

Mark Scheme with Examiners' Report

GCE O Level Human Biology (7042)

June 2005

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HUMAN BIOLOGY 7042, MARK SCHEME

Paper 1

1. (a) X: Tendon;
 Y: Cartilage;
 Z: Bone. (3)
- (b) (i) **Synovial fluid**
 Prevents contact between cartilage / acts as a lubricant;
 Absorbs shock / cushions joint; (2)
- (ii) **Ligaments**
 Links bone to bone;
 Prevent dislocation of joint; (2)
- (c) (i) Links muscle to bone;
 No longer able to transmit pull of muscle / bone cannot be moved.
 (Any two - 1 mark each) (2)
- (ii) Smooth surface becomes rough;
 Smooth movement impaired / friction increases;
 Pain on movement.
 (Any two - 1 mark each) (2)
- (Total 11 marks)
2. a) (i) A: Vertebra;
 B: Spinal cord; (2)
- (ii) **Memory**
 Cerebral hemispheres / cerebrum;
Balance
 Cerebellum; (2)
- (iii) Leads into loss of control over internal organs / heart beat /
 some homeostatic mechanisms; (1)
- (b) • FSH / ICSH
 Stimulates follicles to produce gametes;
 • LH
 Stimulates follicle to produce progesterone;
 • ADH
 Controls osmotic potential of blood / affects water reabsorption
 of water in kidney tubule;
 Growth hormone;
 Stimulates cell division;
 • TSH;
 Stimulates thyroid gland.
- Accept any suitable other hormone with its effect.
 (Any two pairs - 2 marks each) (4)

- (c) (i) Keeping internal conditions / cell environment within narrow limits. (1)
- (ii) Information from blood / via carotid sinus / pH of blood;
To medulla;
(nerve to) diaphragm / intercostal muscles to increase rate /
A/W; (3)

(Total 13 marks)

3. (a) (i) X: Vena cava;
Y: Aorta; (2)
- (ii)
 - Atrium / auricle;
 - Vena cava;
 - Contracts;
 - Rises / goes up / increases;
 - Close / shut;
 - Semilunar;
 - Pulmonary artery;
(7)

(b) Left ventricle; (1)

- (c)
 - Supplies heart muscle / cells;
 - With oxygen;
 - Glucose;
 - For respiration;
 - Allows removal of carbon dioxide etc;

(Any three - 1 mark each) (3)

(Total 13 marks)

4. (a) (i) 36 (breaths per minute); (1)

(ii) 4 - 6 minutes; (1)

(b) (i) 8 dm³; (1)

(ii) 21 - 16% = 5%;
8 x 5 / 100 dm³;
0.4 dm³ / 400 cm³; (3)

(c) (i) 6.0 - 0.4 = 5.6 dm³; (1)

(ii) Reference to oxygen debt / build up of lactic acid; requires
oxygen to break it down;
At Y debt paid back;
N.B. look for continuous error. Only penalise once where it
occurs. (3)

(Total 10 marks)

5.

Role in body	Compound
	fibrinogen;
	colostrum;
	thyroxin;
	glucagon;
	haemoglobin;
	oestrogen;

(6)

(Total 6 marks)

6. (a) (i) (B), A, C, E, D;;

(2)

(ii) Nucleus contains genes / DNA / inherited material from parent / genetic stability;
Determine how cell will act / look;

(All correct - 2 marks, up to one / two errors - 1 mark)

(2)

(b)

	meiosis	mitosis
Number of chromosomes in nuclei produced	23;	46;
Number of nuclei produced	4;	2;

(4)

(Total 8 marks)

7. (a) Smokers make a greater number of visits than non-smokers / A/W;

(1)

(b) (i) 7%;

(1)

- (ii)
- Blockage in coronary artery;
 - Cuts off blood supply to area of heart muscle;
 - Lack of oxygen / glucose;
 - Leads to severe pain;

(Any three - 1 mark each)

(3)

(c) (i) 33 / 5.5 or any other suitable method;
6 times;

(2)

- (ii)
- Particles in smoke;
 - Cause increase in mucus production;
 - Other chemical damage / inactivated cilia;
 - Coughing to remove mucus;
- (Any three - 1 mark each)

(3)

(Total 10 marks)

8. (a) (i) Brussel sprouts; (1)
(ii) Peas. (1)
(b) (i) Fat and Vitamin D (1)
(ii) Levels fall on cooking;
Greater fall in carbohydrates; (2)
(c) • Food in clean, dry test tube, add ethanol and shake;
• Drain off ethanol and add 1 or 2 drops of cold water to it;
• Look for cloudy / milky liquid - fat present;
OR
• Squash food on filter paper;
• Attempt to dry stain;
• If still translucent - fat present;
OR
• Chop / squash food;
• Add Sudan (III or IV) dye
• Leave for a few minutes and wash off;
• Look for orange / red colour in food;
• Accept any other suitable fat test; (3)

(Total 8 marks)

9. (a) (i) Allele "hidden" by dominant form;
Only seen in homozygous state / when no dominant present; (2)
(ii) In heterozygous state;
Both alleles influence phenotype / have an effect; (2)
(b) (i) $I^B I^O$; (1)
(ii) Group A; (1)
(iii) Parent genotypes: $I^A I^O$ $I^B I^O$;
Gametes I^A I^O I^B I^O ;
Offspring genotypes $I^A I^B$ $I^B I^O$ $I^A I^O$ $I^O I^O$;
Offspring phenotypes AB, A, B and O;
(Look for all four correct for mark) (4)
(c) $I^A I^O$ group A;
 $I^B I^O$ group B;
Genotypes and phenotypes of the child? (2)

(Total 12 marks)

10. (a) (i) Two sources plotted correctly;
Other two sources plotted correctly;
Key; (3)
(ii) Power stations; (1)
(iii) No - as homes only contribute 10% to start with / A/W; (1)

- (b) (i) Dissolves in rain water / moisture;
Forms sulphuric acid; (2)
- (ii) Accept any suitable relevant effect
Buildings: Corrodes limestone / mortar / erosion of stone;
(Any one - 1 mark)
- Plants:** Damage to leaves / reduced photosynthesis;
(Any one - 1 mark) (2)
- (Total 9 marks)

Paper 2

Section A

Answer any **THREE** questions

1. (a) (i) Large animal cell (no cell wall); (1)

Cell membrane;

- Nuclear membrane (with gaps);
- Nucleus / DNA / genetic material;
- Endoplasmic reticulum (indication of form);
- Ribosomes (smaller than mitochondria);
- Cytoplasm;
- Mitochondria (some structure shown - (should be several / more than 1)
- Lysosomes / Golgi apparatus / centrisomes / inclusions;

Any six labels for reasonably drawn structures - 1 mark each (6)

(ii) No nucleus;
Biconcave / thinner in middle / regular shape / disc shape
(suitable reference); (2)

(b) (i) **Mitochondria**

- Respiration (aerobic);
- Folded membrane / cristae increase surface area / enzymes;
- Respiration described / form glucose and oxygen;
- Mention of ATP;

Ribosomes

- Interpret / reads the code mRNA / translation;
- Collects / attracts tRNA / amino acid;
- Arranged in order;
- Joined / linked by peptide bonds;
- To form proteins;

Cell membrane

- Semi / differentially / partially / selectively permeable;
- Controls entry to cell;
- Keeps wanted material in cell;

(Control entry and exit 1 mark only. Any nine - 1 mark each) (9)

(ii) • By enzymes;
• (made in) nucleus / by DNA;
• diffuse into cytoplasm;

(Any two - 1 mark each) (2)

(Total 20 marks)

2. (a) **Quality**

- Large diagram rounded at back;
 - Ciliary apparatus reasonably shown;
 - Three coats to eyeball;
- (3)**

- Cornea,
- Retina,
- Iris,
- Lens,
- Pupil,
- Fovea / yellow spot,
- Optic nerve,
- Ciliary muscles,
- Suspensory ligaments,

(Any eight labels - 1 mark for each pair of labels) **(4)**

- (b) (i) • (Distant view) light rays almost parallel;
- Rays enter cornea;
 - Refracted / bent;
 - Pass across aqueous humour;
 - Into lens;
 - Refracted / bent again;
 - Rays brought to focus on retina / fovea;
 - As bus approaches rays (more) diverging;
 - Ciliary muscles contract;
 - Exert less pull on ligaments / ligaments slacken / relax;
 - Allows lens to become more curved / convex / more rounded / fatter / thicker;
 - Refracts / bends rays more;
 - Still in focus / meet on fovea;
- (10)**

(Any ten - 1 mark each)

- (ii) • Image of object formed by both eyes (simultaneously) / each eye shows different image;
- Allows (brain to) formation of 3D image;
 - Therefore can judge speed (of object);
 - Can judge distance / relative movement (of object);

(Any three - 1 mark each) **(3)**

(Total 20 marks)

3. (a) (i) • Secretes / produces bile;
- Into duodenum;
 - Emulsifies fats / lipids / explanation;
 - Bile alkaline;
 - Helps to neutralise stomach acid;
 - Produces optimum for enzymes;

(Any four - 1 mark each) **(4)**

- (ii)
- Secretes juice to **duodenum**;
 - Contains enzymes.
 - Lipase;
 - Digests fat;
 - To fatty acids and glycerol;
 - Trypsin / protease / chymotrypsin / trypsinogen;
 - Digests protein / polypeptides;
 - To peptides / amino acids (smaller items);
 - Amylase;
 - Digests starch;
 - To maltose;

(Any eight - 1 mark each)

(8)

(b) **Absorbed as amino acids;**

- Via villi;
- Into blood (capillaries);
- Via hepatic portal vein;
- To liver;
- Some used by cells;
- To form cell proteins (growth) / cytoplasm / protoplasm;
- And enzymes;
- Specific component, eg fibrinogen / haemoglobin / hormones;
- Excess deaminated (in liver);
- Urea excreted;
- Via kidney;

(Any eight - 1 mark each)

(8)

(Total 20 marks)

4. (a)
- Accept any body fluid and its function.
 - Blood (plasma);
 - Transporting materials / named example;
 - Saliva; digestion of starch / lubrication of food;
 - Sweat;
 - Reducing body temperature;
 - Urine;
 - Excreting metabolic waste / named example;
 - Tear fluid;
 - Removing foreign bodies from eye;
 - Mucus;
 - Removing particles from airways;

Any two fluids and function - 2 marks each

Other fluids might include synovial fluid / amniotic fluid / lymph etc;

(4)

- (b) (i)
- Enzymes need water to be active;
 - Chemical reactions occur in solution;
 - Needed for digested material to pass into blood;
 - Ease of swallowing / peristalsis / mucus formation;
 - Hydrolysis;

(Any three - 1 mark each)

(3)

- (ii)
- Sweating / sweat;
 - Can be increased or decreased;
 - When sweat produced on surface;
 - Evaporation;
 - Takes heat from body to do so / latent heat concept;
 - (Increases) cooling / heat loss from body;

(Any four - 1 mark each) (4)

- (iii)
- Lining moist / water film;
 - Oxygen dissolves in this;
 - Can then diffuse across cell membranes / into capillaries / blood;
- (3)

- (c)
- Osmoregulation;
 - Water content of blood monitored;
 - In carotid sinuses / arterios to brain;
 - Information to hypothalamus;
 - Pituitary secretes ADH;
 - Amount adjusted;
 - ADH passes via blood;
 - To kidney;
 - Increases reabsorption of water;
 - From kidney tubule / collecting duct / nephron;

(Any six - 1 mark each) (6)

(Total 20 marks)

5. (a) (i)
- Large diagram - at least 3 cm depth;
 - Sectional view;
 - Cervix narrow;
- (3)

- Uterus,
 - Cervix,
 - Vagina,
 - Amnion,
 - Umbilical cord,
 - Placenta,
- (Six labels - 1 mark for each pair of labels) (3)

- (ii)
- Absorption in ileum / small intestine;
 - Via villi;
 - Into blood / capillaries;
 - Dissolved in blood (plasma);
 - To placenta;
 - Diffusion;
 - Down concentration gradient;
 - To fetal blood;
 - Via umbilical cord / vein to fetus;
- (Any six - 1 mark each) (6)

- (b) (i)
- Carbon monoxide;
 - Across placenta;
 - Into fetal blood;
 - Reduce oxygen uptake;
 - Brain damage;
 - Lower body mass / premature birth;

(Any five - 1 mark each) (5)

- (ii)
- Uterus wall stops growing;
 - Lining breaks down;
 - Shed with placenta;
 - Miscarriage / abortion / death of fetus;

(Any three - 1 mark each) (3)

(Total 20 marks)

Section B

Answer any TWO questions

6. (a) (i) • Injection of weakened / dead pathogens; (1)

- Antigens / protein;
- Stimulate white blood cells;
- Lymphocytes;
- Produce antibodies;
- Destroy / kill pathogens;
- Neutralise toxins / produces antitoxins;

(Any five - 1 mark each) (5)

(ii) **Active**

- Body forms own antibodies;
- Long term / memory cells;
- Occurs by having disease;
- Or vaccination;

Passive

- Antibodies from elsewhere; A/W
- White blood cells / lymphocytes not involved / not able to form them;
- Cross placental membrane;
- Found in colostrums / breast milk;
- Serum / injection of antibodies;
- Short term;

(Any six - 1 mark each) (6)

- (iii) • Pathogens develop / reproduce in body;
- Produce toxins;
 - May cause some symptoms;
 - Takes several days / time for antibody levels to rise;
 - When level rises pathogens destroyed;

(Any three - 1 mark each) (3)

- (b) (i) • Unable to deal with pathogens / no defense;
- Very vulnerable to even minor diseases / AW;
- (2)

- (ii) • Problem may be inability to form (healthy) white blood cells / lymphocytes;
- Made in bone marrow;
 - May now be able to produce (healthy) lymphocytes;
 - Able to produce antibodies;
 - Can now destroy pathogens;

(Any three - 1 mark each) (3)

(Total 20 marks)

7. (a) **Schistosomiasis (Bilharzia)**

- Vector / host snail;
- Egg in faeces / urine;
- Release larvae (miracidium) into water;
- Swims to snail / enters snail;
- Reproduces in snail;
- Second larva (cercaria) set free (in damp grass);
- Burrows through skin;
- Disposal of faeces / urine properly / sewage treatment;
- Drain (slow flowing) water;
- Use of molluscicides / copper salts;

(Any seven - 1 mark each)

(7)

(b) **Typhoid**

- Vector housefly;
- Bacillus carried on body / legs;
- In saliva / gut;
- Saliva squirted onto food;
- Feeding habits / move from one food to another;
- Cover food;
- Store food in fridge if possible;
- Remove waste to eliminate fly breeding / transfer from faeces;
- Use of insecticides;

(Any six - 1 mark each)

(6)

(c) **Malaria**

- Vector mosquito;
- (Pierces skin) to suck blood;
- If victim infected it picks up parasite / plasmodium;
- Moves to salivary glands (of mosquito);
- Parasite / saliva injected into new victim (to prevent coagulation);
- Adult mosquito killed by insecticide;
- Prevented from reaching human by nets / clothing;
- Introduce insect eating fish into ponds etc;
- Introduce *Bacillus thuringiensis*;
- Spray oil / detergents on stagnant water / drainage;
- Larvae / pupae destroyed;

(Any seven - 1 mark each)

(7)

(Total 20 marks)

8. (a) (i)

- May contain pathogens;
- eg, Cholera / typhoid etc;
- Eggs / larvae of parasites;
- Attracts insects;
- To lay eggs / transfer pathogens onto food;
- May attract other vectors eg, Rats;

(Any four - 1 mark each)

(4)

- (ii)
- High nitrate levels;
 - Contaminates streams and lakes;
 - Eutrophication occurs;
 - Rapid growth of algae / algal bloom;
 - Bacteria increase;
 - Use up oxygen;
 - Conditions become anaerobic;
 - Fish etc. die;
 - Looks and smells unpleasant;

(Any six - 1 mark each)

(6)

- (b)
- Screens / grids;
 - Remove large objects;
 - Sedimentation / grit chambers;
 - Settlement as flow slows;
 - Separates solid (sludge);
 - From liquid effluent;
 - Method of dealing with effluent;
 - **Either** filter described; **or** activated sludge system;
 - Aerobic organisms;
 - Sludge to digester;
 - Anaerobic bacteria;
 - Produce methane;
 - Harmless fertilizer;

(Any ten - 1 mark each)

(10)

(Total 20 marks)

9. (a)
- Photosynthesis;
 - Carbon dioxide + water;
 - Presence of chlorophyll / in leaf / grass;
 - Light energy;
 - Starch formed / stored;

 - Leaf / grass eaten by sheep;
 - Starch digested;
 - Teeth grind up food;

 - Amylase in mouth;
 - Maltose released;
 - Converted into glucose in small intestine;
 - By maltase (pancreatic enzyme);
 - Absorbed into blood;
 - Converted into glycogen in liver;

(Any ten - 1 mark each)

(10)

- (b) (i)
 - Thorough cooking destroys bacteria present;
 - Eaten before recontamination occurs;
 - From air or by flies;

(Any two - 1 mark each) (2)

- (ii) **Canning**
- Heat to destroy bacteria;
 - Seal in can;
 - No more bacteria can enter;

- Dry / dehydrate**
- Remove water;
 - Bacteria etc unable to digest food;
No more bacteria / unable to be active;

- Freezing**
- Reduce temperature below freezing (-12 °C);
 - Enzymes inactivated;
 - Bacteria unable to reproduce;

- Salting**
- Raise osmotic potential of meat;
 - Bacteria unable to obtain water / dehydrate;
Bacteria cannot reproduce;

- Smoking**
- Suspend for some time over wood smoke;
 - Chemicals in smoke destroy microorganism;
 - Often combined with dehydration or vacuum packing;

(Any three methods - up to 4 marks each, with an overall maximum of 8 marks) (8)

(Total 20 marks)

HUMAN BIOLOGY 7042, CHIEF EXAMINER'S REPORT

Paper 1

General comments

Most candidates appeared to find all the questions accessible, with few questions being left blank. There were a number of scores in excess of 70% but also very few really low scoring scripts. There was no evidence that candidates were short of time. There was some evidence of candidates not reading the question with sufficient care, especially where an extended prose response was required. This sometimes led to responses that were on the general topic but failed to answer the question. Some candidates lacked the mathematical skills needed to complete the calculations.

Question 1

- (a) The only problem here was for those candidates who did not recognise the term tissue and who thus thought Z was the femur rather than bone.
- (b) The functions of synovial fluid and ligaments were well known but a number of candidates failed to note that each response carried two marks and thus a single word or phrase was unlikely to gain full marks.
- (c) In both cases the candidates understood the problems caused by the defects but many had difficulty in expressing their ideas clearly.

Question 2

- (a) Parts A and B were usually correctly identified and the majority of candidates who failed to do this named the bone (A) as the spine which was considered too vague. The label line to B clearly went to the spinal cord not the spinal canal. Knowledge of the functions of the parts of the brain was good.
- (a) Some candidates failed to note that the hormones required had to be produced by the pituitary gland and thus oestrogen, progesterone, insulin and adrenalin were all unacceptable. Many candidates gained maximum credit but a few were unable to suggest specific effects for their choice of hormone.
- (c) (i) Most candidates clearly had some understanding of the term homeostasis but often found it hard to explain. A number limited it to control of one factor such as temperature.
(ii) This was very poorly answered with the only creditworthy point in many cases being an increase in the rate or depth of breathing.

Question 3

This question presented few problems for most candidates but there was evidence of careless reading of the question, especially part (c).

- (a) Most candidates identified the two vessels correctly. The only common error in part (ii) was to claim that an increase of pressure in the ventricle would bring about the opening of the tricuspid valve.
- (b) Most candidates identified the left ventricle. The response 'ventricle' was considered inadequate.

(c) In this section candidates were expected to describe the role of the capillaries in the ventricle wall specifically, not capillaries in general. Some candidates failed to mention heart muscle at all and many talked of delivering 'food' rather than glucose.

Question 4

The majority of candidates were able to obtain the information they needed from the graph.

(a) Candidates were expected to use the graph to determine the number of breaths inhaled in a minute at Y and combine this with the volume of air in each breath to work out the total volume of air inhaled in one minute. Many could not do this and even those who managed part (i) correctly often could not complete part (ii).

(b) The calculation in part (i) proved difficult although we accepted the candidates response to (b)(ii) as a starting point for the calculation. In part (ii) those who read the question carefully should have appreciated that the graph showed events after the exercise was completed, i.e. during the recovery stage. Many assumed that the exercise was beginning at X and ended at Y and thus completely failed to appreciate that this represented the removal of lactic acid and repayment of an oxygen debt.

Question 5

This was a high scoring question. The only terms to cause problems were the expected confusion between glucagon and glycogen.

Question 6

(a) Most candidates got at least two of the stages in the correct order but a number confused C and E.

In part (ii) a lot of vague responses were seen but few explained clearly that the daughter cell needed an identical genetic make-up to the parent cell if it was to look and function in the same way.

(b) Many candidates gained maximum credit here. In spite of the word number in each feature some failed to state this and used terms such as diploid instead.

Question 7

(a) Most candidates interpreted the bar graph correctly although some had difficulty in expressing the relationship clearly.

(b) This section was poorly answered. Many completed the calculation without difficulty but the sequence of events during a heart attack was rarely described correctly and many concentrated on causes not symptoms.

(c) Candidates had considerable difficulty with the calculation in part (i). In part (ii) more careful reading of the question might have led to answers that were relevant. Carbon monoxide is not a major cause of bronchitis.

Question 8

(a) The majority of candidates managed to extract the data they needed from the table.

(b) In part (i) some candidates failed to notice that it was food components that were required, not types of vegetable. The comparison in part (ii) proved difficult. Many commented on the fact that both components decreased during cooking but most failed to say which decreased most.

- (c) Although candidates are expected to know tests to demonstrate the presence of the major components of the diet it was clear most were unfamiliar with a test for the presence of fats. Some tried to use Benedict's solution while others who did use ethanol had no idea of the technique.

Question 9

- (a) It was disappointing that very few candidates could give precise meanings to the two genetic terms. Many still appear to think that recessive alleles never express themselves or describe them in loose terms such as 'weaker'. Many seemed to have some appreciation of codominance but could not express this clearly.

- (b) In this section too many candidates insisted on using the old nomenclature for the alleles although the modern terms were on the examination paper. Most were able to identify John's genotype but Beth's phenotype was often expressed as another genotype!

The genetic diagram required was rarely fully labelled and most did not realise that the other two children could have any of the four blood groups, not just one of the groups not found in Peter and Dan.

- (c) Most had little difficulty with this section.

Question 10

- (a) (a) The pie chart was usually completed correctly but sometimes it was so untidy that the individual segments could not be distinguished and thus credit could not be given.

- (b) Most knew that sulphur dioxide was involved in the formation of acid rain although details of the process involved were often confused.

In (ii) some detail of the effect of acid rain on buildings and on plants was expected, not just 'it harms them'. The major effect is on limestone or marble buildings or on cement or lime mortar. Damage to the leaves of plants is the principal effect on plants.

Paper 2

General Comments

The paper produced a wide range of responses with questions 1, 2 and 3 being the most popular in Section A and questions 6 and 8 being the most popular in Section B. Questions 5 and 9 were the least popular questions on the paper. Examiners complained that a significant number of candidates failed to indicate which questions they had attempted by filling in the boxes on the front of the paper and in addition, within the body of the script, answers were not always clearly numbered. It is helpful if candidates can leave spaces between answers so that it is clear where one answer finishes and another begins. A few candidates failed to note the rubric and answered all of the questions on the paper.

The standard of drawings was variable; there were some excellent ones. However, candidates should note that diagrams must be large and drawn using a pencil. The diagrams set in this paper should have occupied at least half of one side of a page in the answer booklet. Candidates should also observe the convention that when labelling a diagram the label lines should not cross each other in a grid formation. Where this happened, and diagrams were small, it was very difficult for the Examiner to judge whether the line went to the correct structure.

Question 1

A number of candidates drew a cell with cilia rather than a generalised epithelial cell. Many candidates failed to show the nuclear membrane with pores despite the question asking for the appearance as seen using an electron microscope. A minority included a cell wall and many failed to show that mitochondria have an internal structure. Many candidates gave scant attention to the shape/detail of cell organelles.

Part (a)(ii) was well answered though some candidates made reference to the red colour of the blood cells. Individually red blood cells do not appear red and this was not accepted. A number of candidates made reference to haemoglobin being present which is not relevant to the appearance of the cell.

Most candidates were only able to give a superficial account of the roles of the three organelles, though cell membrane tended to be better understood. Many candidates thought that mitochondria *produced* energy rather than make reference to its release via aerobic respiration, yielding ATP. The role of ribosomes usually progressed no further than a reference to protein synthesis rather than expand the answer by a reference to how the amino acids are assembled in the process. Most candidates were aware that the cell membrane is selectively permeable and controls movement in and out of the cell, but fewer made reference to it retaining materials within the cell.

Part (b)(ii) usually elicited no more than one mark for a reference to the nucleus, few candidates expanding their answers to include a reference to enzymes.

Question 2

A common mistake with the drawing was a failure to show the eye having three layers. Often, the ciliary apparatus was indistinct and a sizeable number of candidates drew inadequate irises and in the wrong position. Many candidates ignored the question and included labels for structures other than those demanded, which added to the confusion with many diagrams. A common omission in the answers to part (b)(i) was the description of how the eye can 'focus the image of the bus'; instead, many candidates concentrated on the second part which asked them how the bus was kept in focus as it approached. There was a lack of appreciation of how the rays of light are refracted at both the cornea and the lens and how the degree of refraction would differ for a near, as opposed to a distant object. The

term *stereoscopic vision* was well understood by the majority of candidates including the facility to judge both distance and speed.

Question 3

In answer to part (a)(i) some candidates gave a long discourse on the general role of the liver rather than a focus on bile secretion into the duodenum and the role of bile once there. Part (a)(ii) was well answered by many candidates and it was not uncommon to see full marks. Candidates should be reminded that the enzyme trypsin catalyses the breakdown of proteins into polypeptides and not directly into amino acids, and likewise, amylase catalyses the breakdown of starch into maltose and not into glucose. Many candidates, although naming three enzymes, failed to note that they were enzymes, for which a mark had been included in the scheme.

Again, part (b) was often well answered but a common omission was a failure to state that proteins are broken down, ultimately to amino acids and this is the form in which they are absorbed. Many candidates failed to state that it is *excess* amino acids that are deaminated and that the urea produced is excreted. Many candidates only gave one use of amino acids and that was often couched in vague terms such as 'growth'. The mark scheme allowed marks for references to enzyme manufacture, production of protein hormones and also metabolites such as haemoglobin and the manufacture of cell structures.

Question 4

An unpopular question which overall, was badly answered. Many candidates could not state two fluids and even where they could were often unable to attribute a detailed and precise function for each. Fluids that could have been chosen included plasma, synovial fluid, tears, urine and semen. This is not an exhaustive list and others were accepted.

An inability to give precise roles was a problem for many candidates in part (b)(i). Too many mentioned only dissolving food. Expected answers included a reference to the role of water in hydrolysis, its role in the absorption of digested food and its subsequent transport in the blood. The need for water as a medium for chemical reactions was seen only rarely.

In part (b)(ii) the role of water in temperature regulation was well understood, but this was not the case for part (iii), where there was a lack of appreciation of the need for the oxygen to be dissolved, prior to diffusion.

Part (c) was usually well answered, but candidates were often weak on the monitoring of blood water content and many were confused over the circumstances under which ADH was secreted or not secreted. Improvements to answers would include a better understanding of the area of the kidney tubule where reabsorption takes place and also the use of the word *reabsorption*.

Question 5

The diagrams produced in response to this question were the poorest, overall. Often they were too small to see the necessary detail and in addition the proportions of some of the females drawn was imaginative, to say the least. Particular attention should be paid by candidates to the proportions of the cervix and vagina. Again, some candidates created problems by ignoring the question and labelling far more structures that was intended. The transfer of dissolved nutrients was not well understood and many of the answers to part (a)(ii) were rambling and confused. A number concentrated on the need to keep the two circulations separate. Many confused the roles of the umbilical artery and vein and many gave the impression in their answers that the umbilical cord was a piece of rubber tubing. The terms *diffusion* and *diffusion gradient* were seen only rarely and many candidates gave no indication how the digested food passed from the mother's intestine into the blood.

Part (b) was poorly answered. Many candidates failed to make any reference to carbon monoxide in answer to (b)(i), instead, discussing tar. Few candidates made

reference to the passage of carbon monoxide across the placenta and its subsequent effect in reducing the oxygen content of the blood of the foetus. In answer to part (i) it was usual for candidates to refer to the functions of progesterone rather than discuss the effect of an under production.

Question 6

In answer to part (a)(i) far too few candidates could describe a vaccine accurately because they failed to make reference to the weakened or attenuated nature of the organisms that comprise a vaccine. Throughout the question as a whole, many candidates described the activities of the immune system in terms of 'fighting' the invading organisms. Marks are not awarded for such terminology and candidates should be discouraged from using this term, instead, develop the use of more biologically accurate terms and descriptions. In a similar vein far too many candidates are still using the term 'germs'. Again, no credit is given for the use of this word and appropriate alternatives should be used.

In answer to part (a)(ii) it was often the case that candidates did not make it clear as to whether they were referring to active or to passive immunity. The best answers often started with a subheading 'active immunity' and a corresponding one for passive immunity followed this. The transfer of antibodies from mother to offspring was often mentioned but many candidates failed to be sufficiently specific in terms of transfer through colostrum or transfer across the placenta.

Part (iii) was very badly answered. Candidates failed to appreciate that the injection of a weakened bacterium would in the first instance allow the bacterium to multiply, albeit on a limited basis whilst the immune system was generating the necessary antibodies, which would take some time to appear. Often, candidates did little more than repeat the stem of the question.

Part (b) also caused difficulties for candidates. In part (i) there was a general understanding that the child would suffer from many illnesses but a failure to explain in detail why that would be the case. In answer to part (ii) the majority of candidates did not seem to understand the role of bone marrow in the production of white blood cells and as a consequence, were unable to explain that healthy bone marrow would allow the production of white blood cells, which in turn could produce antibodies.

Question 7

A not uncommon mistake in the answers to this question was a failure to name the vector. Equally common was an answer that started 'the disease is caused by a snail/fly/mosquito'. Loose terminology penalises a candidate. The role of the snail in the transfer of Schistosomiasis was often confused and only part of the life cycle of the causative organism was described. Control methods against the vector were not well understood with few candidates referring to *molluscicides*, though some did mention the use of copper salts, which was acceptable. The role of the housefly in transferring typhoid was not well understood. There were vague references to the fly feeding on faeces but answers often did not go beyond that stage. It was most unusual to see any reference to the housefly regurgitating saliva onto human food and often the mechanism of bacterial transfer on the body/hairs of the housefly was ignored.

The role of the mosquito in the transfer of malaria was better known but even here candidates failed to give a precise account, instead contenting themselves with vague references to the mosquito sucking blood and passing on the organism. The Examiners expected references to blood sucking from an infected person, the subsequent migration of the organism into the salivary glands of the mosquito, followed by a reference as to the transfer of the organism to a non-infected person when the mosquito next sucked blood. Control measures for the vector were usually well documented.

Question 8

This question was not well answered. Few candidates in response to part (a)(i) made reference to the presence of pathogenic organisms within the sewage though many recognised that it could give rise to disease. Few candidates made reference to named diseases and few recognised the importance of houseflies or other vectors such as rats spreading disease as a result of the sewage. Candidates did not seem to appreciate that part (ii) of the question was all about eutrophication. The minority that did link the question to eutrophication had few problems in scoring well, though many failed to appreciate that it was the rapid growth of bacteria that led to oxygen depletion leading to the death of fish. Very few made any reference to the smell and unsightly appearance caused by the process. In answer to part (b) a number of candidates confused sewage treatment with water purification. Many who focussed on sewage treatment, nevertheless, omitted one or more stages or used incorrect terminology to describe the various stages.

Question 9

Although the majority of candidates who attempted this question were able to describe the process of photosynthesis, they did not then go on to describe how the starch that is the storage form of glucose in a plant is digested and subsequently absorbed into the blood of the sheep. Few candidates made reference to the action of the teeth in chewing of the plant or made any reference to salivary amylase and maltase and their roles in the overall digestion of starch.

In answer to part (b)(i) most candidates realised that cooking the meat would lead to the destruction of bacteria in the meat but failed to appreciate that if it were left for any length of time it could be re-contaminated by bacteria from the air or by houseflies landing on the meat. Many candidates scored badly on part (ii). A significant number described more than three methods. Once again, the best answers were usually those that started by putting the method of preservation as a heading, leaving the Examiners in no doubt as to which method was under discussion. The question specified the preservation of sheep meat and so methods such as pickling were discounted as being inappropriate. Although many candidates referred to freezing of the meat they specified temperatures e.g. 0°C that were inadequate. A temperature of at least -12 °C was required. References to putting the meat in a refrigerator were discounted for the same reason. Candidates who mentioned canning often had an inadequate knowledge of the process involved apart from the initial heating to kill the bacteria. Likewise, the methods of salting or dehydration were often quoted but the way in which they operate was little understood, particularly the osmotic effects caused by salting.

HUMAN BIOLOGY 7042, GRADE BOUNDARIES

Grade	A	B	C	D	E
Lowest mark for award of grade	130	110	91	81	61

Note: Grade boundaries may vary from year to year and from subject to subject, depending on the demands of the question paper.

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