

Mark Scheme (Final)

Summer 2008

GCE O

GCE O Human Biology (7042/02)

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
1(a)(i)	<ol style="list-style-type: none"> 1. right atrium; 2. atrium (wall) contracts; 3. pushes blood into ventricle; 4. (via) cuspid valve; Reject bicuspid <ol style="list-style-type: none"> 5. ventricle (wall) contracts; 6. forces blood into pulmonary artery; 7. (via) semilunar valves; 8. through lung capillaries; 9. via pulmonary vein to left atrium; 10. valves prevent backflow of blood; 	max (7)

Question Number	Answer	Mark
1(a)(ii)	<ol style="list-style-type: none"> 1. blood in vena cava has raised carbon dioxide level; 2. blood in vena cava has lower oxygen level; R - none 3. carbon dioxide produced by body cells; 4. oxygen removed from blood as it passes through tissues; 5. blood in vena cava has low pressure; 6. pressure increased by pumping of heart; 7. alveolar air has high concentration of oxygen; 8. oxygen diffuses into capillaries; 9. combines with haemoglobin / forms oxyhaemoglobin; 10. low carbon dioxide concentration in alveolar air; 11. carbon dioxide diffuses out of blood; 12. suitable ref. to concentration gradient; 13. glucose level drops; 14. reference to respiration in alveoli; 	max (9)

Question Number	Answer	Mark
1(b)	<p>2 marks for each correct answer from any of the following pairs - maximum 4 marks.</p> <ul style="list-style-type: none"> • cardiac muscle involuntary; • skeletal muscle voluntary; • cardiac muscle single cells; • skeletal muscle fibres with scattered nuclei / coenocyte described; • cardiac muscle no fatigue; • skeletal muscle fatigues; • cardiac muscle not joined to skeleton; • skeletal muscle joined to bones; • cardiac muscle myogenic; • skeletal muscle neurogenic; 	<p style="text-align: right;">max (4)</p>

(Total 20 marks)

Question Number	Answer	Mark
2(a)	<ul style="list-style-type: none"> • they detect a stimulus / eq ; Accept changes in environment <ul style="list-style-type: none"> • they respond by generating electrical impulse; • pass this to CNS / brain / sensory neurone; • one example from following list: skin / tongue / cochlea / semi-circular canals / nose / eye ; Reject senses	max (3)

Question Number	Answer	Mark
2(b)	Accept points on labelled / annotated diagram <ol style="list-style-type: none"> 1. light rays (almost) parallel; 2. enter via cornea; 3. rays refracted / bent; 4. pass (unaltered) through aqueous humour; 5. enters lens via pupil; 6. lens made less convex / flatter; 7. by relaxation of ciliary muscles; 8. suspensory ligaments pull on lens; 9. fine adjustment / final refraction by lens; 10. pass (unaltered) through vitreous humour; 11. final focus on fovea / yellow spot; 	max (7)

Question Number	Answer	Mark
2(c)	<u>hard lens</u> <ul style="list-style-type: none"> • more difficult to change shape of lens / accommodation difficult; • difficult to form sharp focus; • especially on distant / very close objects; <u>cloudy lens</u> <ul style="list-style-type: none"> • light rays cannot penetrate / scattered; • image is blurred / fuzzy; 	max (4)

Question Number	Answer	Mark
2(d)(i)	<ul style="list-style-type: none"> • (mechanism that) keeps internal conditions / cell environment; • constant / within narrow limits; 	(2)

Question Number	Answer	Mark
2(d)(ii)	<p>1 mark for each correct answer from any of the following - maximum 4 marks</p> <ul style="list-style-type: none"> • regulates the amount of light reaching the retina; • too much / bright light / ORA; • circular muscles of iris contract /ORA; • radial muscles of iris relax / ORA; • pupil becomes smaller / less light enters /ORA; 	(4)

(Total 20 marks)

Question Number	Answer	Mark
3(a)(i)	<ul style="list-style-type: none"> • respiration; • glucose; • energy released in mitochondria; • suitable ref. to enzymes; • present on cristae / inner membranes; • (glucose) reacts with oxygen; • waste products are carbon dioxide and water; • in aerobic respiration; • energy released used to form ATP; 	max (6)

Question Number	Answer	Mark
3(a)(ii)	<ul style="list-style-type: none"> • energy is used to form ATP; • combines ADP and phosphate group; • stored in cell; • when energy required ATP breaks down; 	max (3)

Question Number	Answer	Mark
3(b)(i)	<p>Any three pairs - up to 2 marks each</p> <ul style="list-style-type: none"> • anaerobic - end product is lactic acid; • aerobic - end products are carbon dioxide and water; • aerobic - requires oxygen; • anaerobic - no oxygen needed; • aerobic - glucose molecule completely broken down; • anaerobic - glucose molecule only partially broken down; • aerobic - large number of ATP molecules formed / a lot of energy released; • anaerobic - few ATP molecules formed / little energy; <p style="text-align: right;">(6)</p> <p>1 mark for correct answer</p> <ul style="list-style-type: none"> • only minimal amount of lactic acid tolerated as it is toxic / causes cramp; • anaerobic respiration wasteful of energy reserves / eq; <p style="text-align: right;">(1)</p>	max (7)

Question Number	Answer	Mark
3(b)(ii)	<ul style="list-style-type: none"> • carbon dioxide removed via alveoli / lungs; • carbon dioxide used to form urea; • water removed via alveoli / lungs; • water removed by kidney; • lactic acid oxidised (when oxygen is available); • lactic acid converted to glycogen; • in the liver; 	max (4)

(Total 20 marks)

Question Number	Answer	Mark
4(a)(i)	<ul style="list-style-type: none"> • long structure/folded internally; • large surface area; • ref. to entry of bile / pancreatic ducts; • secretion of enzymes; • presence of villi; • muscles move food along / mixing; 	max (4)

Question Number	Answer	Mark
4(a)(ii)	<ul style="list-style-type: none"> • for absorption materials must be soluble; • enzymes activated by alkaline conditions / higher pH; • bile produces alkaline conditions; • bile emulsifies fats / eq; • lipase; • fats to fatty acids and glycerol; • amylase; • starch to maltose; • maltase; • maltose to glucose; • peptidase / relevant named example e.g. trypsin; • protein / peptides to amino acids; <p>(Accept any other relevant enzyme and effect)</p>	max (8)

Question Number	Answer	Mark
4(a)(iii)	<ul style="list-style-type: none"> • glucose absorbed into blood capillaries; • amino acids absorbed into blood capillaries; • fatty acids / glycerol absorbed into lacteals; • ref. to diffusion gradient / relative concentrations; • ref. active uptake; 	max (3)

Question Number	Answer	Mark
4(b)	<ul style="list-style-type: none">• metabolism of products of digestion / eq;• glucose converted to glycogen;• stored in liver;• excess amino acids deaminated;• urea formed;• alcohol broken down / oxidised;• harmful substances detoxified;	max (5)

(Total 20 marks)

Question Number	Answer	Mark
5(a)	<ul style="list-style-type: none"> • progesterone produced / level high; • fertilised egg cell / zygote passes to uterus; • moved along oviduct (by cilia); • uterine lining rich in blood vessels; • zygote settles on / sinks into / attaches to uterine lining / implants; • zygote divides to form ball of cells; • cells differentiate / eq; • some cells form placenta / attach to uterine lining; • other cells become embryo / fetus; 	max (5)

Question Number	Answer	Mark
5(b)(i)	<ul style="list-style-type: none"> • interlocking of maternal and fetal tissues; • ref. to villi; • large surface area in contact; • a rich blood supply in both maternal and fetal tissues; • very thin barrier between blood supplies; • allows diffusion to occur readily (from one system to the other); • ref. to concentration gradients; • blood systems are not connected to each other / no mixing of blood; 	max (5)

Question Number	Answer	Mark
5(b)(ii)	<p><u>small intestine</u></p> <ul style="list-style-type: none"> • higher concentration in maternal blood; • glucose / amino acids / vitamins / mineral salts / fatty acids / glycerol; • diffusion into fetal blood; <p><u>lungs</u></p> <ul style="list-style-type: none"> • oxygen higher concentration in maternal blood; • carbon dioxide higher concentration in fetal blood; • diffusion down concentration gradient; <p><u>kidneys</u></p> <ul style="list-style-type: none"> • urea in fetal blood diffuses to maternal blood; 	max (6)

Question Number	Answer	Mark
5(c)	<ul style="list-style-type: none"> • progesterone; • prevents breakdown of uterine lining; • thus prevents miscarriage abortion; • uterine lining further vascularised / blood vessels grow into lining; • stimulates placental growth; • prevents further ovulation / implantation / FSH production; 	max (4)

(Total 20 marks)

Question Number	Answer	Mark
6(a)	<ul style="list-style-type: none"> • an organism that transfers pathogens from host to host; • not itself harmed by the pathogen; 	(2)

Question Number	Answer	Mark
6(b)(i)	<p>1 mark for correct answer.</p> <ul style="list-style-type: none"> • louse; <p>(1 Mark)</p> <p>1 mark for each correct answer from any of the following - maximum 3 marks</p> <ul style="list-style-type: none"> • pathogen / bacterium / microbe on body / in faeces of louse; R - germ • left on human skin; • louse bites cause irritation; • scratching breaks skin surface / allows pathogen entry; <p>(max 3 Marks)</p>	(4)

Question Number	Answer	Mark
6(b)(ii)	<p>1 mark for correct answer.</p> <ul style="list-style-type: none"> • anopheline mosquito; <p>(1 Mark)</p> <p>1 mark for each correct answer from any of the following - maximum 3 marks</p> <ul style="list-style-type: none"> • bites/ stab and sucks human blood; • if victim has malaria parasite enters mosquito with blood; • when biting injects saliva to prevent blood clotting; • saliva contains parasite; <p>(max 3 Marks)</p>	(4)

Question Number	Answer	Mark
6(c)	<ul style="list-style-type: none"> • (Schistosoma) eggs present in faeces / urine; • hatch in water to release larva; • larva enters body of snail; • develops into second type of larva; • released into water; • this larva can penetrate human skin 	max (5)

Question Number	Answer	Mark
6(d)	<ul style="list-style-type: none"> • objects that pierce skin / named example; • may be contaminated by virus from user; • if not sterilised can pass virus to second user; • direct transfusion of contaminated blood / blood products; • sexual transmission; • lining of penis / vagina has no epidermis; • transmission from mother to fetus / child; • across placenta / during birth; 	max (5)

(Total 20 marks)

Question Number	Answer	Mark
7(a)(i)	<p>1 mark for each correct answer from any of the following - maximum 4 marks If nucleus included - maximum 3 marks Accept marks on a labelled diagram</p> <ul style="list-style-type: none"> • ref. to small size / possible shape; • cell wall; • cell membrane; • cytoplasm; • thread / coil of nucleic acid / DNA; • flagellum / flagella; • presence of plasmids; 	max (4)

Question Number	Answer	Mark
7(a)(ii)	<p>Accept points on a labelled diagram</p> <ul style="list-style-type: none"> • most cannot manufacture own food; • parasites or saprophytes; • saprophytes secrete enzymes / eq; • external digestion; • (both groups) absorb / take in digested foods; • by diffusion; • food sources - living organism / dead organic matter; • ref. to chemotrophs; • ref. to photosynthetic bacteria; 	max (5)

Question Number	Answer	Mark
7(b)(i)	<p>1 mark for correct answer.</p> <ul style="list-style-type: none"> • name / description of disease; (must be a bacterial example); <p style="text-align: right;">(1 mark)</p> <p>1 mark for each correct answer from any of the following - maximum 4 marks (treatments and controls must be specific to named disease) For non-bacterial diseases allow treatment and control</p> <ul style="list-style-type: none"> • use of antibiotics; • named example; • second method of treatment; • vaccination / medical method of control; • environmental method of control; <p style="text-align: right;">(maximum 4 marks)</p>	(5)

Question Number	Answer	Mark
7(b)(ii)	<p>Accept any three recognised processes with examples - 2 marks each</p> <ul style="list-style-type: none"> • food production; e.g. yoghurt / cheese / soy sauce; • decomposition; formation of humus / manure / compost / etc; • recycling; e.g. nitrogen cycle / carbon cycle / sewage treatment; • biotechnological processes; genetic engineering / named example; <p>accept any relevant examples need explanation /description for second mark</p>	<p>max (6)</p>

(Total 20 marks)

Question Number	Answer	Mark
8(a)	<ul style="list-style-type: none"> • an injection / oral liquid; • containing weakened / dead pathogens / antigens; 	max (2)

Question Number	Answer	Mark
8(b)(i)	<ul style="list-style-type: none"> • antigens; • proteins on surface of pathogen • stimulate white blood cells / lymphocytes; • to form antibodies; • action of antibody / destroy / agglutinate pathogens; • remain in blood for some time; • memory cells retain ability to make specific antibody; • thus can respond to future infections; • before symptoms appear; 	max (6)

Question Number	Answer	Mark
8(b)(ii)	<ul style="list-style-type: none"> • takes some time for antibodies to be formed; • if infected antigens already present; • thus white blood cells already stimulated; 	max (2)

Question Number	Answer	Mark
8(b)(iii)	<ul style="list-style-type: none"> • antibodies present in mother's blood; • from infections / immunisations she has had; • antibodies can cross placenta; • antibodies active in child at birth; • memory cells do not cross placenta; • child's organs destroy / excrete antibodies within months; • presence of future antigens needed to trigger child's own immune system; 	max (5)

Question Number	Answer	Mark
8(c)	<ul style="list-style-type: none"> • white blood cells / lymphocytes needed to form immune system; • baby not able to form antibodies; • therefore unable to destroy pathogens; • even normally mild infections can become fatal; • white blood cells formed in bone marrow; • tissue matching necessary for donor tissue to avoid rejection; • successful transplant will form new active white blood cells; 	max (5)

(Total 20 marks)

Question Number	Answer	Mark
9(a)(i)	<ul style="list-style-type: none"> • process of photosynthesis; • light energy; • absorbed by chloroplasts / chlorophyll; • converted to chemical energy; • used to combine carbon dioxide and water; • to form glucose / simple sugar; • glucose converted to other substances; • e.g. starch / fats / proteins; • passed to consumers; • some ATP formed; 	max (6)

Question Number	Answer	Mark
9(a)(ii)	<ul style="list-style-type: none"> • suitable food chain; (must start with producer have a suitable herbivore and end with human) • eaten / digestion by consumers; • materials assimilated in body of consumer; • energy lost at each stage of chain; <p>Maximum of 2 marks from</p> <ul style="list-style-type: none"> • by respiration; • by defaecation; • excretion; • heat / movement undigested material; 	max (4)

Question Number	Answer	Mark
9(b)(i)	<ul style="list-style-type: none"> • for manufacture of proteins; • nitrates needed for conversion glucose to amino acids; • amino acids formed into proteins; • nitrates supply increased by use of manure / compost / humus; • increased by use of chemical fertilisers; • use of leguminous crop (explained); 	max (4)

Question Number	Answer	Mark
9(b)(ii)	<ul style="list-style-type: none"> • nitrates very soluble; • easily leached into lakes / rivers; • eutrophication can occur; • rapid growth of algae (on surface) / algal bloom; • light excluded from deeper layers; • death of algae and other aquatic plants; • provide food for bacteria; • rapid reproduction of bacteria; • use up oxygen / create anaerobic conditions; • aquatic animals die from lack of oxygen; 	max (6)

(Total 20 marks)