



**Test Papers
Hub.**

VCE Biology Practice Paper 1

Units 3 & 4 — Practice Examination

Section A: 20 multiple-choice (20 marks) · Section B: short-answer and extended-response (100 marks) · 120 marks in all

How to use this booklet

- Reading time – 15 minutes. Writing time – 2 hours 30 minutes. A scientific calculator is permitted. A data sheet (genetic code and useful relationships) is provided at the back of the paper.
- Section A has 20 multiple-choice questions (1 mark each). Section B has 24 questions (100 marks); show working wherever more than one mark is available.
- Responses to extended questions should be written in sentences using correct biological terms.
- Worked solutions follow the paper: every question has step-by-step working, a key takeaway and (for multiple choice) a note on why each wrong option is wrong.

SECTION A — MULTIPLE-CHOICE QUESTIONS

20 marks · Answer all questions

Choose the response that is correct or that best answers the question. A correct answer scores 1; an incorrect answer scores 0. Marks will not be deducted for incorrect answers.

1. An enzyme-catalysed reaction proceeds at $4.9 \mu\text{mol min}^{-1}$ at 30°C . When the temperature is raised to 40°C (below the enzyme's optimum) the rate is $8.82 \mu\text{mol min}^{-1}$. Calculate the temperature coefficient Q_{10} (rate at the higher temperature $\div$ rate at the lower temperature).

- A 18
- B 3.92
- C 0.556
- D 1.80

2. Which of the following correctly identifies where each stage of aerobic cellular respiration occurs in a eukaryotic cell?

- A glycolysis in the mitochondrial matrix; the Krebs cycle in the cytosol
- B glycolysis in the cytosol; the Krebs cycle in the mitochondrial matrix; the electron transport chain on the inner mitochondrial membrane
- C all three stages in the cytosol
- D glycolysis and the Krebs cycle in the cytosol; electron transport in the nucleus

3. Which of the following correctly matches the immune cell with its role?

- A plasma cell – secretes antibodies
- B memory T cell – secretes antibodies
- C macrophage – produces antibodies
- D natural killer cell – produces memory B cells

4. Part of the template (antisense) strand of a gene reads $3'\text{--TACCTGATAGAGACT--}5'$. Use the genetic code on the data sheet. Write the sequence of the mRNA transcribed from this strand.

- A $5'\text{--ATGGACTATCTCTGA--}3'$
- B $5'\text{--AGUCUCUAUCAGGUA--}3'$
- C $5'\text{--AUGGACUAUCUCUGA--}3'$
- D $5'\text{--UACCUGAUAGAGACU--}3'$

5. In a phylogenetic tree, two species that share a more recent common ancestor are shown as:

- A with the longer branch always showing the older species
- B on the same branch, because they are the same species
- C further apart, because they are more different
- D closer together, with branches that split from a more recent node

6. Which of the following is NOT a requirement for a population to remain in Hardy–Weinberg equilibrium?

- A no gene flow into or out of the population
- B a large population size
- C random mating
- D natural selection acting on the gene

7. In a vaccine trial, 2000 volunteers received the vaccine and 2000 received a placebo. Over the next season 19 vaccinated people and 154 placebo recipients developed the disease. Calculate the vaccine efficacy: (attack rate in unvaccinated – attack rate in vaccinated) ÷ attack rate in unvaccinated × 100.

- A 87.7 %
- B 6.75 %
- C 12.3 %
- D 99.0 %

8. In a fully susceptible population, each person infected with a new influenza strain infects on average 3 others (basic reproduction number $R_0 = 3$). A vaccine is 90% effective at preventing infection. What percentage of the population must be immune to achieve herd immunity? (threshold = $1 - 1/R_0$)

- A 33.3 %
- B 66.7 %
- C 133 %
- D 97.0 %

WORKED SOLUTIONS

Answers & worked solutions

Multiple-choice answer key

1	D	2	B	3	A	4	C	5	D	6	D
7	A	8	B	9	C	10	D	11	C	12	B
13	A	14	D	15	B	16	A	17	B	18	C
19	A	20	C								

SECTION A — MULTIPLE-CHOICE QUESTIONS

1. An enzyme-catalysed reaction proceeds at $4.9 \mu\text{mol min}^{-1}$ at 30°C . When the temperature is raised to 40°C (below the enzyme's optimum) the rate is $8.82 \mu\text{mol min}^{-1}$. Calculate the temperature coefficient Q_{10} (rate at the higher temperature $\div$ rate at the lower temperature).
[Enzymes]

Correct answer: D — 1.80

- $Q_{10} = \text{rate at } (T + 10) \div \text{rate at } T$.
- $= 8.82 \div 4.9 = 1.80$
- Why the other options are wrong:
- A (18): multiplied by 10
- B (3.92): subtracted the rates instead of dividing
- C (0.556): inverted the ratio

LOS: Enzymes

KEY TAKEAWAY

Over a 10°C rise below the optimum, rate is multiplied by Q_{10} (about 2 for many enzymes); above the optimum the enzyme denatures and the rate falls.

2. Which of the following correctly identifies where each stage of aerobic cellular respiration occurs in a eukaryotic cell? [Photosynthesis and respiration]

Correct answer: B — glycolysis in the cytosol; the Krebs cycle in the mitochondrial matrix; the electron transport chain on the inner mitochondrial membrane

- Glycolysis does not need oxygen and occurs in the cytosol.
- The Krebs cycle and electron transport are in the mitochondrion.
- Why the other options are wrong:
- A (glycolysis in the mitochondrial matrix; the Krebs cycle in the cytosol): the locations are swapped
- C (all three stages in the cytosol): the Krebs cycle and electron transport need the mitochondrion
- D (glycolysis and the Krebs cycle in the cytosol; electron transport in the nucleus): the nucleus is not involved