

# Mark Scheme Summer 2009

GCE

## GCE O Level Biology (7040)

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(Total 4 marks)

Question Number	Answer	Mark	
4	(a) X cytoplasm; Y plasmid / DNA;	2	
	(b)	5	
	<b>Activity of bacteria</b>	<b>Description of activity</b>	
	nitrifying	ammonia/ammonium to nitrite/nitrate / nitrite to nitrate;	
	denitrifying	nitrate to nitrite / nitrite to ammonia/ammonium /nitrate to nitrogen / eq;	
	nitrogen fixing	nitrogen to nitrate/amino acids/protein;	
	decomposing	breakdown / decay / rot / feeds + dead/organic /eq;	
pathogenic	cause disease / eq;		

(Total 7 marks)

Question Number	Answer	Mark
5	(a) two sets of chromosomes / chromosomes in pairs / $2n$ / eq;	1
	(b) sex organs / reproductive organs / gonads / testes / ovaries / sperm cells / egg cells / gametes;	1
	(c) (i) 63; 32 from horse; 31 from donkey;	2
	(c) (ii) cannot form gametes / cannot form haploid / eq; 31.5 / (63) odd number / half not possible / cannot divide by 2 eq.;	2
	(d) asexual reproduction / binary fission / mitosis; 13 cannot be halved / 13 is an odd number;	2
	(e) genetic variation in meiosis / no genetic variation in mitosis;  meiosis involves gametes / haploid / reduction in chromosome number / eq; Allow converse  ref to correct chromosome behaviour eg independent assortment / crossing over / eq;  random fertilisation (of gametes);	2 max

(Total 10 marks)

Question Number	Answer	Mark																				
6	(a)	5																				
	<table border="1"> <thead> <tr> <th>Test for substance</th> <th>reagent</th> <th>Colour of reagent at start</th> <th>Colour of reagent at end</th> <th>Result substance present</th> </tr> </thead> <tbody> <tr> <td>Glucose</td> <td><b>Benedicts</b></td> <td>Blue</td> <td><b>red</b></td> <td>present</td> </tr> <tr> <td>Starch</td> <td><b>iodine;</b></td> <td><b>yellow/brown/orange;</b></td> <td>yellow</td> <td><b>absent/eq;</b></td> </tr> <tr> <td><b>protein;</b></td> <td>Biuret</td> <td>Blue</td> <td><b>purple/violet/eq;</b></td> <td>present</td> </tr> </tbody> </table>		Test for substance	reagent	Colour of reagent at start	Colour of reagent at end	Result substance present	Glucose	<b>Benedicts</b>	Blue	<b>red</b>	present	Starch	<b>iodine;</b>	<b>yellow/brown/orange;</b>	yellow	<b>absent/eq;</b>	<b>protein;</b>	Biuret	Blue	<b>purple/violet/eq;</b>	present
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	<b>protein;</b>	Biuret	Blue	<b>purple/violet/eq;</b>	present																	
	(b)	2 max																				
	(c)	4 max																				
	(d)(i)	1 max																				
	(d)(ii)	2 max																				

(Total 14 marks)



Question Number	Answer	Mark
7	(a) (i) any ref to cancer;	1
	(a) (ii) 4032(.028);; Allow one mark if 21.2/100 or 19 019 in working	2
	(b) (i) fatty diet / obesity / less activity / genes / stress / alcohol / high blood pressure / age / gender / eq;;	2 max
	(b) (ii) ref to blocked blood vessel/artery / eq; less oxygen / anaerobic;( to heart) less glucose; respiration / energy; lactic acid; heart attack / heart stops;	3

(Total 8 marks)

Question Number	Answer	Mark
8	(a) shrimp + small fish + squid + whale;	1
	(b) plants → shrimp/small fish → seal → killer whale; arrows;	2
	(c) less photosynthesis; less plants / less plant growth / eq; less food for consumers/eq.; death / fall in numbers / migration / eq;	3 max
	(d) homeostasis / eq;  winter coat / loss of coat; fat layer / less fat; hibernation / burrowing / eq;  hair erect / hair flat; less sweat / more sweat; shivering / no shivering; more active/more respiration / less active/less respiration / eq; vasoconstriction/vasoconstriction described / vasodilation/vasodilation described;	3 max

(Total 9 marks)

Question Number	Answer						Mark
9	hormone						5
	Effect on body	Adrenaline	Progesterone	Testosterone	Insulin	Oestrogen	
	Increases heart rate	✓ ;					
	Deepens voice at puberty			✓ ;			
	Converts blood glucose to glycogen				✓ ;		
	Maintains lining of uterus		✓ ;				
Repairs lining of uterus					✓ ;		

(Total 5 marks)

Question Number	Answer	Mark								
10	(a)	2								
	<table border="1"> <thead> <tr> <th>function of mineral ion</th> <th>name of mineral ion</th> </tr> </thead> <tbody> <tr> <td>making DNA</td> <td>(phosphate)</td> </tr> <tr> <td>making amino acids</td> <td>nitrate;</td> </tr> <tr> <td>making chlorophyll</td> <td>magnesium;</td> </tr> </tbody> </table>		function of mineral ion	name of mineral ion	making DNA	(phosphate)	making amino acids	nitrate;	making chlorophyll	magnesium;
	function of mineral ion		name of mineral ion							
	making DNA		(phosphate)							
making amino acids	nitrate;									
making chlorophyll	magnesium;									
(b)(i)	2									
(b)(ii)	2 max									
(c)	3 max									

(Total 9 marks)

Question Number	Answer	Mark
11	(a)(i) 0.216;; Allow one for /15 in working	2
	(a)(ii) 0.172-0.32 / 0.148;	1
	(b) reliability / reduce effect of anomalous results/eq;	1
	(c) 4.53;;; Allow two marks for 4.5 in working or Allow two marks for 453 in working or Allow one mark for 78 / 0.172 in working	3
	(d) receptor / receptor cells; optic nerve / sensory neurone/nerve; brain; spinal cord; motor neurone/nerve; synapse; (once) effector;	4 max
	(e) avoid danger / escape / run away (from predators); prevent damage / survive / not be killed / eq; able to catch prey;	2
(f) tiredness / eq; increase reaction time/ slow reactions;  alcohol /depressant drug; increase reaction time / slow reactions;  adrenaline / stimulant drug; decrease reaction time/ fast reactions;  fatty sheath / myelin; increases nerve impulse / decrease reaction time / fast reactions;	2 max	

(Total 15 marks)

Question Number	Answer	Mark																				
12	(a) removal of /eq; (metabolic) waste products / urea / poisons / toxins / eq;	2																				
	(b)		4																			
	<table border="1"> <thead> <tr> <th>Situation</th> <th>Water in blood</th> <th>ADH in blood</th> <th>Volume of urine</th> <th>Concentration of urine</th> </tr> </thead> <tbody> <tr> <td>After exercise in a hot dry environment</td> <td>low</td> <td>(high)</td> <td>low;</td> <td>high</td> </tr> <tr> <td>After dinking 1 litre of water</td> <td>high;</td> <td>low</td> <td>(high)</td> <td>low</td> </tr> <tr> <td>After a meal rich in salt and protein</td> <td>(low)</td> <td>high;</td> <td>(low)</td> <td>high;</td> </tr> </tbody> </table>	Situation		Water in blood	ADH in blood	Volume of urine	Concentration of urine	After exercise in a hot dry environment	low	(high)	low;	high	After dinking 1 litre of water	high;	low	(high)	low	After a meal rich in salt and protein	(low)	high;	(low)	high;
	Situation	Water in blood		ADH in blood	Volume of urine	Concentration of urine																
	After exercise in a hot dry environment	low		(high)	low;	high																
After dinking 1 litre of water	high;	low	(high)	low																		
After a meal rich in salt and protein	(low)	high;	(low)	high;																		
one mark for each correct column;;;																						

(Total 6 marks)

(Total for paper: 100 marks)

7040 / 02 Paper 2 Mark Scheme - June 2009

**Section A**

Question Number	Answer	Mark
1	(a) sewage / organic material; microorganisms / eq; fertiliser / minerals; eutrophication / eq;	2 max
	(b) increase / eq;	1
	(c) (i) respiration; Reject anaerobic	1
	(ii) (less) photosynthesis; release oxygen/eq;	2
	(iii) optimum temp. / best temp / eq; enzymes;	2
	(iv) raw sewage;	1
	(d) plants + animals / all organisms / biotic / community / different species;  ref abiotic factor / environment / eq;	2
	(e) cells further from surface / small SA:VOL;  diffusion inadequate / eq;  (more) respiration / metabolism; need more oxygen / eq;	2 max
	(f) death of plants / algae; decomposition / decomposers / decay / eq; microorganisms / bacteria / fungi / eq; respiration; use of oxygen; Reject if by plants/algae	2 max
	(g) not when raining / not too much / eq; Ignore ref to organic fertiliser	1
(h) food webs disrupted / loss of habitat /	1	

	grow /	no plants / takes time for plants to eq;	
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(Total 17 marks)

Question Number	Answer	Mark
2	(a) 22;; Allow one mark for 180 mins = 3 hours	2
	or 180/60	1
	(b) (i) light / temperature / carbon dioxide;	1
	(ii) same number/ species / mass / age /eq;	1
	(c) (i) phloem;	1
	(ii) storage / respiration / for energy / for active uptake / eq;	1 Max

(Total 6 marks)



Question Number	Answer	Mark	
3	(a)(i)	size / both half grid and y axis linear; key / 6-11 and 12-19; range of bars; axis correct and labelled (percentage + years/surveys); plotted bars accurately;	5
	(a)(ii)	level / constant; increased;	2
	(a)(iii)	eat too much: carbohydrate/fat / junk food / food / hamburgers / diet not balanced / eq;  lack of exercise/ travel by car / eq;	2
	(b)	increase blood pressure; arteries blocked with fat / cholesterol; risk of heart attack / heart disease /eq; stroke; diabetes;	2 max
	(c)	kwashiorkor /marasmus / malnutrition;	1

(Total 12 marks)

Question Number	Answer	Mark
4	C no SO <sub>2</sub> / SO <sub>2</sub> / range of SO <sub>2</sub> ; O same species / type / size / mass / eq. ; R repeat / eq ; M 1 measure % / number / freq / of germination / eq; M 2 leave for same time / eq; S 1 and 2 same temp / water / fertilizer / light / disinfected / eq;	5 max

(Total 5 marks)

Question Number	Answer	Mark																
5	<p>a)</p> <table border="1"> <thead> <tr> <th>tank</th> <th>contents</th> <th>Colour of indicator at start</th> <th>Colour of indicator at end</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>(snails)</td> <td>(orange)</td> <td>yellow;</td> </tr> <tr> <td>B</td> <td>(Elodea)</td> <td>orange</td> <td>dark red;</td> </tr> <tr> <td>C</td> <td>(snails + Elodea)</td> <td>orange;</td> <td>orange;</td> </tr> </tbody> </table> <p>b) respiration ; releases CO<sub>2</sub> / CO<sub>2</sub> increases; no photosynthesis; no absorption of CO<sub>2</sub>;</p> <p>c) <u>lots</u> of alveoli; large surface area / increase diffusion;</p> <p><u>lots/dense network</u> of capillaries; large surface area / increase diffusion;</p> <p>moist; allows gases to dissolve;</p> <p>thin walls / one cell thick (alveoli or capillary); short distance for diffusion;</p> <p>movement of blood; carry away oxygen / maintain (diffusion) gradient /eq.;</p>	tank	contents	Colour of indicator at start	Colour of indicator at end	A	(snails)	(orange)	yellow;	B	(Elodea)	orange	dark red;	C	(snails + Elodea)	orange;	orange;	<p>4</p> <p>2</p> <p>4 max</p>
tank	contents	Colour of indicator at start	Colour of indicator at end															
A	(snails)	(orange)	yellow;															
B	(Elodea)	orange	dark red;															
C	(snails + Elodea)	orange;	orange;															

(Total 10 marks)

Question Number	Answer	Mark
6	a) mass increases lifespan increases / mass decreases lifespan decreases;	1
	b) i) as mass increases its heart rate decreases / as mass decreases its heart rate increases;	1
	ii) heart is larger / more powerful / eq; (therefore it can send more blood in each beat)	1
	OR smaller animals are more active / higher respiration rate (so heart faster);	2 max
	c) stress / fear / adrenaline; greater activity / exercise; increases heart rate;	3
	d) yes: beats per lifetime is similar / not very variable / constant; for short life + long life; ref. to data from two animals;  no: beats per lifetime different / eq; for short life + long life; ref. to data from two animals;	2 max
e) live longer; access to medicine / hospitals / repair to damage / transplants / can control their environment /eq;		

(Total 10 marks)

Total for Section A: 60 marks

## Section B

Question Number	Answer	Mark
7	(a) random movement; high conc to low conc / down conc gradient / increase by increasing gradient; passive / no energy needed; increased by increase in temp; increased by increase in SA;  osmosis (only) water molecules / diffusion for different molecules/gases; osmosis + membrane / diffusion membrane not involved;	4 max
	(b) diffusion slow in water; less oxygen / anaerobic conditions; (less) (aerobic) respiration; (less) energy / ATP; active transport / active uptake / less minerals absorbed; low to high conc / against conc gradient;	4 max

(Total 8 marks)

Question Number	Answer	Mark
8	(a) (i) same alleles / same gametes / TT / tt / both dominant / both recessive / eq; different alleles / different gametes / Tt / eq;	2
	(ii) (in heterozygote) one allele expressed / dominant allele expressed / one allele hidden / recessive allele not expressed / eq;	2
	(in heterozygote) both alleles expressed /eq;	2
	(iii) genotype = alleles present / genetic makeup; phenotype= appearance/ expression / eq;	2 max
(b)	survive / not killed / eq; antibiotic no longer works; increase in number / frequency; disease caused /spread / eq;	

(Total 8 marks)

Question Number	Answer	Mark
9	(a) faster / slower; brief / long lasting / eq; electrical / impulses / chemical; neurones / blood;	4
	(b) auxin; promotes growth / elongation / eq; (no) chlorophyll; (no) photosynthesis; (cannot make) starch, food / eq;	4 max

(Total 8 marks)

Total for Section B: 16 marks

## Section C

Question Number	Answer	Mark
10	<p>white blood cells; phagocytes/ eq; engulf/ingest pathogens;</p> <p>lymphocytes; antigens; antibodies; kill /destroy pathogens / eq; (ONCE) antitoxins / eq;</p> <p>memory cells; quick/increased production of antibodies; immunity / immune response;</p> <p>platelets; clotting; fibrinogen / fibrin / eq; mesh / net / scab /eq; prevent loss of blood; prevent entry of pathogens;</p>	12

Question Number	Answer	Mark
11	<p>broad flat;  large SA;  to absorb light / gases;</p> <p>thin;  less distance / no cell far from surface;  diffusion; (ONCE)  transparent epidermis;  lets light through;</p> <p>palisade cells;  near upper surface;  (many) chloroplasts;  long and thin / eq;  absorb light;</p> <p>spongy mesophyll;  air spaces;  diffusion;  moist film;  dissolves gases;</p> <p>stomata / guard cells;  on lower surface;  gas exchange;</p> <p>xylem + water transport;</p>	12



Question Number	Answer	Mark
12	oesophagus; peristalsis; stomach; (capsule/protein) digested; protease / pepsin; (chemicals) absorbed; into blood; (ONCE) in duodenum / ileum / small intestine; villi; microvilli; capillary; diffusion; into vein; liver; back to heart; arteries; brain;	12

Total for Section C: 24 Marks

(Total for paper: 100 marks)

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