

MASTER CLASS PROGRAM 2012
UNIT 3 BIOLOGY
WRITTEN EXAMINATION 1 – STUDENT SOLUTIONS

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SECTION A

QUESTION 1	Answer is D
QUESTION 2	Answer is C
QUESTION 3	Answer is A
QUESTION 4	Answer is B
QUESTION 5	Answer is B
QUESTION 6	Answer is A
QUESTION 7	Answer is C
QUESTION 8	Answer is B
QUESTION 9	Answer is D
QUESTION 10	Answer is D
QUESTION 11	Answer is D
QUESTION 12	Answer is C
QUESTION 13	Answer is C
QUESTION 14	Answer is D
QUESTION 15	Answer is B
QUESTION 16	Answer is C
QUESTION 17	Answer is D
QUESTION 18	Answer is D
QUESTION 19	Answer is B
QUESTION 20	Answer is B
QUESTION 21	Answer is B
QUESTION 22	Answer is D
QUESTION 23	Answer is C
QUESTION 24	Answer is C
QUESTION 25	Answer is C

SECTION B

QUESTION 1

(a)

Organelle/Molecule	Role of Organelle/Molecule
Nucleus (DNA)	Contains original instructions for synthesis of insulin.
Golgi apparatus	Packages/modifies insulin for secretion from cell.
Rough Endoplasmic Reticulum	Synthesises and transports insulin.
Messenger RNA	Carries instructions for insulin synthesis to ribosomes.
Golgi vesicle	Secretes insulin via exocytosis.

5 marks

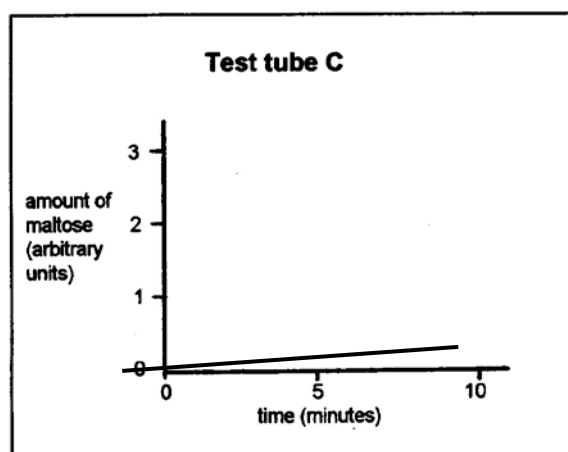
(b) (i) Phospholipid.

(ii) The fluid mosaic model of membrane structure allows for the continual separation and reformation of the phospholipid bilayer.

(c) Mitochondrial fluid is hypertonic to distilled water (1), hence, water enters the mitochondrion via osmosis, causing the membranes to rupture (1).

QUESTION 2

- (a) (i) Ribosomes on rough endoplasmic reticulum.
(ii) Golgi apparatus.
- (b) (i) Temperature (15°C versus 35°C).
(ii) Amount of starch, amount of pancreatic amylase, pH of mixture, duration of experiment.
- (c) (i) Two units of maltose was produced in each experiment.
(ii) Same amount of substrate (starch) was used in each experiment.
- (d) (i) Tube A: Two units of maltose was produced in approx. 7 minutes.
Tube B: Two units of maltose was produced in only approx. 3 minutes.
(ii) 35°C is closer to the optimum temperature for pancreatic amylase than 15°C , hence, the greater rate of reaction.
- (e) (i)



- (ii) Pancreatic amylase denatured at 60°C (active sites destroyed) (1), however, the exergonic reaction can still proceed at a slow rate without assistance from the enzyme (1).
- (f) Bread (starch).
- (g) Pepsin denatures as it enters the alkaline environment of the small intestine, with its active sites destroyed.

QUESTION 3

- (a) Nervous system. Nervous system involves rapid responses provided by direct neural pathways from receptors to effectors (1). Hormones involve a slower means of transport via body fluids (typically bloodstream) (1).
- (b) A hormone is a chemical compound produced in a cell. It either acts within the cell or diffuses or is transported to other cells where it brings about a specific response.
- (c) All body cells have protein receptors for insulin (1) but only cells of the thyroid gland have receptors for TSH (1).
- (d) (i) Cell membrane.
(ii) Cytosol or nucleus.
- (e) Detects a stimulus.
- (f) (i) Synapse.
(ii) Impulse reaches axon terminal. Synaptic vesicles merge with presynaptic membrane and release neurotransmitter via exocytosis (1). Neurotransmitter diffuses across synaptic cleft to stimulate receptors on postsynaptic membrane (1).
- (g) Motor (effector) neuron.
- (h) Insulates axons reducing loss of impulse information OR speeds up impulse transmission.

QUESTION 4

- (a) Auxin
- (b) (i) A, D, E
(ii) A higher concentration of auxin travels down the coleoptile on the side away from light relative to the side facing the light source (1). Auxin elongates the cells on the side opposite the light source, causing the tip to bend towards the light source (1). (Include diagram.)

QUESTION 5

- (a) Glucose.
- (b) Examine faeces for the presence of eggs.
- (c) (i) High rate of reproduction OR
Tooth-like structures.

(ii) Increased chance of some offspring reaching a new host OR Provide grip to prevent worm being dislodged as food passes through alimentary canal.
- (d) (i) Method 1: Worm dogs regularly.

(ii) Method 2: Collect faeces.
- (e) The hookworm lives within a host organism, from which it derives both nutrients and shelter.

QUESTION 6

- (a) To determine the compatibility of the donor organ to the recipient (1), i.e. to find an organ with as many MHC markers in common as possible with the recipient in order to reduce the chance of organ rejection (1).
- (b) Family member: Brother 1.

Reason: Brother 1 has the most tissue proteins in common with the patient (5 of the 6 proteins tested).
- (c) B cells (and therefore antibodies) (1) can still be used to specifically defend the body against future infections (1).
- (d)
 - Macrophage presents antigen from transplanted kidney on its surface and releases cytokine (interleukin-1) to attract helper T cells (1).
 - Activated helper T cells release cytokine (interleukin-2) to activate B cells and cytotoxic T cells (1).
 - Cytotoxic T cells attach to transplanted kidney cells and cause their lysis (1).