

EXAMPLE GRAMMAR SCHOOL

ESAT Mock Examination

Biology

Paper SMP-2026-09 · Version 1.0

NAME

TEACHING GROUP

DATE

Instructions

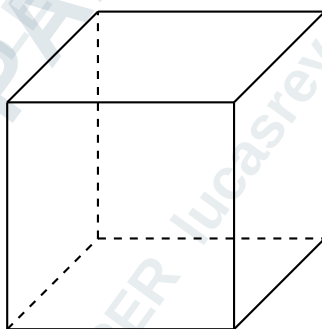
- Time allowed: **15 minutes**.
- There are **10 multiple-choice questions**. Each is worth 1 mark.
- There is no negative marking. Answer every question, even if you have to guess.
- Calculators are not permitted.
- Record your answers on the separate answer sheet. Only the answer sheet is marked.
- Formulae are not provided. The ESAT does not supply a formula sheet.

Note: the real ESAT is sat on screen at a Pearson test centre. This paper trains the mathematics and the pacing, not the on-screen interface.

Written for Example Grammar School by Lucas Rey, Engineering Science, University of Oxford; MRes, University of Cambridge.

Question 1

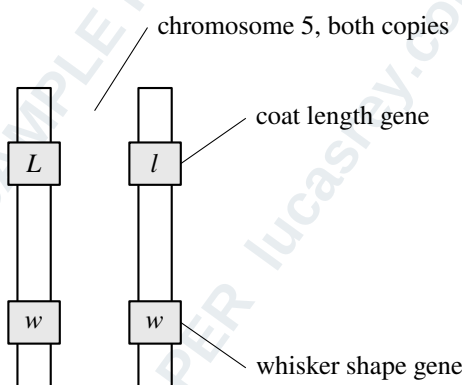
The diagram shows a cubic cell, with the length of one side marked. What is its surface area to volume ratio in its simplest integer form?

 $10\ \mu\text{m}$

- A. 6 : 1
- B. 1 : 10
- C. 3 : 5
- D. 5 : 3
- E. 3 : 50

Question 2

In domestic cats, one gene on chromosome 5 controls coat length, with the short-fur allele L completely dominant over the long-fur allele l . A second gene on the same chromosome controls whisker shape, with the straight allele W completely dominant over the curled allele w . The diagram shows the alleles carried on one cat's two copies of chromosome 5. Which statement describes this cat correctly?



- A. It is homozygous for coat length and heterozygous for whisker shape, so it has short fur and straight whiskers.
- B. It is homozygous for coat length and homozygous for whisker shape, so it has short fur and curled whiskers.
- C. It is heterozygous for coat length and heterozygous for whisker shape, so it has short fur and straight whiskers.
- D. It is heterozygous for coat length and homozygous for whisker shape, so it has short fur and curled whiskers.
- E. It is heterozygous for coat length and homozygous for whisker shape, so it has long fur and curled whiskers.
- F. It is homozygous for coat length and homozygous for whisker shape, so it has long fur and curled whiskers.

Question 3

Gene expression is controlled from the nucleus by

- A. selecting which genes are transcribed to mRNA.
- B. deleting unused genes permanently.
- C. moving genes to the ribosomes.
- D. choosing which proteins are eaten.
- E. dissolving the nuclear membrane.

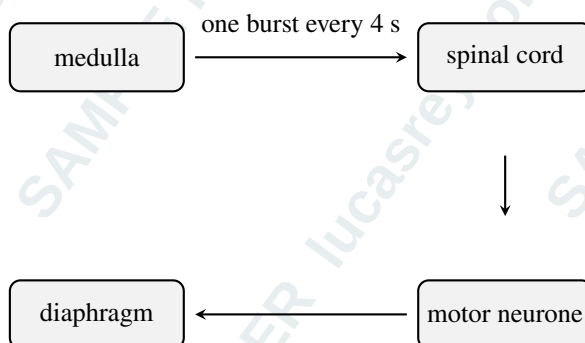
Question 4

A sperm carrying a Y chromosome fertilises an X egg. The child will be

- A. female (XX).
- B. female (X).
- C. male (YY).
- D. male (XX).
- E. male (XXY).
- F. male (XY).
- G. female (XY).
- H. cannot be determined.

Question 5

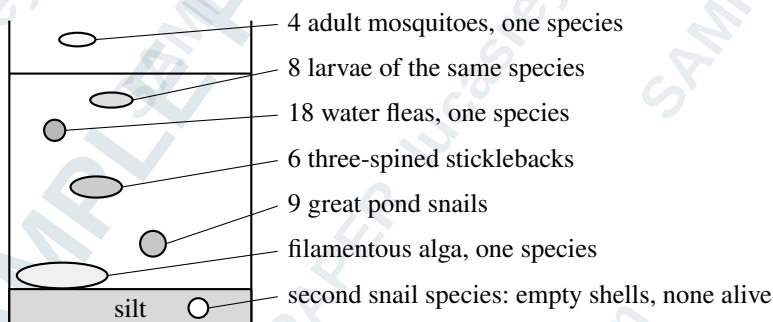
The diagram shows the pathway and the timing of the bursts of impulses that drive each inspiration in a resting adult. Every burst contains 30 impulses, and each whole burst produces one contraction of the diaphragm, drawing 450 cm^3 of air into the lungs. Breathing stays quiet and regular. Calculate the volume of air drawn into the lungs each minute.



- A. $6750 \text{ dm}^3 \text{ min}^{-1}$
- B. $13.5 \text{ dm}^3 \text{ min}^{-1}$
- C. $27.0 \text{ dm}^3 \text{ min}^{-1}$
- D. $0.45 \text{ dm}^3 \text{ min}^{-1}$
- E. $1.8 \text{ dm}^3 \text{ min}^{-1}$
- F. $202.5 \text{ dm}^3 \text{ min}^{-1}$
- G. $67.5 \text{ dm}^3 \text{ min}^{-1}$
- H. $6.75 \text{ dm}^3 \text{ min}^{-1}$

Question 6

A drainage ditch is surveyed as part of a study of freshwater ecology. The diagram shows the ditch in cross-section, and what the survey recorded in it. The surveyors also record the temperature of the water, the depth of the silt and the concentration of dissolved oxygen. Assume the survey found every species that is present as a living organism, and that the ditch is isolated from other water bodies. How many populations make up the community in this ditch?



- A. 5
- B. 4
- C. 6
- D. 7
- E. 45

Question 7

A single cell undergoes 4 consecutive rounds of mitosis. Assuming all daughter cells survive and divide, how many cells will be present at the end?

- A. 8
- B. 488
- C. 16
- D. 831
- E. 547

Question 8

Which list goes from simplest to most complex?

- A. muscle cell → muscle tissue → heart → circulatory system.
- B. circulatory system → heart → muscle tissue → muscle cell.
- C. muscle tissue → muscle cell → circulatory system → heart.
- D. muscle cell → heart → muscle tissue → circulatory system.
- E. heart → muscle cell → muscle tissue → circulatory system.
- F. muscle cell → muscle tissue → circulatory system → heart.

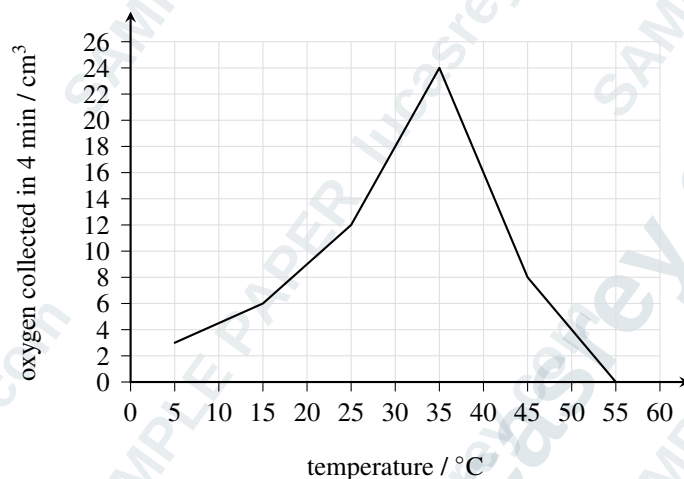
Question 9

A gardener takes a single healthy potato plant and grows 200 new plants from its tubers, planting no seed. She then crosses two different potato varieties and raises 200 seedlings from the seed produced. Assuming no mutations occur, which statement about the two groups of 200 plants is correct?

- A. The tuber-grown plants are all genetically identical; the seedlings are not.
- B. The seedlings are all genetically identical; the tuber-grown plants are not.
- C. All 400 plants are genetically identical to one another.
- D. Neither group contains any two plants that are genetically identical.
- E. Each seedling is genetically identical to one tuber-grown plant, though neither group is uniform.

Question 10

A student investigates catalase, the enzyme in potato tissue that breaks hydrogen peroxide down into water and oxygen. Identical potato discs are dropped into hydrogen peroxide held in a water bath, and the volume of oxygen collected during the first four minutes is recorded at six temperatures. The graph shows the results. Below its optimum temperature this enzyme obeys a temperature coefficient $Q_{10} = 2.0$, meaning that the rate is multiplied by 2.0 for every 10°C rise. Assume hydrogen peroxide is in excess throughout and that all the gas is collected at room temperature and pressure. Using the 15°C reading, calculate the rate of oxygen production at 45°C that this relationship predicts.



- A. $9 \text{ cm}^3 \text{ min}^{-1}$
- B. $24 \text{ cm}^3 \text{ min}^{-1}$
- C. $3 \text{ cm}^3 \text{ min}^{-1}$
- D. $48 \text{ cm}^3 \text{ min}^{-1}$
- E. $6 \text{ cm}^3 \text{ min}^{-1}$
- F. $2 \text{ cm}^3 \text{ min}^{-1}$
- G. $8 \text{ cm}^3 \text{ min}^{-1}$
- H. $12 \text{ cm}^3 \text{ min}^{-1}$

END OF PAPER

Questions 11 to 27 are in the full paper

This is an extract. The 10 questions before this page are real questions from a commissioned question paper, shown in full and with nothing withheld, so that the standard can be judged rather than described.

The rest of the paper is not hidden behind this page. It was never in this file. Each commissioned paper is written for one school, recorded against it, and issued to no other, so the questions in it are not published anywhere, including here.

A commissioned paper is NOT this paper with the missing questions restored. Every question in it is different from every question here, the 10 shown above included. Your school's paper is drawn fresh, and no question that has ever been published, on this page or anywhere else, can appear in it.

A full paper runs to 27 questions in this module alone, with a question paper, an answer sheet, a mark scheme and a worked solution for every question, across all five ESAT modules.

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Written by researchers in engineering, physics and mathematics at Oxford and Cambridge, and checked question by question before it is issued.

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