Neap

Trial Examination 2023

VCE Biology Units 1&2

Written Examination

Suggested Solutions

SECTION A – MULTIPLE-CHOICE QUESTIONS

1	A	B	**C**	D
2	A	**B**	C	D
3	A	B	C	**D**
4	**A**	B	C	D
5	**A**	B	C	D
6	A	B	**C**	D
7	A	**B**	C	D
8	**A**	B	C	D
9	A	B	C	**D**
10	A	**B**	C	D
11	A	**B**	C	D
12	A	B	C	**D**
13	A	B	**C**	D
14	A	B	**C**	D
15	**A**	B	C	D
16	**A**	B	C	D
17	A	B	C	**D**
18	A	**B**	C	D
19	A	B	C	**D**
20	A	**B**	C	D
21	A	B	C	**D**
22	A	**B**	C	D
23	A	**B**	C	D
24	A	B	**C**	D
25	A	B	**C**	D
26	A	**B**	C	D
27	A	B	**C**	D
28	A	**B**	C	D
29	A	B	**C**	D
30	A	B	**C**	D
31	A	**B**	C	D
32	A	B	**C**	D
33	**A**	B	C	D
34	**A**	B	C	D
35	**A**	B	C	D
36	A	**B**	C	D
37	**A**	B	C	D
38	A	B	**C**	D
39	A	B	C	**D**
40	A	**B**	C	D

Question 1 C

C is correct. The organism has a membrane-bound nucleus and other membrane-bound organelles, so it is eukaryotic. It has no cell wall or chloroplasts, and can move using its cilia, so it is an animal cell.

A and **B** are incorrect. Although the organism consists of one cell and is therefore unicellular, it is not a plant cell as it has no cell wall or chloroplasts and can move using its cilia. The organism has a membrane-bound nucleus and other membrane-bound organelles, so it is eukaryotic.

D is incorrect. While the organism is eukaryotic, it is unicellular, not multicellular.

Question 2 B

B is correct. The Golgi apparatus is a membrane-bound organelle found only in eukaryotic cells. Therefore, the presence of a Golgi apparatus in the *Paramecium* allows it to be classified as a eukaryotic cell.

A and **C** are incorrect. Nuclear material and ribosomes are found in all living cells.

D is incorrect. Cell walls are only found in plant cells.

Question 3 D

D is correct. Organelle Z is the rough endoplasmic reticulum; this is the location of the ribosomes, which are the sites of protein synthesis.

A, **B** and **C** are incorrect. Organelle W is a small vacuole, organelle X is the nucleus and organelle Y is a Golgi apparatus; none of these organelles are the site of protein synthesis.

Question 4 A

A is correct. Oxygen would pass from a higher concentration in the water to a lower concentration in the single-celled *Paramecium*, which is known as diffusion.

B is incorrect. Osmosis is the term used for diffusion of water, not oxygen.

C is incorrect. Active uptake refers to the movement of molecules from a lower concentration to a higher concentration. Since oxygen is being used up by the *Paramecium*, there would be a lower concentration of oxygen in the cell than in the water.

D is incorrect. Although facilitated diffusion also involves the movement of molecules down the concentration gradient, it occurs at a faster rate using protein carrier molecules when the cell's demand for the substance is high.

Question 5 A

A is correct. Binary fission is a process of asexual reproduction in which one fully grown parent organism divides into two identical offspring that are the same as the parent, which occurs in both *Paramecia* and prokaryotic bacteria.

B is incorrect. Fusion refers to the joining of two organisms. The *Paramecium* splits in two; thus, it undergoes fission, not fusion.

C is incorrect. Budding involves small cells being produced off the parent cell, which occurs in yeast.

D is incorrect. Blebbing is a stage in apoptosis and is unrelated to methods of reproduction.

Question 6 C

C is correct. Active transport occurs when molecules or ions move against the concentration gradient, which requires energy provided by the cell and generated by cellular respiration.

A is incorrect. The root cells need a large surface area to volume ratio, not a large volume to surface area ratio.

B is incorrect. The plasma membrane must be selectively permeable, not selectively impermeable, to allow the mineral ions through.

D is incorrect. The mineral ions are dissolved in water and pass through the protein channels of the plasma membrane, not the phospholipid bilayer.

Question 7 B

B is correct. A mitochondrial pathway resulting in programmed cell death (apoptosis) involves an intrinsic/internal signal, often triggered by DNA damage.

A, **C** and **D** are incorrect. These options are environmental factors that result in necrosis.

Question 8 A

A is correct. Umbilical cord blood cells have the ability to develop into a few specific types of cells and are therefore multipotent.

B is incorrect. Pluripotent refers to cells with the ability to develop into many different types of cells.

C is incorrect. Totipotent refers to cells with the ability to develop into a fully developed individual.

D is incorrect. Superpotent is not an appropriate term used to describe types of potency.

Question 9 D

D is correct. Hypoglycaemia is a condition that occurs when an individual's blood glucose level has dropped too low and is rectified by the individual consuming foods with high glucose content, such as jellybeans, honey or glucose tablets. Stored umbilical cord blood would not be useful in treating this condition.

A is incorrect. Bone marrow transplants require stem cells, which could be sourced from umbilical cord blood.

B is incorrect. If an individual's blood cells have been damaged or reduced in number due to a serious blood disorder, umbilical cord blood cells could be used to replace the affected cells.

C is incorrect. The treatment of some cancers and other diseases can damage an individual's bone marrow cells, so umbilical cord blood cells could be used to replace the affected cells.

Question 10 B

B is correct. Beneficence refers to ensuring that the benefits of a course of action are maximised. Sharing umbilical cord blood with other families allows the benefits of the umbilical cord blood bank to reach the largest amount of individuals possible.

A is incorrect. Integrity encourages full commitment to knowledge and understanding and reporting all findings, which is not relevant to this scenario.

C is incorrect. Justice involves fairness to all and no burden to any particular group, which is not relevant to this scenario.

D is incorrect. Respect is the acknowledgment of the value of all living things, considering both individuals and the collective group; it is not relevant to this scenario.

Question 11 B

B is correct. The ability to divide indefinitely is one of the unique characteristics of tumour cells.

A is incorrect. Tumour cells divide more rapidly than normal body cells as they spend less, not more, time in interphase.

C is incorrect. Tumour cells do not respond to intrinsic or extrinsic signals; therefore, they do not undergo apoptosis.

D is incorrect. Tumour cells have a distorted/altered shape and will often have different chromosome numbers when compared to unaffected stomach cells.

Question 12 D

D is correct. The hormone thyroxine is produced after the thyroid gland is stimulated by the thyroid-stimulating hormone (TSH).

A is incorrect. The hypothalamus is the receptor, not the effector.

B is incorrect. The thyroid gland is the effector, not the receptor.

C is incorrect. There are three hormones involved: thyroid-releasing hormone (TRH), TSH and thyroxine.

Question 13 C

C is correct. Negative feedback reverses the stimulus; therefore, less TSH would be secreted into the blood.

A is incorrect. Negative feedback results in increased stimulation of the hypothalamus.

B is incorrect. Negative feedback results in more TRH being secreted into the blood.

D is incorrect. There would be reduced, not variable, stimulation of the hypothalamus.

Question 14 C

C is correct. An overactive thyroid gland will result in the production of too much thyroxine.

A and **B** are incorrect. A TSH reading of 6.0 mU/L and a low T4 blood concentration are both indicators of hypothyroidism.

D is incorrect. A TSH reading of 3.0 mU/L is within the normal TSH range.

Question 15 A

A is correct. On a cold day, heat loss is higher. The release of thyroxine increases the metabolism of body cells, causing the cells to produce more heat and thus increasing the individual's body temperature.

B is incorrect. When heat loss is high on a cold day, the skin blood vessels constrict to reduce heat loss.

C is incorrect. When heat loss is high on a cold day, the body muscles contract to produce more heat as a byproduct of the metabolism required to generate energy for muscle contraction, leading to shivering.

D is incorrect. The metabolic rate would increase to combat the higher rate of heat loss that occurs on a cold day.

Question 16 A

A is correct. Accessory organs are organs in the digestive system that secrete substances needed for digestion, but do not form part of the tract through which food passes.

B is incorrect. The liver produces and secretes bile that carries out chemical digestion when it enters the duodenum.

C is incorrect. Food never enters the accessory organs; they only secrete substances needed for digestion into the gut.

D is incorrect. Accessory organs play no part in the absorption of digested food, mineral ions or water.

Question 17 D

D is correct. The pancreas releases bicarbonate ions that neutralise the acidity of the stomach content passing into the duodenum. This allows the digestive enzymes to function and thus digestion to occur.

A is incorrect. The salivary glands produce enzymes that are essential for chemical digestion in the mouth. However, mucus is not involved in this digestion.

B is incorrect. The pancreas does produce insulin, but it is not involved in digestion.

C is incorrect. The liver does produce bile, but it is not activated by the acidic stomach contents.

Question 18 B

B is correct and **A** is incorrect. At night, no photosynthesis occurs so carbon dioxide will not diffuse into the plant. However, cellular respiration continues to occur at night, so oxygen will diffuse in through the stomata if they are partly open.

C is incorrect. Water never passes into the plant through the stomata; water passes into the roots and up through the xylem to be distributed throughout the plant. Some water vapour passes out through the leaves, but this always occurs in one direction.

D is incorrect. Even though nitrogen makes up 70% of air, nitrogen does not enter the plant through the leaves and is not used in cellular respiration.

Question 19 D

D is correct. The skin, digestive tract and kidneys are all used in the homeostatic regulation of water–salt concentration in body fluids, which is the process known as osmoregulation.

A is incorrect. Osmoregulation is the control of the water–salt concentration in body fluids, not body temperature.

B is incorrect. Negative feedback is essential to the relatively constant water–salt concentration in body fluids.

C is incorrect. Antidiuretic hormone (ADH) is not an enzyme; it is a hormone released by the pituitary gland.

Question 20 B

B is correct. Anything that raises the set point of the body's internal thermostat in the hypothalamus, such as bleeding in the brain, would cause an individual's body to produce more heat and could result in hyperpyrexia.

A is incorrect. The stimulus enhances the response in positive feedback, not negative feedback.

C is incorrect. If heat-regulating mechanisms shut down, the individual's body temperature would decrease drastically.

D is incorrect. If the body's thermostat was set to a lower temperature, the body would carry out mechanisms to lose heat.

Question 21 D

D is correct. As a lily plant has a far greater number of chromosomes and length and mass of DNA per somatic cell, it has more genes in its genome than a vinegar fly.

A is incorrect. A greater number of chromosomes or length and mass of DNA is not an indication of evolutionary position.

B is incorrect. A lily plant has more chromosomes than a vinegar fly.

C is incorrect. The data shown does not indicate the number of alleles per gene.

Question 22 B

B is correct. There are 40 chromosomes in a somatic cell of a house mouse, so a sperm cell would contain 20 chromosomes (that is, half of 40).

A is incorrect. A zygote is a fertilised egg and contains 8 chromosomes.

C is incorrect. Before meiosis, human testes cells have the same number of chromosomes (46) as all human somatic cells.

D is incorrect. Pollen grains are the male gametes of the lily plant and contain 12 chromosomes.

Question 23 B

B is correct. Each of the four eggs formed from one ovary cell would receive one quarter of the DNA replicated during interphase $\left(\text{that is, } \frac{5.0 \times 2}{4} = 2.5 \text{ pg}\right)$.

A and **D** are incorrect. Neither of these values is relevant to the amount of DNA in house mouse cells.

C is incorrect. 5.0 pg is the amount of DNA in one somatic cell of a house mouse.

Question 24 C

Somatic cells are diploid. Therefore, as there is a total of 40 chromosomes in a liver cell of a house mouse, 38 of these would be autosomes/non-sex chromosomes and two would be sex chromosomes, X and Y.

Question 25 C

C is correct. Humans are all the same species, so all individuals have the same genes/gene loci on their homologous chromosomes (excluding their X and Y chromosomes).

A is incorrect. Females have more DNA in their somatic cells than males; they have two long X chromosomes, whereas males have one long X and one short Y chromosome.

B is incorrect. Females and males both have 23 chromosomes in their gamete cells.

D is incorrect. Although the gene sequences in female and male chromosomes are the same, the alleles of the genes are often different.

Question 26 B

B is correct and **C** is incorrect. Structure P is a double helix, which consists of one DNA molecule. Structure Q is a chromosome; thus, the labelled part of the structure is a chromatid, which is one of the replicas of the chromosome.

A is incorrect. Structure P is a double, not simple, helix.

D is incorrect. Structure P is a double helix; however, the labelled part of structure Q is not the chromosomal material called chromatin, which is present before cell division occurs.

Question 27 C

C is correct. The letters in 'Gg' represent the alleles for a specific gene for a particular characteristic of the plant and are called its genotype.

A is incorrect. The genome is the total of all the genes in the plant's cells.

B is incorrect. Gg are the alleles for one gene only, not several or many genes.

D is incorrect. The phenotype is the characteristics that the plant expresses; in this case, dark green leaves.

Question 28 B

B is correct. G represents the allele for the dominant characteristic expressed; in this case, a dark green colouration.

A is incorrect. G is not the dominant allele; it is the allele for the dominant characteristic.

C is incorrect. G represents the allele for the dominant trait; it does not represent the recessive allele.

D is incorrect. GG represents a specific genotype of the plant.

Question 29 C

C is correct. The term homozygous refers to an organism with two alleles of a gene that are the same. As Gg has two different alleles, it is not homozygous.

A and **B** are incorrect. The terms heterozygous and carrier can be used to describe an organism with two different alleles of a gene.

D is incorrect. Hemizygous refers to the presence of only one member of a chromosome pair or chromosome segment, rather than two; thus, a Gg plant could not be described as hemizygous.

Question 30 C

C is correct and **D** is incorrect. As Shona wants to determine the genotype of the gifted plant using the quickest possible method, she should perform a cross between the plant expressing the dominant trait (that is, the gifted plant with dark green leaves) and a homozygous recessive pale green (gg) plant.

A is incorrect. If Shona performed this cross, all the offspring would be dark green.

B is incorrect. If Shona performed this cross, 50% of the offspring would be dark green and 50% would be pale green.

Question 31 B

B is correct. In a test cross, an individual expressing a dominant trait is crossed with an individual that is homozygous recessive. In this case, the gifted plant expresses the dominant trait; thus, a cross with a homozygous recessive, pale green (gg) plant to determine the genotype of the gifted plant.

A, **C** and **D** are incorrect. These terms are not used for this type of cross.

Question 32 C

C is correct. A base letter (in this case, C) with two alternative letters (in this case, G and Y) indicates that the two alleles represented by the alternative letters are equally expressed or neither is completely expressed, not that one trait is dominant.

A, **B** and **D** are incorrect. The two alleles are codominant, meaning that they are both equally expressed in the offspring, so the leaves could be patchy dark green and pale green.

Question 33 A

A is correct. Changes resulting from DNA methylation are associated with obesity and may lead to changes in gene expression that cause type 2 diabetes.

B is incorrect. Although macronutrients cause unfavourable changes in the epigenome, these changes do not affect the DNA structure of the genes.

C is incorrect. Although macronutrients cause unfavourable changes in the epigenome, these changes do not affect the positions of the genes on the chromosomes.

D is incorrect. Although gene expression is affected by the environment, epigenetic factors do not affect the environment.

Question 34 A

A is correct. Water stored in pockets under the frog's skin and in their bladder could be squeezed out and used as drinking water.

B is incorrect. As the frog has little meat, it would not be an ideal source of food; additionally, squeezing the frog releases water.

C is incorrect. Eggs are only produced by female breeding frogs when water is available; there would be no eggs produced by a frog in an underground chamber.

D is incorrect. No useful medicines come from the frog.

Question 35 A

A is correct. The major factors that change between spring and summer (when asexual reproduction occurs) and late autumn (when sexual reproduction occurs) are day length and temperature.

B is incorrect. There is no evidence of chemical factors altering DNA structure.

C is incorrect. Genes do not change from dominant to recessive, or vice versa.

D is incorrect. In spring and summer, days become longer and warmer, not shorter and cooler.

Question 36 B

As aphids have an XO sex-determination system, male aphids would have XO chromosomes and female aphids would have XX chromosomes.

Question 37 A

A is correct. Precision is a scientific term that refers to the closeness of the measurements taken during an experiment; the closer these values are to the mean, the more precise the experiment is. It is not related to the ethics of research on human subjects.

B is incorrect. Beneficence is a concept that encourages researchers to act in a way that benefits others and minimises risks and harm to the subjects.

C is incorrect. Respect is essential in human research so that subjects are considered of value and are protected from exploitation.

D is incorrect. Justice is a commitment to ensuring that competing claims and different groups are treated fairly, and that there is equal access to the benefits of research.

Question 38 C

C is correct. Staying in underground chambers for several years is a behaviour that the frog has developed to survive the environment; thus, it is a behavioural adaptation. Reducing its metabolic rate involves a change in an internal body process of the frog; thus, it is a physiological adaptation.

A, **B** and **D** are incorrect. These options do not identify the correct types of adaptation. A structural adaptation is a physical feature of an organism's body that enables its survival. A functional adaptation involves internal features that affect the biochemistry and/or physiology of an organism and increase its chances of survival.

Question 39 D

D is correct. As there is a lack of water during droughts, the behaviour of staying dormant in a waterproof underground chamber increases the frog's chances of survival.

A is incorrect. As all other frogs of the species would also be dormant underground during a period of drought, no mates would be present.

B is incorrect. If this behaviour was performed to avoid predators, the frog would not need to stay underground for such a long period of time.

C is incorrect. It is unlikely that the frog would grow during the time it spends underground as there is no food input.

Question 40 B

B is correct. Water-holding frogs need to grow rapidly from tadpoles into frogs while there is still water in the pools produced after intermittent rainfall, so their life cycle is very short.

A is incorrect. In high humidity areas, water can be retained in pools for longer periods.

C is incorrect. Predators would eat tadpoles regardless of the climate.

D is incorrect. In the water-holding frog's environment, there would be depressions and areas for water to accumulate; the length of this stage of their life cycle is more dependent on how long the water is retained in these depressions.

SECTION B

Question 1 (12 marks)

a. **i.** Prokaryotic cells such as cyanobacteria do not have membrane-bound nuclei or other membrane-bound organelles, whereas eukaryotic cells have membrane-bound nuclei and membrane-bound organelles. 1 mark

ii. Membrane-bound organelles provide internal compartments where the chemicals required for specific cellular functions are contained, allowing cell functioning to be more efficient and ensuring that different processes can occur at different times. 1 mark

iii. The very small size of prokaryotic cells provides a greater surface area to volume ratio for more efficient exchange of inputs and outputs for cell functioning. 1 mark

b. **i.** plasma membrane 1 mark

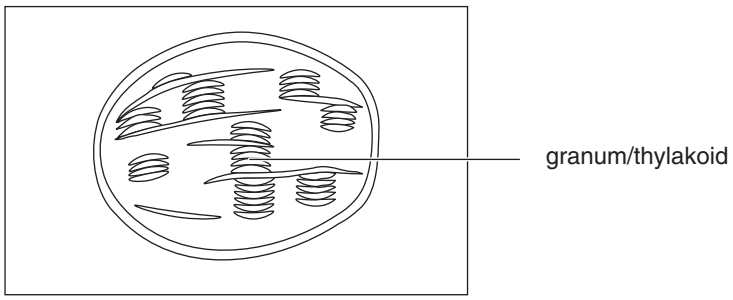
ii. The plasma membrane controls the substances that can move through it, as it is semi/partially/selectively/differentially permeable. 1 mark

c. **i.** light energy **OR** sunlight energy 1 mark

ii. photosynthesis 1 mark

iii. organelle 2 1 mark

iv.



Organelle 2

1 mark

1 mark for labelling the granum (grana)/thykaloid.

d. The water of Hamelin Pool is extremely salty (hypertonic compared to the solute concentration of the sea snail cell's cytosol). 1 mark

Therefore, water would move out of the sea snail's body cells from a lower solute concentration to a higher solute concentration via osmosis. 1 mark

This would result in cell shrinkage due to dehydration and lead to cell malfunctioning, causing sea snail death. 1 mark

Question 2 (8 marks)

a. **i.** transpiration 1 mark

ii. xylem 1 mark

b. As pot 1 was watered at 7:00 am in the cool of the morning, the bean plants lost little water and the graph line stayed relatively constant. 1 mark

The graph line then increased as pot 1 was exposed to the hot sun and water loss increased rapidly between 9:00 am and 12:30 pm. During this time, the sun caused evaporation and transpiration through the open stomata of the bean plants. 1 mark

Water loss started to decrease from 12:30 pm as the stomata closed to reduce transpiration in the hot conditions, causing the graph line to also decrease. 1 mark

c. **i.** Identical plants are plants of the same species; therefore, the bean plants should be of similar age, size, and structure and all be in the same (healthy) condition. 1 mark

ii. Having very similar bean plants is necessary as only one variable should be altered in an experiment (the plants should be a controlled variable and kept the same in all pots). 1 mark

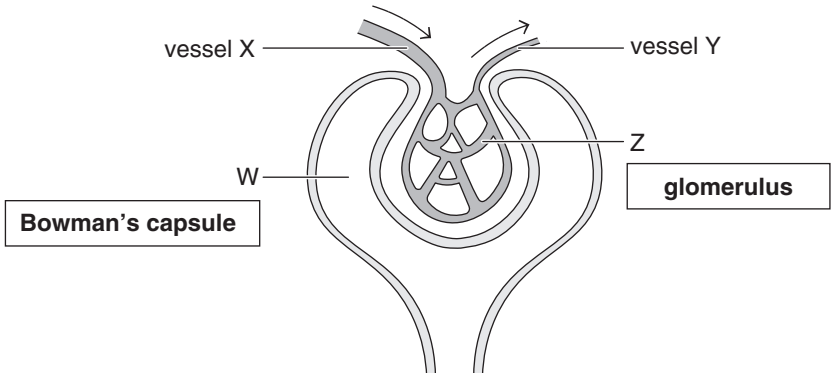
d. No. The experiment is not valid as Liam did not measure what he set out to investigate. Instead, he altered several experimental variables and did not keep all other variables constant, so valid conclusions cannot be drawn from the results. 1 mark

Question 3 (8 marks)

a. **i.** a nephron 1 mark

ii. The much larger number of filtering units in a human kidney than in a cat kidney would provide a greater surface area for filtration, which more efficiently reduces the concentration of unwanted substances in the blood (for example, excess sodium). 1 mark

b.



2 marks

1 mark for labelling the Bowman's capsule.
1 mark for labelling the glomerulus.

c. **i.** As blood flows from a wider vessel (X) into a narrower vessel (Y), pressure builds up and forces smaller molecules to filter into the Bowman's capsule cavity. 1 mark

ii. Solutes can pass through more efficiently across vessel walls that are one cell thick than across walls that are made up of several cell layers. 1 mark

d. **i.** *Any one of:*

- protein
- red blood cells

1 mark

ii. *Any one of:*

- distal convoluted tubules
- collecting duct

1 mark

Question 4 (12 marks)

a. Organelle M is the rough endoplasmic reticulum, which is necessary as it is the site of synthesis of insulin produced by these cells. 1 mark

Organelle L is the Golgi complex, which is necessary for the modification and packaging of insulin ready for secretion out of the cell. 1 mark

b. **i.** Facilitated diffusion is faster than simple diffusion, so glucose would enter the cell more quickly to meet its demands. 1 mark

ii. Insulin increases the permeability of the cell plasma membrane for glucose, thereby allowing more glucose to pass into the cell. 1 mark

c. Although type Z takes much longer to start working (240–480 minutes), it provides insulin for up to 24–28 hours, which would last for an entire day. 1 mark

d. Both, as the results of kidney mass and volume provide numerical/quantitative data and the photos of kidney tissue provide non-numerical/qualitative data. 1 mark

e. More than one rabbit was used in each group so that the results of each group could be averaged, any outliers could be identified, and the precision of the results could be ensured. 1 mark

f. group 3 1 mark

The ± value for group 3 is less than for groups 1 and 2, which indicates that the range of results around the mean were narrower and therefore more precise. 1 mark

g. **i.** The results indicate that diabetes does affect kidney mass and volume, as the results for group 2 were significantly higher than the results for the control group. 1 mark

ii. As daily injections of insulin were given to group 3, these rabbits showed a reduction in kidney mass and volume compared to group 2, however the results were still higher than the control group. 1 mark

h. *Any one of:*

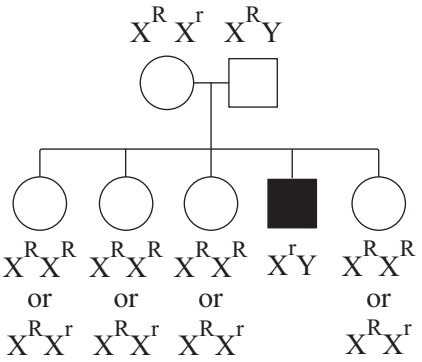
- Non-maleficence encourages individuals to minimise harm, which should be considered for the rabbits used in the experiment.
- Respect for the rabbits as living organisms needs to be considered so they are protected from exploitation.

1 mark

Question 5 (6 marks)

a. X^R = not red–green colour blind, X^r = red–green colour blind 1 mark

b.



2 marks

1 mark for providing the genotypes of the parents.

1 mark for providing the genotypes of the offspring.

Note: Responses must show X^RX^R and X^RX^r for four offspring.

c. Males show the trait if they inherit one X^r from their mother and have no allele on the Y chromosome from their father to mask the trait; females inherit an X chromosome from each parent and could be X^RX^r or X^RX^R, so there is a greater chance that they will not show the trait. 1 mark

d. Non-maleficence involves weighing up the potential benefits and risks associated with an action and attempting to minimise disproportionate harm. 1 mark

The optometrist should advise Bobby not to obtain his learner permit because the deterioration of his vision could pose a danger to himself and other motorists if he were to drive. 1 mark

Question 6 (11 marks)

a. Linked genes are two or more genes that are close together on the same homologous chromosome. 1 mark

They are likely to be inherited together because of their physical proximity, which results in them moving together on the chromosome during the separation of homologous chromosomes in meiosis. 1 mark

b. **i.** locus 1 mark

ii. The El and Rh genes are positioned the closest to each other and are therefore the most likely to be inherited together. 1 mark

c. **i.** $\frac{RA}{ra}$

2 marks
1 mark for providing the letters.
1 mark for using the correct notation.

ii. $\text{woman}\ \frac{RA}{ra} \times \text{man}\ \frac{ra}{ra}$

2 marks
1 mark for each parental genotype provided.

iii.

	Possible genotypes of offspring	Expected ratio
1	$\frac{RA}{ra}$	one (or many)
2	$\frac{Ra}{ra}$	less than 1 (or few)
3	$\frac{rA}{ra}$	less than 1 (or few)
4	$\frac{ra}{ra}$	one (or many)

3 marks
1 mark for providing genotypes 1 and 2.
1 mark for providing genotypes 3 and 4.
1 mark for providing the expected ratio for all four children.

Question 7 (11 marks)

a. **i.** structural adaptations 1 mark

ii. physiological adaptation 1 mark

iii. The stolons, rhizomes and release of chemicals are considered adaptations because they increase the plant's chances of survival and reproduction in its environment. 1 mark

b.

	Diagram 1	**Diagram 2**
Type of reproduction illustrated	sexual reproduction	asexual reproduction **OR** vegetative reproduction
One advantage of the type of reproduction illustrated	*For example, any one of:* • greater genetic variation in offspring • greater chance of survival in changing environments	*For example, any one of:* • a mate of the opposite sex is not required • faster reproduction rate and spread

4 marks

1 mark for each correct cell.
Note: Accept other suitable answers.

c. **i.** gametes 1 mark

ii. The pollen grains are haploid as they contain only one set of chromosomes. 1 mark

d. **i.** *Any one of:*

- The genetic diversity of the species would stay the same as no shuffling occurs *(due to the lack of crossing over and recombination, and independent assortment)*.
- The genetic diversity of the species may decrease by a small amount due to mutations *(as there is a lack of crossing over and recombination, and independent assortment)*.

1 mark

ii. The survival of the species in a changing environment may be markedly decreased as there may be no organisms with features suitable for survival in the new conditions *(due to the lack of crossing over and recombination, and independent assortment)*. 1 mark

Question 8 (5 marks)

a. The researchers would have removed the nucleus from the extracted egg cells *(thus producing enucleated egg cells)*. 1 mark

b. As fibroplasts are somatic cells, they would have contained two sets of chromosomes; therefore, the fused cells are diploid. 1 mark

c. **i.** The DNA of the six calves would have been genetically identical. 1 mark

ii. The DNA of the six calves would have been genetically identical to that of the fibroplast donor cells, but it would have been different to the DNA of the original egg cells and the surrogate mothers' cells. 1 mark

d. The researcher did not uphold integrity as they were not honest or truthful in the communication of their results or the claims they made about their findings. 1 mark

Question 9 (7 marks)

a. **i.** The grey nurse shark is a top order predator as it feeds on many other species at the top/apex of the food web, without natural predators of its own. 1 mark

ii. The grey nurse shark is a keystone species as it plays a critical ecological role in marine ecosystems that cannot be occupied by another species; without the shark, the ecosystems could become unstable or collapse. 1 mark

b. **i.** The shark's skin is tough and smooth, which helps reduce friction with the surrounding water and aids in movement through the water. 1 mark

ii. The shark's body has a streamlined shape, which aids in efficient, rapid movement. 1 mark

c. As the grey nurse shark is a keystone species, a rapid decline in numbers could result in the marine ecosystems becoming unstable and potentially changing markedly or disappearing entirely. 1 mark

d. *For example:*

The positive associations that some First Nations peoples have with sharks could prevent overfishing of sharks. 1 mark

This would contribute to the conservation of marine ecosystems as the shark populations would be maintained, ensuring that the various shark species can continue to fulfil their crucial roles in their ecosystem. 1 mark

