

# Mark Scheme January 2008

GCE

## GCE O Level Human Biology (7042)

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## HUMAN BIOLOGY 7042, MARK SCHEME

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### Symbols used in marking points

- ; indicates separate mark points
- / indicates alternatives
- eq means allow any correct equivalent

### Paper 1

Question Number	Answer	Mark
1 (a)(i)	A = humerus ; B = ulna ; C = ligament ; D = synovial membrane ;	4

Question Number	Answer	Mark
1 (a)(ii)	synovial / hinge ;	1

Question Number	Answer	Mark
1 (a)(iii)	lubrication ; reduce friction / smooth movement ; stop bones rubbing/grinding together ;	max 2

Question Number	Answer	Mark
1 (b)	no cartilage shown ; (normally covers) ends of bone ; smooth / slippery ; reduces friction ; shock absorber ; bones will rub together ;	max 4

Question Number	Answer	Mark
2 (a)(i)	villus ;	1

Question Number	Answer	Mark
2 (a)(ii)	small intestine / ileum ;	1

Question Number	Answer	Mark
2 (b)(i)	glucose ; amino acids / eq ; <b>NOT</b> vitamins	2

Question Number	Answer	Mark
2 (b)(ii)	glycerol / fatty acids ;	1

Question Number	Answer	Mark
2 (c)(i)	large surface area ;	1

Question Number	Answer	Mark
2 (c)(ii)	short distance/eq for diffusion / thin ;	1

Question Number	Answer	Mark
2 (d)	liver ;	1

Question Number	Answer	Mark
2 (e)	peristalsis / reference to muscles contracting/relaxing ; moves food along ; mixes food / maintains diffusion gradient ;	max 2

Question Number	Answer	Mark
3 (a)	air ; fluid ; fluid ;	3

Question Number	Answer	Mark
3 (b)	arrow to position of oval window ; arrow to position of round window ;	2

Question Number	Answer	Mark
3 (c)	line to cochlea labelled X ; line to vestibular apparatus labelled Y ;	2

Question Number	Answer	Mark
3 (d)	passage to air outside/to atmosphere/to throat ; to equalise pressure ; in middle ear ; blockage causes pressure to be unequal ; shape of eardrum distorted ; doesn't vibrate (against ossicles) ; sound waves not transmitted ; to middle ear ;	max 4

Question Number	Answer	Mark
4 (a)(i)	$\frac{1500 \times 100}{180,000}$ ; 0.83% ;	2

Question Number	Answer	Mark
4 (a)(ii)	protein ;	1

Question Number	Answer	Mark
4 (a)(iii)	glucose ;	1

Question Number	Answer	Mark
4 (b)	(replaces) water lost as sweat / (because of) increased sweating / description of process ; figures for blood plasma / filtrate would remain same ; (figure for) urine decreases / more water reabsorbed ; by collecting duct ;	max 3

Question Number	Answer	Mark
4 (c)(i)	liver ; from excess amino acids ; by deamination ;	max 2

Question Number	Answer	Mark
4 (c)(ii)	in solution / dissolved (in blood) ; in plasma ;	2

Question Number	Answer	Mark
4 (c)(iii)	approximately half reabsorbed / correct use of figures ; 25 g / half stays in urine ; removed from body ; if it were needed by body / not an excretory product more would be reabsorbed / less in urine ;	max 2

Question Number	Answer	Mark
5 (a)(i)	organism that transfers parasite / pathogen from one host to another; vector not harmed by parasite / pathogen / doesn't show symptoms ;	2

Question Number	Answer	Mark
5 (a)(ii)	line labelled A at point where 'female takes a blood meal' ;	1

Question Number	Answer	Mark
5 (a)(iii)	<p><i>stage 1 - adult / mated female</i>                      spray with insecticide ;                      kills adults ;</p> <p>use mosquito nets / <u>insect</u> repellents ;                      prevents access to humans ;</p> <p><i>stage 2 - water stages</i>                      drain water ;                      remove breeding ground ;</p> <p>spray oil ;                      destroys / kills larvae ;</p> <p>insecticide ;                      destroys / kills pupa ;</p> <p>introduce fish ;                      eats larvae ;</p>	max 4

Question Number	Answer	Mark
5 (b)	difficult to remove all breeding areas / kill all mosquitoes / large numbers of mosquitoes ; can lay eggs in small amounts of water ; no drugs to destroy <i>Plasmodium</i> / no cure ; mosquito shows resistance to insecticides ; no vaccinations ;	max 2

Question Number	Answer	Mark
5 (c)	mosquito requires warm climate ; more area of world becoming warmer / wetter ; mosquito will spread to more areas / breeding sites increase ; taking malaria with it / increased number of cases ;	max 2



Question Number	Answer	Mark
6 (a)	electrical / electrochemical ; synapses ; neurotransmitters ; vesicles ; diffusion ; initiates / starts / generates ;	6

Question Number	Answer	Mark
6 (b)	secretion of transmitter is active process / requires energy/ATP ; released by respiration ; in mitochondria ; also restitution of membrane when impulse has passed ;	max 2

Question Number	Answer	Mark
7 (a)	$\frac{75}{(1.5)^2}$ ; = 33.3 ; therefore obese / eq ;	3

Question Number	Answer	Mark
7 (b)	increase in body mass index causes increase in diabetes ; in both / men and women ; increase greater in women / less in men / ref to difference ;	3

Question Number	Answer	Mark
7 (c)(i)	sample of urine add Benedict's solution    OR clinistix ; boil (for one minute)                            OR colour change ; brick red / orange (precipitate) formed    OR pink to purple ;	3

Question Number	Answer	Mark
7 (c)(ii)	insulin ;	1

Question Number	Answer	Mark
7 (d)	coronary / varicose veins / colon cancer / high blood pressure / foot problems / heart attacks / increased pressure in eye ;	1

Question Number	Answer	Mark
8 (a)(i)	genes / alleles found in cells / genetic make up ;	1

Question Number	Answer	Mark
8 (a)(ii)	two different alleles ; in heterozygote ; equal dominance / neither is recessive or dominant ; both expressed in phenotype ;	max 2

Question Number	Answer	Mark
8 (b)(i)	Hb <sup>S</sup> Hb <sup>S</sup> ;                      yes ; Hb <sup>S</sup> Hb/Hb Hb <sup>S</sup> ;              yes ; Hb Hb <sup>S</sup> ;                              yes ;	6

Question Number	Answer	Mark
8 (b)(ii)	HbHb ; Hb <sup>S</sup> Hb <sup>S</sup> ;	2

Question Number	Answer		Mark
9 (a)	A	vena cava ;	carries blood to heart from body ;
	B	pulmonary veins ;	carry blood to heart from lungs ;
	C	pulmonary artery ;	carries blood to lungs from heart ;
	D	cords / chordae tendinae / tendon ;	prevent inversion of valve ;
			8

Question Number	Answer	Mark
9 (b)(i)	prevent backflow of blood / stops blood going the wrong way ;	1

Question Number	Answer	Mark
9 (b)(ii)	veins ;	1

Question Number	Answer	Mark
9 (c)(i)	left ;	1

Question Number	Answer	Mark
9 (c)(ii)	more (cardiac) muscle ; high / more pressure generated ; push blood all round body ; right ventricle at low(er) pressure ; blood only to lungs ; lower pressure prevents damage to lungs ;	max 3

TOTAL FOR PAPER: 100 MARKS

Paper 2

Question Number	Answer	Mark
1 (a)	contraction of intercostal muscles ; ribs move up and out ; diaphragm muscles contract ; diaphragm flattens ; increase in volume of thorax ; decrease in pressure in thorax ; outside / atmospheric pressure greater than internal ; air forced in ; reverse occurs for breathing out ; reference to lung elasticity ;	max 8

Question Number	Answer	Mark
1 (b)	oxygen required for aerobic respiration ; to release energy / ATP ; body's activities increase / named activity / physical exercise ; more energy / ATP required ; so greater respiration ; more oxygen required ; increased rate of breathing ; when body less active / asleep ; less energy required ; reference to feedback ; reference to carbon dioxide levels in blood ;	max 8

Question Number	Answer	Mark
1 (c)	<u>oxygen</u> inside red blood cells ; with haemoglobin ; combined to form oxyhaemoglobin ;  <u>carbon dioxide</u> as hydrogencarbonate (ions) ; in solution ; in plasma ; combined with haemoglobin ;	max 4

Question Number	Answer	Mark
2 (a)	<p><u>incisors</u> chisel shape ; used for biting / cutting ;</p> <p><u>canines</u> pointed / conical ; for tearing / cutting meat / eq ;</p> <p><u>molars</u> large surface area ; cusps / ridged ; for grinding / crushing ; better attachments through larger root ;</p>	max 6

Question Number	Answer	Mark
2 (b)(i)	<p>bacteria ; act on sugar / carbohydrates ; to produce acid ; which decays / erodes / dissolves enamel ; causing / leading to tooth decay ; removes plaque / bacteria ;</p>	max 4

Question Number	Answer	Mark
2 (b)(ii)	<p>(diet containing adequate) calcium ; and protein ; and phosphates ; components of teeth ; vitamin D required ; for uptake of calcium ; fluoride makes teeth more resistant to acid / reduces erosion ; vitamin C ; for gum development ;</p>	max 6

Question Number	Answer	Mark
2 (c)	<p>(bread mixed with) saliva ; rolled by tongue ; into a bolus ; (saliva contains) amylase / ptyalin ; breaks down starch ; into maltose ;</p>	max 4

Question Number	Answer	Mark
3(a)	collection / many / large number of cells ; usually similar structure / can be different ; working together ; carry out a function ; two correct examples ;; e.g. muscle e.g. epithelium	max 5

Question Number	Answer	Mark
3 (b)	<u>nucleus</u> contains genetic material / chromosomes / genes / DNA ; controls activities of cell ; used as a template / ref to coding ; for manufacture of (m)RNA / DNA / proteins ; controls cell division ;  <u>mitochondria</u> site of aerobic respiration ; <u>release</u> energy ; in form of ATP ; used to drive other chemical reactions ;  <u>cytoplasm</u> contains cell organelles ; site of chemical reactions ; acts as storage area ; handles materials going in and out of cells ;	max 9

Question Number	Answer	Mark
3 (c)	protein ; catalyst ; speeds up chemical reactions ; remain unchanged at end of reaction ; many reactions occur in cell ; occur too slowly if no enzymes ; require too high a temperature to react without enzymes ; too little synthesis of materials / too little breakdown ; some intracellular and some extracellular ;	max 6

Question Number	Answer	Mark
4 (a)	rapid ; involuntary / automatic ; response ; no involvement of brain ; protective function ;	max 4

Question Number	Answer	Mark
4 (b)	<p><u>diagram quality</u> suitable size ; dorsal and ventral root correctly shown; synapses in grey matter of spinal cord ;</p> <p><u>labels of structures in correct position</u> receptor organ ; sensory neurone ; motor neurone ; relay neurone ; white matter ; grey matter ; synapse ; effector ; dorsal root ganglion;</p>	<p>3</p> <p>max 7</p> <p>max 10</p>

Question Number	Answer	Mark
4 (c)	<p>Iris controls light entering eye ; adjusts size of pupil ; too much light iris closes ; prevents damage to retina ; light intensity too low ; pupil enlarged / radial muscles contract ; blinking when object approaches / object touches eye ; to prevent damage to eye ; blinking moves fluid over surface of eye ; clears away material that has entered eye ;</p>	max 6



Question Number	Answer	Mark
5 (a)	<p><u>contraceptive pill</u>                      contains hormones ;                      prevents release of ovum ;                      reliable ;                      easy to take / use ;                      could forget to take it ;                      problems with blood clots / other health factors ;                      thickens mucus ;</p>	max 3
	<p><u>condom</u>                      prevents sperm reaching ovum / eq ;                      reliable ;                      reduce risk of AIDS ;                      reduce risk of STDs / named disease ;                      needs to be put on before intercourse ;                      cost ;</p>	max 4
	<p><u>sterilisation</u>                      involves operation / specialist medical expertise ;                      cut sperm duct / oviduct ;                      prevents sperm reaching ovum ;                      effective ;                      can't be reversed ;                      carries risk of infection ;</p>	max 3
		max 10

Question Number	Answer	Mark
5 (b)	<p>meiosis results in haploid number / n / half the number ;                      when gametes fuse / fertilisation ;                      diploid / 2n restored ;                      mitosis results in diploid / 2n / same number ;                      on fusion chromosome number would be doubled ;                      results in death / deformities ;</p>	max 4

Question Number	Answer	Mark
5 (c)	<p>increase in size / change in body proportions ;                      development of secondary sexual characteristics ;                      deepening voice ;                      development of muscles ;                      pubic hair / hair under arms / on legs / chest / chest ;                      increase in size of reproductive organs ;                      gamete production ;                      increase awareness of opposite sex ;                      increased confidence / independence ;                      increased aggression / testosterone level increases ;</p>	max 6

Question Number	Answer	Mark
6 (a)	cars increase oxides of nitrogen in the air ; causes breathing problems / asthma ; carbon monoxide / CO given out by cars ; combines with haemoglobin ; reduced oxygen carriage ; lead in exhaust fumes ; toxic metal / enzyme inhibitor / causes brain damage / eq ; cigarette smoke contains harmful chemicals / named chemical ; destroys cilia of respiratory tract ; more mucus produced / can't be removed easily ; leads to bronchitis / emphysema ; lung cancer ; high blood pressure / heart attacks ;	max 10

Question Number	Answer	Mark
6 (b)	increase in temperature ; increases activity of white blood cells / reference to antigens ; phagocytes engulf organism ; digest / destroy ; lymphocytes make antibodies ; specific ; antitoxins neutralise toxins ; others cause pathogens to clump ; easier digestion by phagocytes ;	max 6

Question Number	Answer	Mark
6 (c)	diseases in (a) not caused by pathogens ; caused by pollutants which enter body / cause damage ; white blood cells can't respond to these ; no antibodies produced ; no memory cells produced ; body can't be immune / can't defend itself against new attack ;	max 4

Question Number	Answer	Mark
7 (a)	<p><u>diagram quality</u> size of at least five lines equivalent ;</p> <p><u>labels</u> cell wall ; cell membrane ; genetic material (reject if shown as a nucleus) ; flagellum / pilli ; ribosome ; cytoplasm ; capsule ;</p>	<p>1</p> <p>max 5</p> <p>max 6</p>

Question Number	Answer	Mark
7 (b)	<p>disease causing organism ;</p> <p>TB ; typhoid ; cholera ;</p>	<p>1</p> <p>max 2</p> <p>max 3</p>

Question Number	Answer	Mark
7 (c)	<p>decomposition / dead plants / animals / matter / sewage ; <u>yeast</u> in alcohol production ; brewing / wine making ; <u>yeast</u> in breadmaking ; makes dough rise ; <u>bacteria</u> in yoghurt production / cheese ; <u>fungi</u> antibiotic production ; e.g. penicillin / streptomycin ; eaten as mushrooms / truffles ; flavour cheese ; SCP / Quorn ; <u>bacteria</u> synthesis of vitamins ;</p>	<p>max 8</p>

Question Number	Answer	Mark
7 (d)	<p>fungus not made of cells ; fungus has a nucleus / many nuclei ; cell wall of chitin ; hyphae ; other organelles / two or more named organelles present ;</p>	<p>max 3</p>

Question Number	Answer	Mark
8 (a)	drain irrigation ditches (when growing season is over) ; no water for free swimming miracidium / fluke ; replace water canals with piped water ; dig wells to supply water ; snails can't enter ; treat infected people ; prevents them passing on disease ; use chemicals to kill snails ; use a biological control ; no intermediate host / larval stage can't develop ; keep ducks ; they eat snails ; provide boots for farmers / workers / don't swim in water ; fluke can't penetrate ; treating drinking water ;	max 10

Question Number	Answer	Mark
8 (b)(i)	<u>endemic</u> always present ; at low levels ; in a population ;  <u>epidemic</u> large number of cases / sudden outbreak ; above normal level ; widespread / rapid spread ;	max 4

Question Number	Answer	Mark
8 (b)(ii)	tuberculosis spreads rapidly / becoming drug resistant ; tuberculosis spread direct from person to person ; through the air ; no vector / intermediate host ; no special conditions ; <i>Schistosomiasis</i> requires water ; and snails ; for part of life cycle ; transfer to humans only occurs when in contact with infected water ; these conditions only in certain areas ; so disease can't spread outside these areas ; so can't develop into a world-wide epidemic ;	max 6

Question Number	Answer	Mark
9 (a)	plants incorporate energy into ecosystem / use energy from sun ; plants make own food / starch ; by photosynthesis ; humans eat starch (in plants) ; use as source of energy ; oxygen produced by plants ; required for respiration ; other animals / named animal eat plants ; humans then eat these animals ;	max 6

Question Number	Answer	Mark
9 (b)	at each stage / at each transfer energy is lost ; in respiration ; growth ; indigestible material e.g. hair ; (after four consumers) not enough energy / little energy left ; to support another consumer ;	max 4

Question Number	Answer	Mark
9 (c)	canning ; heat kills bacteria ; seal in can / put into airtight can ; prevents entry of bacteria ;  dry / dehydration ; water removed ; *bacteria inactive / unable to digest food / food cannot decay ; *unable to reproduce ; <span style="float: right;">* ALLOW ONCE ONLY</span>	
	freezing (NOT refrigeration) ; <u>low</u> temperature / -12°C or below ; enzymes inactivated ; *bacteria can't reproduce ;	
	salting / syrup ; removes water from <u>bacteria</u> / dehydrates <u>bacteria</u> ; *bacteria can't reproduce ; *bacteria inactive / unable to digest food / food cannot decay ;	
	smoking ; suspend over wood smoke ; chemicals in smoke destroy bacteria ;  Other suitable method: (1) for method, up to (3) for how it works	max 10

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