CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the May/June 2013 series

5090 BIOLOGY

5090/22 Paper 2 (Theory), maximum raw mark 80

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Mark schemes will use these abbreviations:

- **;** separates marking points
- **/** alternatives
- **()** contents of brackets are not required but should be implied
- **R** reject
- **A** 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
- **underline** 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

	Expected Answer	Mark	Clarification
1 (a) (i)	epidermal / epidermis;	1	
(ii)	arrow shown clearly pointing to / or passing through stoma;	1	A arrow head on either end
(b)	stoma shown clearly more closed than in Fig. 1.1; **any 3** correctly identified and labelled features from: nucleus; vacuole / cell sap; cytoplasm; chloroplast; cell wall; cell membrane; vacuolar membrane / tonoplast;	1 Max 3	R any view other than surface view Ignore mitochondrion / ribosome

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(c)	Correct ref. to photosynthesis anywhere in (c); (1300 hrs) *allows CO_2 to enter; *allows O_2 to be released; (* allow ONE for ref. gaseous exchange); ref. to water loss / transpiration + cooling / bringing water or ions or minerals (to the leaf) / from the soil; (0100 hrs) prevents / reduces / stops + transpiration / loss of water; correct ref. wilting; O_2 entry + for respiration;	Max 5	R water loss for temperature regulation / control
		[Total: 11]	

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2	(a)	**any 2** from: #duodenum / small intestine*; #ileum / small intestine*; #colon / large intestine; (# OR intestine for one mark) kidney; pancreas; liver; gall bladder; spleen; named blood vessel;	Max 2	*credit (small intestine) once only.
	(b)	bacteria / virus / fungus / microoganism / pathogen; (stomach contents) acid(ic) / ref. HCl; (and/or) enzyme / protease; destroys / kills / ref. wrong pH for growth (of microorganism or colony implied);	Max 3	Ignore germs
	(c)	chest / thorax no longer airtight; ref. intercostal muscles (damage or action); diaphragm (damage or action); correct volume / pressure reference; air drawn in / out through hole; lungs / alveoli damaged or infected; insufficient / less air or oxygen in lungs / not properly inflated;	Max 5	
			[Total: 10]	

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3 (a) (i)	bacteria / Rhizobium;	1	
(ii)	nitrogen from the air / atmosphere; converts / changes / fixes; (into) ammonium ions / salts / compounds; (into) amino acids / proteins;	Max 3	R first two marks with incorrect bacteria R oxidised R ammonia
(b)	artificial selection / selective breeding; over many years / generations / repetition; selecting plants with largest flower spikes; and most colourful flowers; cross (breeding/ pollinating/ fertilising) / hybridisation; genetic engineering;	5	Ignore refs self- R if between species
(c)	**any two** from: temperature; oxygen; carbon dioxide; water; soil fertility / lack of nutrients / nutrition; different genetic makeup / mutation; wind;	Max 2	R any reference to 'high' AW for first 5 points Ignore light Ignore any additional (numbered) lines
		[Total: 11]	

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4 (a)	kidney;	1	
(b) (i)	C – renal artery / aorta; E – pulmonary artery;	2	No e.c.f. in this instance
(ii)	right atrium/auricle; right ventricle;	2	
(c)	**C** / **F** blood + urine; (a named) cells / platelets / plasma + no cells / platelets / plasma; protein/antibodies / amino acids / fats + none; lower urea concentration / higher urea concentration; glucose + no glucose; fewer salts / ions / less water / more / salts or ions / water; more hormones / vitamins / fewer hormones / vitamins;	Max 4	Ignore refs. to O_2 / CO_2 waste products Ignore minerals
		[Total: 9]	

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5	**(a)**	biotechnology / fermentation / culturing;	1	
	(b)	to control / lower / the temperature;	1	A maintain
	(c)	<u>enzymes</u>; prevention of denaturation / destruction / prevents death of fungus / microorganism / bacterium; optimum / best / better / + for growth / reproduction; high(er) yield;	2	
	(d)	any ref. sterile; (H) for introduction of microorganism or named; and food / nutrients / culture medium; e.g. amino acids / protein / carbohydrates or named; (J) for introduction of air / oxygen; bubbles / large surface area (as O_2 passes through grille) / sparger; for respiration;	Max 5	Ignore refs to stirring
			[Total: 9]	

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6 (a)	1. addition / availability of carbon dioxide; 2. controlled / optimum AW temperature (or any reasonable stated temperature); 3. ref. light (intensity); 4. ref. blinds during day / artificial lights (at night time); 5. keep well supplied with water / ref. irrigation / humidity control; 6. addition of fertiliser / any named ion / pH control / hydroponic techniques ; 7. nitrate + protein manufacture / magnesium + chlorophyll production; 8. photosynthesis (A anywhere relevant); 9. growth; 10. maximum rate / day and night / 24 hrs per day ; 11. pest control; 12. protection from (adverse) climatic factors or any named AW;	Max 7	Ignore refs. to O_2 A any named ion + function R chloroplasts Must be ref. P/S or growth
(b)	isolation from other varieties of the species; limited <u>genetic</u> variation; can pollinate only with plants in the building / cannot cross pollinate with plants outside; exclusion from agents of pollination / wind / insects; seeds less viable;	Max 3	R isolation from other species A fertilisation for pollination
		[Total: 10]	

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7 (a)	1. protein + for growth / repair / production of protoplasm or antibodies or enzymes or hormones; 2. carbohydrates (ignore names) + for energy; 3. fats + for energy / insulation / solvent (e.g. for some vitamins); 4. named mineral / ion + function*; 5. named vitamin + function*; 6. fibre / roughage + effective digestive transit AW; 7. water + solvent / other correct use;	Max 6	Ignore refs. energy do not penalise for refs to energy production *Disallow if function is incorrect for named component.
(b) (i)	(diabetic) reduced carbohydrate / sugar or named ; digestion / breakdown to glucose; lack of insulin / cells do not take up glucose / no glucose to glycogen; high <u>blood</u> sugar / glucose;	Max 2	Ignore ref. fats
(ii)	(heart patient) reduced fat; animal/saturated (fat); deposition on / in artery / atheroma / atherosclerosis; of heart / coronary; increased blood pressure;	Max 2	R no fat Ignore refs. to cholesterol Deposition may be of cholesterol Ignore refs. to heart attack
		[Total: 10]	

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8	**(a)**	a <u>chemical</u> ; released into / carried by the blood; to affect a <u>target organ</u>; destroyed in the liver;	Max 3	
	(b)	1. (male)testosterone androgens + testes; 2. for sperm / male gamete production; 3. 2ndry sexual characteristics (or one named); 4. (female) oestrogen + ovary; 5. development / release of an ovum / egg ; 6. 2ndry sexual characteristics (or one named); 7. repairs uterus lining / inhibits production of FSH; 8. progesterone + produced in ovary/ corpus luteum / placenta; 9. maintenance of uterus lining; 10. inhibition of ovulation AW; 11. LH / luteinising hormone + from pituitary; 12. triggers ovulation / development of corpus luteum; 13. FSH / follicle stimulating hormone + from pituitary;	Max 7	(male) Max 2 A production Function must be linked to correct hormone Ignore refs. uterine wall (x2) (female) Max 5
			[Total: 10]	

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9 (a)	1. join arteries to veins; 2. <u>walls</u> + thin / one-cell thick / elastic; 3. allow passage of (tissue) fluid / plasma / permeable; 4. microscopic / pass easily between cells / large surface area / narrow lumen; 5. pressure reduction (along capillary); 6. ref. diffusion; 7. to / from + cells / tissues; 8. **any 2** of the following: (may be carried, passed in / out) glucose, amino acids, oxygen, CO_2 , hormones, urea, ions / salts,	Max 5	(Ignore 'They are one cell thick')
(b) (i)	(WBCs) phagocytes / phagocytosis or described ; antibodies / antitoxins; ref. bacteria / viruses / dead cells / pathogens / microorganisms / microbes; immune response / rejection AW;	Max 3	Ignore germs A ref. immune system / immunity
(ii)	(platelets) plug damaged vessels; fibrinogen; to fibrin; <u>clott</u>ing; ref. antithrombin / prothrombin / thrombin / thromboplastin / thrombokinase;	Max 2	R fibres
		[Total: 10]	

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