram; two chromosome pairs vertically orientated one of each pair on each side of the equator one pair of chromosomes bigger than the other	1
(ii)	Correct labelling of chromatid, <u>centromere</u> , <u>centriole</u> , spindle fibres 2 marks for 4 correct labels 1 mark for 2 or 3 correct labels	2
(iii)	Correct diagrams; Two chromosomes in each cell (one large and one small) Centromeres on dotted line	1
(iv)	{Random/ independent} assortment of {chromosomes/ chromatids}/ description of {random/ independent assortment}; crossing over/ chiasmata; produces haploid cells;	3
Question 3 Total		[8]

Question	Marking details	Marks Available
4 (a) (i)	NnGg for both; NG Ng nG ng for both; correct completion of punnet square; correct ratio 9:3:3:1; correct phenotypes matched to ratio;	5
(ii)	Correct expected number column 72 : 24 : 24 : 8;	1
(b) (i)	0.667/ 0.67/ $\frac{2}{3}$;	1
(ii)	7.82 circled;	1
(iii)	Accept because χ^2 value is to left of {critical value/ 7.82}/ Accept because χ^2 value has probability higher than {0.05/5%}/ Accept because χ^2 value falls between {0.9/90%} and {0.8/80%} probability/ Accept because the probability lies between 80-90% that it is due to chance alone; <i>If not circled any answer for (ii) must refer to 7.82 in (iii)</i> ECF from chi squared table	1
(c)	{Common phenotypes/red grey and scarlet ebony} are due to linkage/ description of linkage; {Rare phenotypes/ red ebony and scarlet grey} due to {crossing over/ recombinants};	2

Question 4 Total [11]

Question	Marking details	Marks Available
5 (a)	Restriction {endonuclease/ enzymes} used to cut (out the desired gene); The <u>same</u> {endonuclease/ enzyme} is used to open the plasmids; Producing {complementary/ corresponding} 'sticky ends'; Ligase is used to {join/ splice/ attach/ adhere/ anneal} gene into plasmid;	4
(b)	Placed in sterile, (aerated) {medium/agar}; NOT soil (Allow) cells to form {callus/ mass of {undifferentiated/ totipotent cells}}; Callus is subdivided; Apply hormones to callus to differentiate into plantlets/ Plantlets {transplanted/put} into sterile soil;	Max 3
(c) (i)	'Roundup' will not kill crop but it will kill {other plants / weeds}; Reducing competition in the field; Allowing increased yield;	3
(ii)	There will be increased use of herbicide; a reduction in biodiversity/ may lead to {herbicide resistant weeds/ superweeds} bioaccumulation in food chain; OR <u>Dispersal of pollen</u> from crops engineered for herbicide resistance to {wild relatives/ weeds}; may lead to {herbicide resistant weeds/ superweeds}; OR <u>Dispersal of pollen</u> from crops engineered for herbicide resistance to other crops; May contaminate organic crops; OR (GM crop) produces a new protein; Unknown effects of <u>eating</u> new protein;	Max 2
Question 5 Total		[12]

Question	Marking details	Marks Available
6 (a) (i)	CGC is replaced by TGC/ C is replaced by T; Amino acid cys has replaced arg;	2
(ii)	Change in {protein/ tertiary} structure/ different protein is made; MC1R will not be stimulated (by the hormone); {Less/no} eumelanin will be produced;	Max 2
(b) (i)	Mice with light fur found in an environment providing {light backgrounds/sandy beaches} AND mice with dark fur in {forest /dark backgrounds}/ Dark fur is found in the darker <u>er</u> background/ light fur is found in the lighter <u>er</u> background; For camouflage/ OWTTE;	2
(ii)	Small populations (of mice);	1
(iii)	Mice with light fur {are less easily seen/caught by predators/ correct reference to camouflage/ have a selective advantage}; Light fur mice (survive to) reproduce and <u>pass {allele C/ advantageous allele/ light fur allele}</u> to next generation; Increasing the frequency of the allele; 95% of population (have allele C);	4
(iv)	{Genetic/behavioural/geographic/allopatric/reproductive/ sympatric/ seasonal/ temporal} isolation;	1
Question 6 Total		[12]

Question	Marking details	Marks Available												
7 (a)	Primary: environment not previously colonised/ from bare rock; Secondary: environment has soil/previous inhabited;	2												
(b) (i)	Acid/acidic; NOT low	1												
(ii)	<table border="1"> <thead> <tr> <th>feature</th> <th>Betula</th> <th>Ulex</th> </tr> </thead> <tbody> <tr> <td>pH</td> <td>(from 3.56 to 4.24, difference of 0.68) Increases pH/makes more alkali/ makes less acidic/</td> <td>(from 3.56 to 3.55 difference of 0.01) Not much/ no change/ no effect/ slight decrease;</td> </tr> <tr> <td>Phosphorus</td> <td>(from 3.88 to 4.7 difference of 0.82) Increases a lot</td> <td>(from 3.88 to 4.16 difference of 0.28) Small increase;</td> </tr> <tr> <td>Nitrate</td> <td>(from 0.68 to 0.84 difference of 0.14) Increases</td> <td>(from 0.68 to 2.37 difference of 1.69) Very large increase;</td> </tr> </tbody> </table>	feature	Betula	Ulex	pH	(from 3.56 to 4.24, difference of 0.68) Increases pH/makes more alkali/ makes less acidic/	(from 3.56 to 3.55 difference of 0.01) Not much/ no change/ no effect/ slight decrease;	Phosphorus	(from 3.88 to 4.7 difference of 0.82) Increases a lot	(from 3.88 to 4.16 difference of 0.28) Small increase;	Nitrate	(from 0.68 to 0.84 difference of 0.14) Increases	(from 0.68 to 2.37 difference of 1.69) Very large increase;	3
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	1 mark for valid COMPARISON of each feature													
(c) (i)	<i>Ulex europaeus</i> ;	1												
(ii)	The {invading /dominant/ new/ named species} {change the soil chemistry/ named change}; Giving them a competitive advantage/ competition for named resource/ existing species are at a disadvantage/ so are better suited to the environment;	2												
(d) (i)	Climax community;	1												
(ii)	Increases;	1												
(iii)	<u>{C. vulgaris /E. cinerea /E. tetralix}</u> are disappearing from plus B and plus PS; These are surviving in plus U; Names must be included to access any marking points	2												

Question 7 Total [13]

Question	Marking details	Marks Available
8 (a)	<p>A* Sepal/calyx –tough leaf-like- to protect more delicate parts {in bud/ when immature}/ can be coloured to attract insects/ green for photosynthesis;</p> <p>B* Petals/corolla - large/brightly coloured/scented - to attract insects ;</p> <p>C {Nectaries/nectar /sugar} to attract insects;</p> <p>D* Filament – thin/stalk-like/short/hooks – to hold anthers where they will come in contact with insect/ contains vascular tissue to provide anther with nutrients;</p> <p>E Anther— to {produce/ contain} {haploid gametes/male gametes/pollen /microspore};</p> <p>F* Anther – is hollow/ has a line of weakness- description of splitting and rolling to put pollen on outside/ correct reference to dehiscence/ getting pollen onto insect;</p> <p>G* Pollen (grain) - sculptured exine/ has hooks – to attach to insects body;</p> <p>H* Stigma – {is sticky – to catch/trap pollen (grains)}/{ - secretes chemicals/sugar} – to stimulate pollen tube growth};</p> <p>I Style to hold stigma where it will come in contact with insects/ pollen tube {gains nutrients from the style/ digests its path though the style};</p> <p>J Correct reference to relative positions of anthers and stigmas to {prevent self /encourage cross} pollination;</p> <p>K* Ovary – {walls - to {protect/contain} developing ovule/embryo sac}/ { -secretes chemicals – pollen tube growth};</p> <p>L* Ovule- integuments – to protect developing embryo;</p> <p>M (Ovule) – tiny hole/micropyle – to allow entry of pollen tube;</p> <p>N Good drawing correctly labelled with at least 4 of above;</p> <p>O Appropriate means of ensuring cross pollination, e.g. dimorphism (single sex plants)/ protogyny (ovules mature first)/ protandry (pollen matures first)/genetic incompatibility/ chemical inhibition on the stigma;</p>	To award * there must be a name, a description and a function
Question 8 Total		[10]

Question	Marking details	Marks Available
8 (b)	<p>A Sun is source of energy/ energy enters as light energy;</p> <p>B Photosynthesis converts light energy to chemical energy (in organic molecules);</p> <p>C {Not all light/ only some light} striking plants is used for photosynthesis;</p> <p>D Some {is reflected/ passes between {cells/chloroplasts}/ wrong wavelength/ is transmitted/ passes through};</p> <p>E Correct definition of GPP/ total (bio)mass of (organic) produce/ rate at which products are formed/ $\text{kJm}^{-2}\text{yr}^{-1}$;</p> <p>F Correct definition for NPP/ Mass available to primary consumers;</p> <p>Accept correct equation to credit E and F (GPP- Respiration=NPP)</p> <p>G {<u>Biomass/ plant matter/ chemical energy</u>} is transferred from producer to {herbivores/primary consumers} when it is eaten;</p> <p>H Not all plant is {eaten e.g. roots/ digested e.g. cellulose};</p> <p>I (Respiration) energy is lost as heat energy/ used for {movement/ metabolism/ active transport};</p> <p>J {<u>Biomass/ chemical energy</u>} is passed to {carnivores/secondary consumers};</p> <p>K Energy in {faeces /urine/ dead bodies} is <u>passed to decomposers</u>; NOT excretion</p> <p>L Carnivores are more efficient + protein is more easily digestible/ herbivores are less efficient + cellulose is less easily digestible;</p> <p><i>Keeping animals in heated sheds with little room to move about</i></p> <p>M Less heat energy will be lost {if the difference between body temperature and shed temperature is small/ maintaining body temperature};</p> <p>N Less energy will be lost in movement if the animals are prevented from moving;</p> <p>O More of the energy is used for making meat / eggs / milk / increasing {biomass/ size}yield;</p>	
Question 8 Total		[10]