GCE BIOLOGY - BY5

MARK SCHEME - SUMMER 2014

Question			Marking details	Marks Available
1	(a)		A – Corona radiata / follicle (cells)/ cumulus cells/ granulosa cells; B- Zona pellucida;	2
	(b)	(i)	Acrosome;	1
		(ii)	{Releases/ contains} {enzymes/proteases/carbohydrase}; To {digest/ break down/ penetrate/ soften} {corona radiata/ zona pellucida};	2
	(c)	(i)	{Splitting/dividing} of {<u>zygote/early embryo</u>} cells to form new cells;	1
		(ii)	Hollow ball of cells/ ball of {undifferentiated/ partly differentiated} cells;	1
		(iii)	The {burying/ embedding/ implanting} of the {blastocyst/ embryo} into the {uterine lining/endometrium};	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/ ⅔;	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; *If not circled any answer for (ii) must refer to 7.82 in (iii)* 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 dark<u>er</u> background/ light fur is found in the light<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)	*(see table below)*	3

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;

1 mark for valid COMPARISON of each feature

(c)	(i)	*Ulex europaeus*;	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)	*{C. vulgaris /E. cinerea /E. tetralix}* 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) A* Sepal/calyx –tough leaf-like- to protect more delicate parts {in bud/ when immature}/ can be coloured to attract insects/ green for photosynthesis;

B* Petals/corolla - large/brightly coloured/scented - to attract insects ;

C {Nectaries/nectar /sugar} to attract insects;

D* Filament – thin/stalk-like/short/hooked – to hold anthers where they will come in contact with insect/ contains vascular tissue to provide anther with nutrients;

E Anther-– to {produce/ contain} {haploid gametes/male gametes/pollen /microspore};

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;

G* Pollen (grain) - sculptured exine/ has hooks – to attach to insects body;

H* Stigma – {is sticky – to catch/trap pollen (grains)}/{ - secretes chemicals/sugar} – to stimulate pollen tube growth};

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};

J Correct reference to relative positions of anthers and stigmas to {prevent self /encourage cross} pollination;

K* Ovary – {walls - to {protect/contain} developing ovule/embryo sac}/ { -secretes chemicals – pollen tube growth};

L* Ovule- integuments – to protect developing embryo;

M (Ovule) – tiny hole/micropyle – to allow entry of pollen tube;

N Good drawing correctly labelled with at least 4 of above;

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;

To award * there must be a name, a description and a function

Question 8 Total **[10]**

Question	Marking details	Marks Available

8 (b) A   Sun is source of energy/ energy enters as light energy;

B   Photosynthesis converts light energy to chemical energy (in organic molecules);

C   {Not all light/ only some light} striking plants is used for photosynthesis;

D   Some {is reflected/ passes between {cells/chloroplasts}/ wrong wavelength/ is transmitted/ passes through};

E   Correct definition of GPP/ total (bio)mass of (organic) produce/ rate at which products are formed/ $kJm^{-2}yr^{-1}$;

F   Correct definition for NPP/ Mass available to primary consumers;

Accept correct equation to credit E and F
(GPP- Respiration=NPP)

G   {Biomass/ plant matter/ chemical energy} is transferred from producer to {herbivores/primary consumers} when it is eaten;

H   Not all plant is {eaten e.g. roots/ digested e.g. cellulose};

I   (Respiration) energy is lost as heat energy/ used for {movement/ metabolism/ active transport};

J   {Biomass/ chemical energy} is passed to {carnivores/secondary consumers};

K   Energy in {faeces /urine/ dead bodies} is passed to decomposers; NOT excretion

L   Carnivores are more efficient **+** protein is more easily digestible/ herbivores are less efficient **+** cellulose is less easily digestible;

Keeping animals in heated sheds with little room to move about

M   Less heat energy will be lost {if the difference between body temperature and shed temperature is small/ maintaining body temperature};

N   Less energy will be lost in movement if the animals are prevented from moving;

O   More of the energy is used for making meat / eggs / milk / increasing {biomass/ size}yield;

Question 8 Total   [10]