IGCSE BIOLOGY 0610 — PAPER 4

Extended Theory · Practice Paper

Time allowed: 1 hour 15 minutes | Total marks: 80 | Calculator allowed

Name: _____ Class: _____ Date: _____

Original questions by TutorZone. Not a Cambridge past paper or mark scheme.

Questions

Question 1 — Cell structure and cell transport (12 marks)

Part	Question	Marks
(a)	Name the part of a cell that controls the movement of substances into and out of the cell.	1
(b)	A photomicrograph of a cell structure has an image length of 45 mm. The actual length of the structure is 0.05 mm. Calculate the magnification. Show your working.	2
(c)	Two cubes of plant tissue have sides of 2.0 mm and 4.0 mm. Calculate the surface area to volume ratio of each cube and explain which cube diffuses oxygen in faster.	3
(d)	Explain how a root hair cell is adapted for absorbing water and mineral ions.	3
(e)	Define diffusion and state one way in which it differs from active transport.	3

Question 2 — Enzymes and human nutrition (14 marks)

Part	Question	Marks
(a)	Define the term enzyme and describe the lock and key model of enzyme action.	3
(b)	In an experiment, 36 cm^3 of oxygen was collected in 45 s from the breakdown of hydrogen peroxide by catalase. Calculate the mean rate of reaction in cm^3 per second.	2
(c)	Catalase works fastest at pH 7. Explain the shape of the curve at pH 2.	3
(c2)	A meal contains 60 g carbohydrate, 25 g protein and 20 g fat. Using 17 kJ g-1 for carbohydrate and protein, and 38 kJ g-1 for fat, calculate the energy content of the meal in kJ.	3
(d)	Explain why a 15-year-old needs a higher proportion of protein in the diet than a 45-year-old office worker.	3

Question 3 — Gas exchange and respiration (14 marks)

Part	Question	Marks
(a)	Describe three features of an alveolus that make gas exchange efficient.	3
(b)	A student takes 15 breaths per minute with a tidal volume of 0.50 dm^3. Calculate the pulmonary ventilation rate in dm^3 per minute.	2
(c)	The stroke volume of an athlete is 70 cm^3 and the heart rate is 72 beats per minute. Calculate the cardiac output in dm^3 per minute.	3
(d)	Compare aerobic respiration with anaerobic respiration in a human muscle cell.	4
(e)	Explain why the breathing rate increases during vigorous exercise.	2

Question 4 — Transport in humans and flowering plants (14 marks)

Part	Question	Marks
(a)	Name the type of blood vessel that carries blood away from the heart and state one way it differs from a vein.	2
(b)	A shoot with a leafy stem had a mass of 84.6 g. After 3 hours in a moving air stream its mass was 72.0 g. Calculate the total mass lost and the mean rate of water loss in g per hour.	3
(c)	Explain how an increase in temperature and an increase in wind speed each affect the rate of transpiration.	4
(d)	Explain what translocation is and state the role of the phloem in a plant.	3
(e)	State two functions of blood plasma.	2

Question 5 — Coordination and homeostasis (14 marks)

Part	Question	Marks
(a)	Put the parts of a reflex arc in the correct order: motor neurone, receptor, relay neurone, effector, sensory neurone.	3
(b)	A person’s blood glucose concentration rose from 5.5 mmol dm^{-3} to 7.8 mmol dm^{-3} after a meal. Calculate the increase and the percentage increase.	2
(c)	Explain how insulin reduces blood glucose concentration.	4
(d)	Describe negative feedback, using the control of body temperature as an example.	3

(e)	State two effects on the body of producing too little ADH.	2

Question 6 — Ecology and inheritance (12 marks)

Part	Question	Marks
(a)	A food chain has energy values of 45 000 kJ at the producer level, 4 500 kJ at the primary consumer level and 450 kJ at the secondary consumer level. Calculate the percentage of the producer's energy transferred to the secondary consumer.	3
(b)	Give two reasons why energy is lost between trophic levels.	2
(c)	40 woodlice were caught, marked and released. Later, 50 woodlice were caught and 8 of them were marked. Estimate the size of the population.	2
(d)	Two heterozygous black mice are crossed (Bb × Bb), where B is black and b is brown. State the expected ratio of phenotypes and the probability that one offspring is brown.	3
(e)	State one difference between continuous and discontinuous variation, giving one example of each.	2