INTUITION EDUCATION

HSC 2026 · PREDICTED PRACTICE PAPER

2026 HSC Biology

Original practice material — not a NESA paper

Total marks: 100

GENERAL INSTRUCTIONS

- Reading time — 5 minutes
- Working time — 3 hours
- Write using black pen
- Draw diagrams using pencil
- Section I — 20 marks. Attempt Questions 1–20. Allow about 35 minutes for this section
- Section II — 80 marks. Attempt Questions 21–35. Allow about 2 hours and 25 minutes for this section

HOW THIS PAPER WAS BUILT

This full-length practice paper was built from the consensus of a six-model AI panel (fable, opus, gpt-5.6-sol, gemini-3.1-pro, grok, deepseek), each of which independently predicted the 2026 examination from the 2019–2025 papers and NESA marking feedback. The 162 question-level predictions were clustered; every cluster with consensus probability ≥ 0.55 is realised in this paper, the remainder is drawn from the panel's watch list, and reproduction and the extended adaptive-immunity cascade are deliberately light in line with the panel's rested calls. Each Section II question is tagged with the consensus cluster it realises and the probability that a question of that kind appears in 2026. Every question is original — none is copied from a past paper.

Answers and marking notes are published as a separate PDF — sit the paper first, then download the solutions from intuitioneducation.com.au/hsc-2026/biology.

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Section I

20 marks — Attempt Questions 1–20 — Allow about 35 minutes for this section

Use the multiple-choice answer sheet for Questions 1–20.

Question 1

Which of the following pathogens contains NO nucleic acid?

A. Virus

B. Prion

C. Bacterium

D. Protozoan

Question 2

Which of the following shows the correct sequence of events in early mammalian reproduction?

A. Fertilisation → ovulation → implantation → placental formation

B. Ovulation → implantation → fertilisation → placental formation

C. Ovulation → fertilisation → implantation → placental formation

D. Implantation → fertilisation → ovulation → placental formation

Question 3

A section of the template strand of a gene has the base sequence:

C T A G G T

What is the base sequence of the mRNA transcribed from this template?

A. GATCCA

B. GAUCCA

C. CUAGGU

D. CTAGGT

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Question 4

Analysis of a sample of double-stranded DNA shows that 30% of its bases are adenine.

What percentage of the bases are guanine?

A. 20%

B. 30%

C. 40%

D. 70%

Question 5

A woman with blood group AB has children with a man with blood group O.

What proportion of their children is expected to have blood group O?

A. 0%

B. 25%

C. 50%

D. 100%

Question 6

During which process do homologous chromosomes exchange segments of DNA, producing new combinations of alleles in gametes?

A. Crossing over during meiosis

B. Cytokinesis during mitosis

C. DNA replication during interphase

D. Random fertilisation

Question 7

Mutations occurred separately in four different cells of one animal.

Which mutation could be inherited by the animal's offspring?

A. A mutation in a skin cell

B. A mutation in a liver cell

C. A mutation in a white blood cell

D. A mutation in a cell that produces gametes

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Question 8

A cyclone kills most of the lizards on an isolated island. In the small surviving population, the frequency of a shell-pattern allele is very different from its frequency before the cyclone, and the survivors were not better adapted than the lizards that died.

Which process caused the change in allele frequency?

A. Natural selection

B. Gene flow

C. Genetic drift

D. Mutation

Question 9

In the production of recombinant DNA, the same restriction enzyme is used to cut both the plasmid and the DNA containing the gene of interest.

Why is the same enzyme used for both?

A. It joins the gene to the plasmid by forming new sugar–phosphate bonds

B. It produces complementary sticky ends on the gene and the plasmid

C. It amplifies the number of copies of the gene

D. It removes the introns from the gene of interest

Question 10

In somatic cell nuclear transfer (whole-organism cloning), the nucleus of a body cell from animal X is inserted into an enucleated egg cell from animal Y, and the embryo is carried by surrogate mother Z.

The offspring's nuclear DNA is identical to that of

A. animal X.

B. animal Y.

C. surrogate Z.

D. an equal mixture of X and Y.

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Question 11

Malaria is caused by *Plasmodium*, which is carried between humans by *Anopheles* mosquitoes.

Which row of the table is correct?

	Pathogen	**Vector**	**Mode of transmission**
A.	*Plasmodium*	Mosquito	Indirect
B.	Mosquito	*Plasmodium*	Direct
C.	*Plasmodium*	Mosquito	Direct
D.	Mosquito	*Plasmodium*	Indirect

Question 12

Which of the following is part of the adaptive (third-line) immune response?

A. The skin acting as a physical barrier

B. Inflammation at the site of a wound

C. Production of memory B cells

D. Acid in the stomach destroying ingested microbes

Question 13

After a deep puncture wound, a patient is injected with tetanus immunoglobulin (pre-formed antibodies).

The immunity provided by this injection is

A. natural active.

B. natural passive.

C. artificial active.

D. artificial passive.

Question 14

A fungal pathogen infects the leaf of a plant.

Which of the following is an active response of the plant to this infection?

A. Phagocytes engulf the fungal cells

B. Programmed death of infected cells to isolate the pathogen

C. Antibodies specific to the fungus are produced

D. The waxy cuticle prevents the fungus from entering the leaf

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Question 15

A study finds that people who drink more soft drink have a higher rate of a non-infectious disease.

Which conclusion is valid from this evidence alone?

A. Soft drink causes the disease

B. Reducing soft drink intake will cure the disease

C. Soft drink consumption is correlated with the disease

D. People with the disease should stop drinking soft drink

Question 16

A new treatment allows people with a previously fatal chronic disease to live much longer, but does not cure the disease or change the number of new cases each year.

Which row shows the effect of the treatment on incidence and prevalence?

	Incidence	**Prevalence**
A.	Increases	Increases
B.	Unchanged	Increases
C.	Unchanged	Unchanged
D.	Decreases	Decreases

Question 17

A person's core body temperature rises during exercise on a hot day.

Which response helps return their body temperature to normal?

A. Shivering of skeletal muscles

B. Vasoconstriction of skin arterioles

C. Vasodilation of skin arterioles

D. Erection of hairs on the skin

Question 18

A patient has a completely and permanently blocked outer ear canal. Their cochlea and auditory nerve function normally.

Which technology is most appropriate for restoring this patient's hearing?

A. A hearing aid that amplifies sound entering the ear canal

B. A bone conduction implant

C. A cochlear implant

D. A myringotomy tube in the eardrum

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Question 19

In a person with myopia (short-sightedness), light from distant objects is focused in front of the retina.

Which technology corrects this disorder, and how?

A. A convex (converging) lens that brings the focal point forward

B. A concave (diverging) lens that moves the focal point back onto the retina

C. Laser surgery that increases the curvature of the cornea

D. An artificial lens that replaces the clouded natural lens

Question 20

The table shows the composition of a patient's blood entering a dialysis machine and the dialysate fluid used.

DATA PROVIDED IN THE EXAM

table — Blood entering dialyser: urea 28 mmol L^{-1}, glucose 5.0 mmol L^{-1}; Dialysate: urea 0 mmol L^{-1}, glucose 5.0 mmol L^{-1}.

Which substance moves from the blood into the dialysate by diffusion, and why?

A. Glucose, because the membrane is permeable to it

B. Urea, because its concentration is higher in the blood than in the dialysate

C. Urea, because it is actively transported across the membrane

D. Glucose, because the dialysate is constantly replaced

Section II

80 marks — Attempt Questions 21–35 — Allow about 2 hours and 25 minutes for this section

Answer the questions in the spaces provided. Show all relevant working in questions involving calculations.

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Question 21 *(3 marks)*

The incomplete dichotomous key below is used to classify four pathogens: a prion, a bacterium, a fungus and a virus.

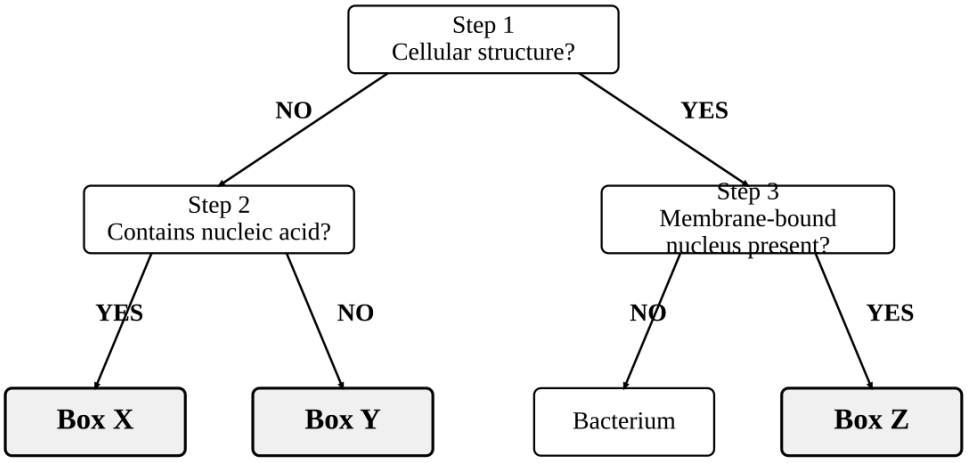


DIAGRAM PROVIDED IN THE EXAM

(a) Identify the pathogens belonging in boxes X, Y and Z. **(2)**

(b) *Vibrio cholerae*, the bacterium that causes cholera, produces a toxin that causes severe watery diarrhoea in its host. Explain how this feature is an adaptation that facilitates the transmission of the pathogen to new hosts. **(1)**

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Question 22 *(3 marks)*

The diagram shows where two mutations arose in the body of one animal during its life.

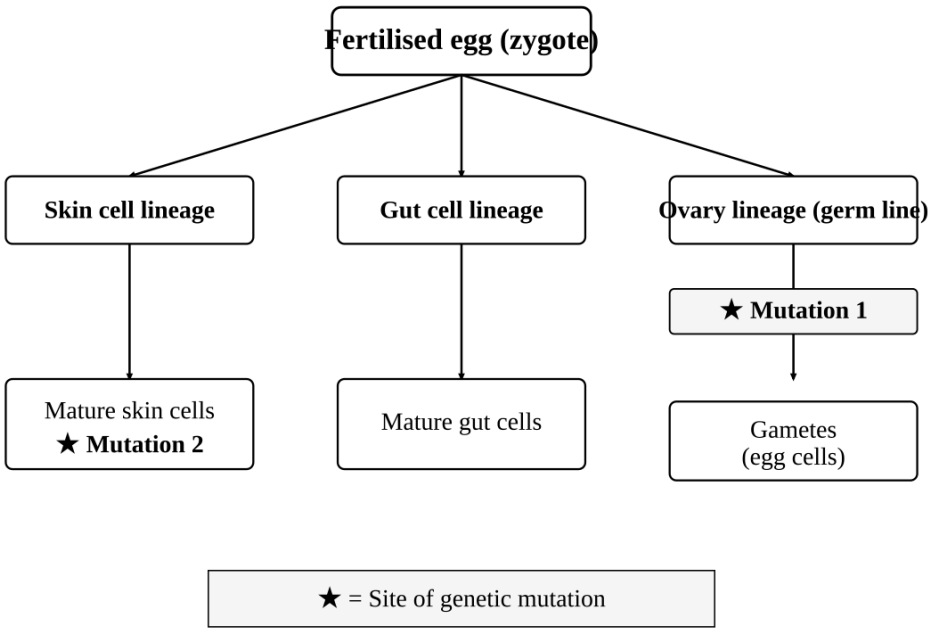


DIAGRAM PROVIDED IN THE EXAM

(a) Identify which mutation could be inherited by this animal's offspring, and justify your answer. **(2)**

(b) Describe ONE possible consequence of Mutation 2 for this animal. **(1)**

Question 23 *(4 marks)*

In Andalusian fowl (a breed of chicken), a cross between a black-feathered bird and a white-feathered bird always produces offspring with blue-grey feathers. When two blue-grey birds are crossed, black, blue-grey and white offspring are all produced.

(a) Identify the pattern of inheritance shown by feather colour in these birds, and justify your answer using the results of the first cross. **(1)**

(b) Using a Punnett square and an appropriate key, determine the expected phenotypic ratio of the offspring of the cross between two blue-grey birds. **(3)**

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Question 24 *(5 marks)*

The pedigree shows the inheritance of a rare disorder in one family.

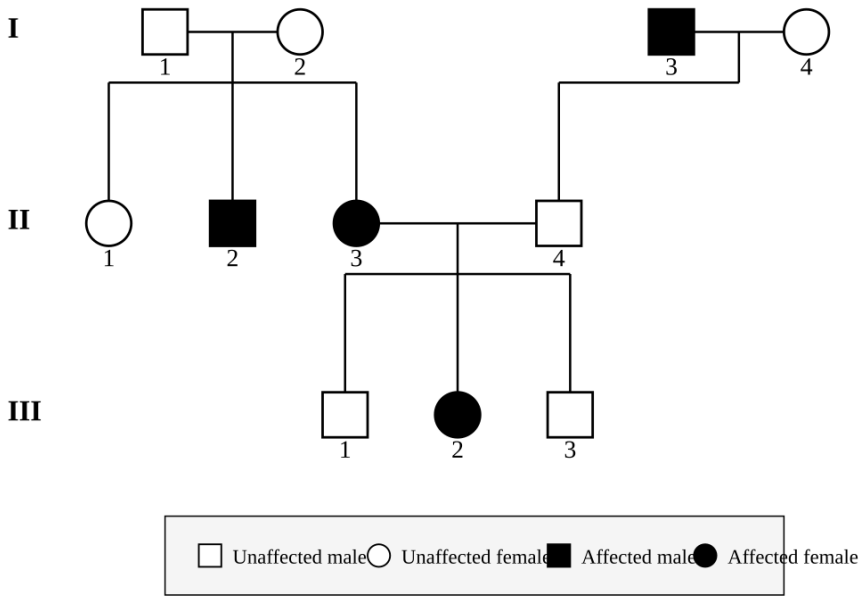


DIAGRAM PROVIDED IN THE EXAM

(a) Identify the mode of inheritance of this disorder. Justify your answer with reference to specific individuals in the pedigree, ruling out ONE alternative mode of inheritance. **(3)**

(b) Using a Punnett square with an appropriate key, determine the probability that the next child of II-3 and II-4 will be affected. **(2)**

Question 25 *(4 marks)*

DNA replication and transcription both occur in the nucleus of a eukaryotic cell.

Compare DNA replication with transcription. In your answer, include the enzymes involved, the template used, and the product formed by each process. **(4)**

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Question 26 *(5 marks)*

The table shows part of the template strand of a gene, and the same region in a mutated cell.

DATA PROVIDED IN THE EXAM

Normal template DNA: TAC GGA TTT ACA ATT. Mutated template DNA: TAC GGA ATT ACA ATT (the seventh base has changed from T to A, shown in bold).

DATA PROVIDED IN THE EXAM

standard mRNA codon table supplied, as in HSC papers. Relevant codons: AUG = methionine (start); CCU = proline; AAA = lysine; UGU = cysteine; UAA = STOP.

(a) Using the codon table, determine the mRNA sequence and the amino acid sequence produced from the NORMAL template strand. **(2)**

(b) Identify the type of mutation shown, and explain its effect on the polypeptide produced and the likely consequence for the function of the protein. **(3)**

Question 27 *(5 marks)*

Human Karyotype

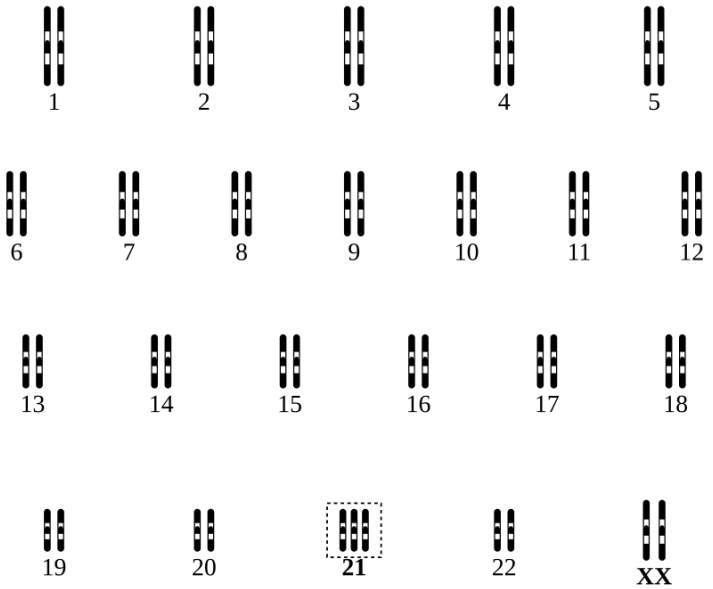


DIAGRAM PROVIDED IN THE EXAM

(a) Identify the chromosomal abnormality shown in the karyotype. **(1)**

(b) Explain how an error during meiosis in one parent, followed by fertilisation, produced this karyotype. **(4)**

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Question 28 *(6 marks)*

The graphs show a healthy person's blood glucose concentration and the concentrations of two pancreatic hormones after a carbohydrate-rich meal eaten at time 0.

DATA PROVIDED IN THE EXAM

three aligned time-series graphs, 0–150 minutes. Graph 1 — blood glucose: 5.0 mmol L^{-1} at 0 min, rising to a peak of 7.6 mmol L^{-1} at 30 min, falling to 5.2 mmol L^{-1} by 120 min. Graph 2 — insulin: 40 pmol L^{-1} at 0 min, rising to a peak of 280 pmol L^{-1} at 45 min, falling to 60 pmol L^{-1} by 150 min. Graph 3 — glucagon: 90 ng L^{-1} at 0 min, falling to a trough of 55 ng L^{-1} at 60 min, returning to 85 ng L^{-1} by 150 min.

(a) Using data from the graphs, identify the stimulus and the hormonal response that follows it. **(2)**

(b) Explain how the changes shown in the graphs demonstrate negative feedback. In your answer, name the cells that detect the change, the effector organ, and the fate of the excess glucose. **(4)**

Question 29 *(6 marks)*

(a) During a hot, windy day, a plant begins to lose water faster than its roots can absorb it. Explain how the plant detects and responds to this internal change to maintain its water balance. **(3)**

(b) During childbirth, the hormone oxytocin stimulates contractions of the uterus. The contractions push the baby against the cervix, which stimulates the release of more oxytocin.

Explain why this mechanism is an example of positive feedback and NOT negative feedback. **(3)**

Question 30 *(4 marks)*

A patient with kidney failure is treated with haemodialysis. The table shows average values for blood entering and leaving the dialyser during one session.

DATA PROVIDED IN THE EXAM

table — Urea: entering 28 mmol L^{-1}, leaving 9 mmol L^{-1}. Glucose: entering 5.0 mmol L^{-1}, leaving 5.0 mmol L^{-1}. Plasma protein: entering 70 g L^{-1}, leaving 70 g L^{-1}. Red blood cells: unchanged. The dialysate entering the machine contains no urea and 5.0 mmol L^{-1} glucose, and is constantly replaced with fresh dialysate.

(a) With reference to the data, explain how the dialyser removes urea from the blood while leaving glucose, plasma proteins and blood cells unchanged. **(3)**

(b) Explain why glucose is included in the dialysate. **(1)**

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Question 31 *(7 marks)*

Several residents of a town have developed gastroenteritis. Health officers suspect that the town's creek, which some residents use for drinking water, is contaminated with bacteria.

(a) Design a valid and reliable first-hand investigation, using agar plates, to determine whether the creek water contains bacteria. Include the variables you would control and an appropriate control treatment. **(4)**

(b) Explain why the agar plates must NOT be reopened after incubation. **(1)**

(c) A bacterium is isolated from the creek water. Outline how Koch's postulates could be used to confirm that this bacterium is the cause of the residents' disease. **(2)**

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Question 32 *(7 marks)*

In 2019, a state government introduced a funded whooping cough (pertussis) booster program for adolescents. Vaccination coverage rose from 74% in 2018 to 94% in 2022. The table shows the incidence of whooping cough in the state.

DATA PROVIDED IN THE EXAM

table — Year / New cases per 100 000 population: 2014: 118; 2015: 121; 2016: 127; 2017: 132; 2018: 138; 2019: 120; 2020: 96; 2021: 78; 2022: 58; 2023: 44; 2024: 31.

(a) On the grid provided, plot the data and draw a curve or line of best fit. Extrapolate your graph to predict the incidence of whooping cough in 2026, showing the extrapolation on your graph. **(3)**

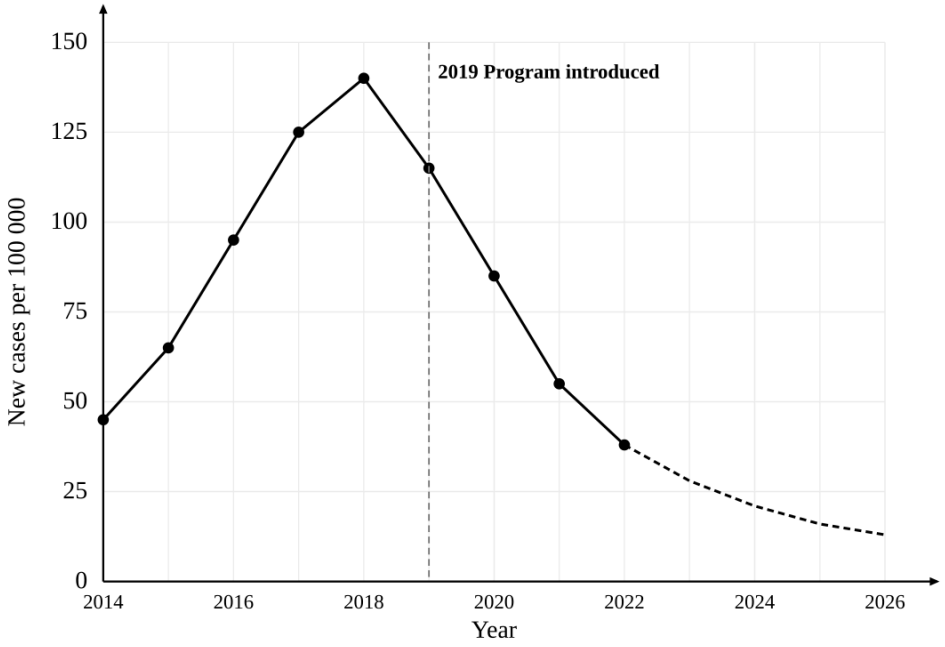


DIAGRAM PROVIDED IN THE EXAM

(b) Assess the effectiveness of the booster program in controlling whooping cough. In your answer, use data from the table and explain how a coverage of 94% protects individuals who are NOT vaccinated. **(4)**

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Question 33 *(6 marks)*

A species of lizard lives on the mainland and on a small island 40 km offshore. The two populations have been isolated from each other for many years. In 2016, a cyclone reduced the island population from about 1500 lizards to 38 survivors. The table shows the frequency of allele B in each population.

DATA PROVIDED IN THE EXAM

table — Frequency of allele B. Mainland population (approx. 60 000 lizards): 2010: 0.61; 2014: 0.60; 2018: 0.59; 2022: 0.61; 2024: 0.60. Island population: 2010: 0.61; 2014: 0.60; 2018: 0.22; 2022: 0.18; 2024: 0.19. Survivors of the cyclone were no better adapted than the lizards that died.

(a) Explain the difference between the island and mainland allele frequencies after 2016. In your answer, name the process responsible, justify your choice using the data, and explain why the same change did NOT occur on the mainland. **(4)**

(b) A tourism operator begins ferrying lizards accidentally between the mainland and the island. Predict, with reasons, how this is expected to change the island population's gene pool. **(2)**

Question 34 *(7 marks)*

Chronic obstructive pulmonary disease (COPD) is a non-infectious lung disease.

(a) A town has a population of 50 000. During 2025 there were 150 newly diagnosed cases of COPD, and at the end of 2025 a total of 1200 residents were living with the disease.

Calculate the incidence of COPD in the town for 2025 (per 100 000 population) and the prevalence of COPD at the end of 2025 (as a percentage). **(2)**

(b) Researchers investigated whether long-term exposure to fine airborne particles from a nearby quarry causes COPD. They recruited 350 adults living in the suburb closest to the quarry, asked them to self-report their breathing symptoms in an online survey over 8 months, and compared the results with state-wide COPD rates. No information was collected about participants' smoking or occupations.

Evaluate the method of this study. In your answer, assess its validity and reliability, and make a judgement about whether its results could establish that quarry dust causes COPD. **(5)**

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Question 35 *(8 marks)*

Panama disease is a fungal disease that kills Cavendish banana plants. A wild banana species carries a gene that provides resistance to the fungus. Scientists have produced a transgenic Cavendish banana that carries the wild species' resistance gene.

(a) Describe the process used to produce this transgenic banana plant, from the isolation of the resistance gene to a whole plant whose cells all carry the gene. Include the names of the enzymes and the vector involved. **(4)**

(b) The table shows three reproductive technologies used by a cattle breeding enterprise.

DATA PROVIDED IN THE EXAM

table — Technology 1: artificial insemination of the entire herd using semen from one champion bull. Technology 2: cloning of the enterprise's single highest-yielding cow, with the clones replacing other breeding cows. Technology 3: a cross-breeding program that introduces bulls of a different breed from another region.

Evaluate the effect of EACH technology on the genetic diversity of the herd, and make an overall judgement about the herd's long-term vulnerability if Technologies 1 and 2 are used together. **(4)**

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