

CIE A-Level Biology 9700 Paper 1 Practice

Paper (Multiple Choice)

Total: 40 marks · 1 h 15 min · 40 multiple-choice questions

Data and formulae

Quantity	Value
Magnification	image size / actual size
Surface area : volume	612 : 13
Q10	$(\text{rate2} / \text{rate1})^{(10 / \text{dT})}$
Hardy-Weinberg	$p^2 + 2pq + q^2 = 1$
Lincoln index	(marked x recaptured) / marked in recapture
Energy transfer efficiency	about 10%
Net primary production	$\text{NPP} = \text{GPP} - \text{respiration}$
Cardiac output	heart rate x stroke volume

1. A cell structure measures 45 mm on an electron micrograph and its actual length is 0.50 μm . What is the magnification? [1]

- (A) x90,000
- (B) x900,000
- (C) x900
- (D) x9,000

2. The field of view is 1.4 mm across and contains 20 cells side by side. What is the mean cell diameter? [1]

- (A) 7 μm
- (B) 28 μm
- (C) 70 μm
- (D) 700 μm

3. A cubic cell has sides of 2.0 μm . What is its surface area to volume ratio? [1]

- (A) $12\ \mu\text{m}^{-1}$
- (B) $1.5\ \mu\text{m}^{-1}$
- (C) $3.0\ \mu\text{m}^{-1}$
- (D) $6.0\ \mu\text{m}^{-1}$

4. Which structure is found only in plant cells? [1]

- (A) Ribosome
- (B) Golgi apparatus
- (C) Chloroplast
- (D) Mitochondrion

5. A light microscope resolves about 200 nm and an electron microscope about 0.5 nm. How many times finer is the detail the electron microscope can resolve? [1]

- (A) 4,000 times
- (B) More than 400 times but not calculable
- (C) 400 times
- (D) 40 times

6. In differential centrifugation of a cell homogenate, which structure pellets first? [1]

- (A) Ribosome
- (B) Enzymes in the cytosol
- (C) Mitochondrion
- (D) Nucleus

7. Which observation supports the fluid mosaic model of the cell membrane? [1]

- (A) Labelled human and mouse cells fused, and their membrane proteins spread evenly over the hybrid membrane
- (B) The membrane shows a three-layered structure in the electron microscope
- (C) The membrane breaks up at low temperature
- (D) Water passes freely through the membrane

8. Which change is most typical of prophase of mitosis? [1]

- (A) The nuclear envelope reforms
- (B) Chromatin condenses into chromosomes visible under the light microscope
- (C) Chromosomes move to the poles of the cell
- (D) Centromeres split and sister chromatids separate

9. Compared with starch, glycogen is: [1]

- (A) Its monomers are joined by peptide bonds
- (B) Made of beta-glucose
- (C) Completely unbranched
- (D) More highly branched, with branch points closer together

10. Haemoglobin has a quaternary structure. What does this mean? [1]

- (A) The sequence of amino acids
- (B) Four polypeptide chains, each bound to a haem group

- (C) One polypeptide chain coiled into a helix
- (D) A polypeptide folded into a three-dimensional shape

11. How do enzymes increase the rate of reaction? [1]

- (A) They lower the activation energy of the reaction
- (B) They increase the overall energy change
- (C) They make the reaction exothermic
- (D) They raise the activation energy

12. An enzyme works at 2.0 at 20 °C and 5.0 at 30 °C (same units). What is its Q_{10} ? [1]

- (A) 5.0
- (B) 2.5
- (C) 1.25
- (D) 2.0

13. When substrate concentration is already saturating, doubling the enzyme concentration will: [1]

- (A) Halve
- (B) Become four times greater
- (C) Change little, because the substrate already occupies every site
- (D) Double, because more active sites are available for the substrate

14. How can the effect of a competitive inhibitor be reversed? [1]

- (A) By increasing the substrate concentration
- (B) By adding heavy metal ions
- (C) By cooling to 0 °C
- (D) By increasing the inhibitor concentration

15. Phospholipids form a bilayer in water because: [1]

- (A) Both heads and tails are hydrophilic
- (B) The hydrophilic phosphate heads face the water while the hydrophobic fatty acid tails turn inwards away from water
- (C) Both heads and tails are hydrophobic
- (D) Phospholipid molecules are positively charged and repel each other

16. Testing for protein with Biuret reagent gives which positive result? [1]

- (A) Colourless
- (B) Purple
- (C) Orange-yellow
- (D) A brick-red precipitate

17. A person has a resting heart rate of 72 beats per minute and a stroke volume of 68 cm³. What is the cardiac output? [1]

- (A) 4,896 dm³ min⁻¹
- (B) 68 cm³ min⁻¹
- (C) 489.6 cm³ min⁻¹
- (D) 4,896 cm³ min⁻¹

18. Tidal volume is 500 cm³, dead space 150 cm³ and breathing rate 14 per minute. What is the alveolar ventilation rate? [1]

- (A) 4,900 cm³ s⁻¹
- (B) 3,500 cm³ min⁻¹
- (C) 7,000 cm³ min⁻¹
- (D) 4,900 cm³ min⁻¹

19. What is the main force that pulls water up the xylem from root to leaf? [1]

- (A) Root pressure pushing water up
- (B) Transpiration pull (negative pressure) created by the leaves
- (C) Capillarity in the xylem vessels
- (D) Active transport in the phloem

20. Which hormone mainly causes stomatal closure in drought? [1]

- (A) Ethene
- (B) Gibberellin
- (C) Abscissic acid (ABA)
- (D) Auxin (IAA)

21. During vigorous exercise, tissues produce much carbon dioxide. How does the oxygen dissociation curve of haemoglobin change? [1]

- (A) It becomes a straight line
- (B) It does not change
- (C) It shifts to the left, raising oxygen affinity
- (D) It shifts to the right, so more oxygen is unloaded at the same oxygen partial pressure

22. A plant loses 12 g of water in 5 minutes. What is the mean transpiration rate? [1]

- (A) 2.4 g h⁻¹
- (B) 0.42 g min⁻¹
- (C) 60 g min⁻¹
- (D) 2.4 g min⁻¹

23. Compared with veins, arteries: [1]

- (A) Have thicker walls with more elastic fibres and smooth muscle, and a narrower lumen
- (B) Have only a single layer of endothelium and no muscle
- (C) Have walls made entirely of cartilage
- (D) Have thinner walls, wider lumens and valves

24. What mainly drives the formation of tissue fluid at the arteriole end of a capillary? [1]

- (A) Suction by lymph vessels
- (B) Blood hydrostatic pressure is higher than that of the tissue fluid
- (C) Active transport by cells
- (D) The osmotic pull of plasma proteins

- 25.** In a dihybrid cross $AaBb \times AaBb$ with independent assortment, how many of 1,600 offspring are expected to show both dominant phenotypes ($A_B_$)? [1]
- (A) 900 plants
 - (B) 300 plants
 - (C) 1,200 plants
 - (D) 100 plants
- 26.** Two heterozygotes ($Aa \times Aa$) are crossed. What is the phenotypic ratio of the offspring? [1]
- (A) 1 : 1
 - (B) 9 : 3 : 3 : 1
 - (C) 3 : 1
 - (D) 1 : 2 : 1
- 27.** In a double-stranded DNA molecule adenine is 32% of all bases. What percentage is guanine? [1]
- (A) 9%
 - (B) 18%
 - (C) 36%
 - (D) 32%
- 28.** A gene has a coding region of 900 bases. How many amino acids are finally translated? [1]
- (A) 100
 - (B) 300
 - (C) 150
 - (D) 299 amino acids
- 29.** A recessive disease affects 9% of a population ($q^2 = 0.09$). What percentage are carriers (heterozygotes)? [1]
- (A) 21%
 - (B) 42%
 - (C) 9%
 - (D) 49%
- 30.** Where do completely new alleles in a population ultimately come from? [1]
- (A) Natural selection
 - (B) Random assortment in sexual reproduction
 - (C) Gene mutation
 - (D) Gene flow
- 31.** Why are X-linked recessive disorders more common in males? [1]
- (A) Males have only one X chromosome, so a single recessive allele is expressed
 - (B) Males have a higher mutation rate
 - (C) The male X chromosome is larger
 - (D) Males lack a Y chromosome

32. The proportion of antibiotic-resistant bacteria in a hospital rises year after year. What is the best explanation? [1]

- (A) Antibiotics increase the mutation rate tenfold
- (B) Bacteria actively become resistant in order to survive
- (C) Antibiotics kill non-resistant bacteria, and resistant bacteria survive and reproduce
- (D) Patients pass resistance to each other

33. An ecosystem has a gross primary production of 3,600 and respiration of 1,200 ($\text{kJ m}^{-2} \text{ yr}^{-1}$). What is the net primary production? [1]

- (A) $1,200 \text{ kJ m}^{-2} \text{ yr}^{-1}$
- (B) $240 \text{ kJ m}^{-2} \text{ yr}^{-1}$
- (C) $2,400 \text{ kJ m}^{-2} \text{ yr}^{-1}$
- (D) $4,800 \text{ kJ m}^{-2} \text{ yr}^{-1}$

34. If energy transfer from producers to primary consumers is 10%, how much of an NPP of 2,400 reaches the primary consumers? [1]

- (A) $24 \text{ kJ m}^{-2} \text{ yr}^{-1}$
- (B) $240 \text{ kJ m}^{-2} \text{ yr}^{-1}$
- (C) $2,400 \text{ kJ m}^{-2} \text{ yr}^{-1}$
- (D) $1,200 \text{ kJ m}^{-2} \text{ yr}^{-1}$

35. What is the main route by which carbon returns from organisms to the atmosphere? [1]

- (A) Photosynthesis
- (B) Nitrogen fixation
- (C) Transpiration
- (D) Respiration by decomposers and other organisms releases carbon dioxide

36. Lincoln index: 40 animals are caught, marked and released; later 200 are caught, 8 of them marked. Estimate the population. [1]

- (A) 1,000 animals
- (B) 200 animals
- (C) 160 animals
- (D) 8,000 animals

37. Which blood cell secretes antibodies? [1]

- (A) Red blood cells
- (B) Plasma cells (differentiated from B lymphocytes)
- (C) Platelets
- (D) Neutrophils

38. Vaccination gives long-term protection mainly because: [1]

- (A) The vaccine removes the pathogen from the body for ever
- (B) It produces memory cells that make a rapid, large antibody response on later exposure

- (C) The vaccine kills pathogens directly
- (D) The vaccine supplies antibodies that never mutate

39. Why is a pyramid of energy always upright while a pyramid of numbers can be inverted? [1]

- (A) Energy is lost as heat at every transfer, so energy always decreases; but one large tree can support thousands of insects
- (B) Energy is recycled by organisms
- (C) Numbers and energy are always proportional
- (D) Higher trophic levels have more energy because they are larger

40. What kind of defence is phagocytosis? [1]

- (A) Releasing histamine to cause inflammation
- (B) A phagocyte engulfs the pathogen with pseudopodia and digests it in a vesicle with lysosomal enzymes
- (C) Secreting antibodies that bind the pathogen
- (D) Rupturing the cell surface to block entry