GCE 2004
June Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Biology/Human Biology A
BYA2

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BYA2

Question 1

(a) (i) C → B → E → F → A → D 2
Mark links: 5 correct = 2, 4 correct = 1, <4 correct = 0

(ii) nucleus; 1

(iii) A, D, F; *(ignore E if evident)* 1

(b) (i) Isoleucine; 1

(ii) TGG; 1

Total 6 marks

Question 2

(a) Protein/glycoprotein/glycolipid/polysaccharide/molecule;
on surface/membrane (of cell);
causes immune response / description / triggers antibody production; max 2

(b) Blood group A has different antigen / group B has B antigen / anti-A antibody present in group B;
Clumping of cells/agglutination; 2

(c) Few blood groups / many people have same blood group;
DNA/genetic fingerprint is unique to individual / very small chance of two people having the same genetic fingerprint; 2

Total 6 marks

Question 3

(a) Chromosomes attach to equator/middle of cell/spindle;
Prophase;
Anaphase;
DNA replication/synthesis / chromosome copying/duplication;
Telophase; 5

(b) (i) Meiosis; 1

(ii) 32; 1

Total 7 marks

Question 4

(a)	(i)	Sticky ends/description; Reference to complementary base-pairing		2
	(ii)	Ligase;		1
(b)		Carrier; DNA/gene; *(context of foreign DNA)* Into cell/other organism/host;	max	2
(c)		Act as marker gene; Allows detection of cells containing plasmid/DNA; Reference to growing bacteria on antibiotic;	max	2

Total 7 marks

Question 5

(a)		Bleach is pollutant/dangerous/toxic / Xylanase/xylose is safe/soluble/biodegradable / Specificity of xylanase;		1
(b)		Amount of xylose/product formed; Divided by time/25;		
OR				
		Gradient of graph; In time interval;		
OR				
		Correct value (0.004) *(ignore next decimal place)*; Correct units (mg cm^{-3} min^{-1});		2
(c)	(i)	Substrate needs to diffuse through gel/membrane; Not all enzyme on surface of membrane/'bead' / smaller surface area of enzyme; Enzyme at lower concentration when immobilised; Immobilised enzyme has little kinetic energy; Immobilisation can affect shape of active site; So fewer enzyme-substrate collisions / fewer enzyme-substrate complexes formed;	max	2
	(ii)	Enzyme can be re-used / enzyme does not contaminate product / can recover enzyme / enzyme more stable to pH/temperature extremes / continuous production possible;		1

Total 6 marks

Question 6

(a) (i) Extensive/long roots;
Thick cuticle;
Small numbers of stomata;
Sunken stomata;
Rolling of leaves; max 2

(b) (i) Effect on photosynthesis;
Effect on stomatal opening;
Affects rate of transpiration/water loss/evaporation;
Heating effect (of light);
Water used in photosynthesis; max 2

(ii) So only one variable;
Plants compete with each other;
Density affects water/light/nutrient/CO_2 availability;(*may credit two different factors)*

max 2

Total 6 marks

Question 7

(a) (i) More micronutrients / greater range of nutrients;
Nutrients released slowly;
Improves soil quality / adds humus / adds microbes / improves soil structure;
Improves water-holding capacity of soil / reduces leaching/eutrophication;
Improves soil aeration;
Already available; max 2

(ii) Known nutrient content;
Nutrients available immediately/fast acting;
Nutrients distributed evenly;
Doesn't contain pests;
Better to handle / easy to use / easy to store/transport;
Concentrated in nutrients / needed in smaller amounts;
Applied using light machinery so avoids soil compaction; max 2

(b) (i) Same as other plots / named variable controlled;
Without fertiliser; 2

(ii) Contains a nutrient/nutrients important for mangolds /
Idea that different crops have different nutrient requirements /
Inorganic fertiliser contains ingredient which inhibits beet growth; max 1

Total 7 marks

Question 8

(a)	(i)	Different genes/characteristics/features; Base sequence determines protein; Different species have different protein sequences; Reference to mutations;	max	2
	(ii)	Primer has different DNA sequence; DNA specific / complementary base-pairing;		2
	(iii)	Electrophoresis separates DNA; (So they can be) identified by position on gel; Smaller/shortest fragments travel furthest/quicker / or reverse argument;		3
(b)		(*conventional*) Many lengths/all DNA / (*new*) one length; Each rung is DNA of one/specific length;		2
(c)		1 Heat DNA; 2 Breaks hydrogen bonds/separates strands; 3 Add primers; 4 Add nucleotides; 5 Cool; 6 (to allow) binding of nucleotides/primers; 7 <u>DNA</u> polymerase; 8 Role of (DNA) polymerase; 9 Repeat cycle many times;	max	6

Total 15 marks

Question 9

(a) 1 FSH stimulates (growth of a) follicle;
2 Follicle produces oestrogen;
3 Oestrogen inhibits FSH/negative feedback on FSH;
4 Oestrogen stimulates LH;
5 High oestrogen stimulates FSH;
6 LH brings about ovulation/oestrus/description;
7 LH leads to corpus luteum formation;
8 Corpus luteum secretes progesterone; max 6

(b) (i) Progesterone inhibits FSH;
By negative feedback;
When progesterone stopped, FSH released;
Stop progesterone treatment on same day (for all pigs); max 3

(ii) Arrange extra labour (for same period for all);
(All pigs need) same feeding pattern;
Saves vets' fees if (several) farrow at same time;
Piglets ready for sale at same time;
All need AI/boar/male at same time; max 2

(c) (i) Same genes/characteristics;
Different breeds have different fertilities/reproduction;
Progesterone only variable; 2

(ii) (Yes)
90.8 x 10.5 = 953.4 piglets per 100 treated sows;
92.9 x 9.8 = 910.42 piglets per 100 untreated sows. 2
(*rounded up % acceptable; also accept calculation per pig rather than per 100)*

2 correct numerical answers and explanation = 2 marks

Correct method and explanation but one arithmetic error = 1 mark

2 correct calculations <u>alone</u> = 1 mark Total 15 marks