

**BAULKHAM HILLS HIGH SCHOOL**

**Higher School Certificate**

**2010**

**Trial Examination**

**Biology**

**General Instructions**

- Reading time - 5 minutes
- Working time - 2 hours
- Board approved calculators may be used
- Write using black or blue pens, only
- Write your student number at the top of each page of your answer sheet.

**Total Marks: 100**

**Section I  
Multiple Choice  
(20 marks)**

Attempt Questions 1-20  
Allow about 40 mins for this section

**Section II  
Extended Response  
(80 marks)**

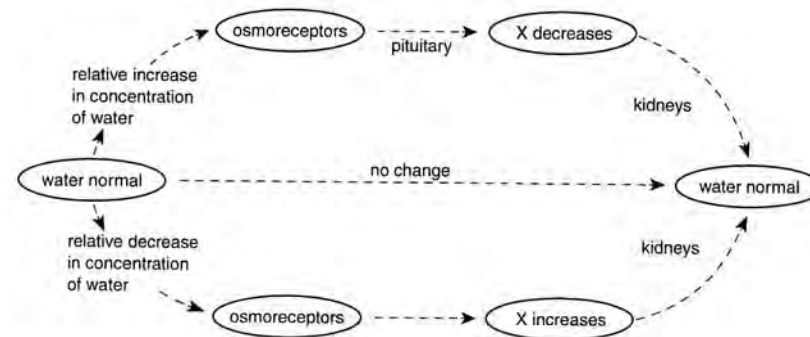
Attempt Questions 21-34  
Allow about 140 mins for this section

**Section I – Multiple Choice**

**20 marks**

**Select the most correct response A,B,C or D on the Multiple Choice Answer Sheet**

1. The diagram below shows one way in which a hormone can regulate salt levels in the blood of humans. X is the hormone responsible for this process. What is the name of hormone X?



- a) Sodium chloride
- b) Antibody
- c) Aldosterone
- d) Anti-diuretic hormone (ADH)

2. Which of the following (a, b, c or d) is a correct comparison of arteries and veins?

	<b>Arteries</b>	<b>Veins</b>
a)	Thin, inelastic walls and large diameter tube because of low blood pressure	Thick, elastic walls and narrow diameter tube to resist the higher blood pressure
b)	Thick, elastic walls and narrow diameter tube to resist the higher blood pressure	Walls one cell thick to allow for the exchange of materials between blood and surrounding tissues
c)	Valves and a wide diameter tube to allow for the flow of blood to the heart	Walls one cell thick to allow for the exchange of materials between blood and surrounding tissues
d)	Thick, elastic walls and narrow diameter tube to resist the higher blood pressure	Valves and a wide diameter tube to allow the flow of blood to the heart

3. The table below contains the names of important scientists and their contribution to science in terms of theories, discoveries and experimental methods. Which alternative correctly matches all scientists with their contribution?

	<b>Darwin</b>	<b>Sutton and Boveri</b>	<b>Pasteur</b>	<b>Koch</b>
a)	Evolution	Chromosomal inheritance	Germ theory of disease	Disease Postulates
b)	Evolution	Disease Postulates	Germ theory of disease	Chromosomal Inheritance
c)	Evolution	DNA structure	Evolution	Germ theory of disease
d)	Chromosomal inheritance	Evolution	DNA structure	Disease Postulates

4. A group of 100 students was randomly assigned one of four tests. In each test the students breathed air with different amounts of oxygen and carbon dioxide and their breathing rate was measured over a five minute period.

The table below shows the average breathing rate for each group at the end of each minute.

Composition of air mixture		Time (minutes)				
		1	2	3	4	5
Test 1	30% oxygen + 0% carbon dioxide	16	15	13	10	9
Test 2	30% oxygen + 0.1% carbon dioxide	16	16	15	16	15
Test 3	21% oxygen + 0.1% carbon dioxide	16	15	15	16	16
Test 4	21% oxygen + 5% carbon dioxide	16	18	19	25	29

What conclusion could reasonably be drawn from these results?

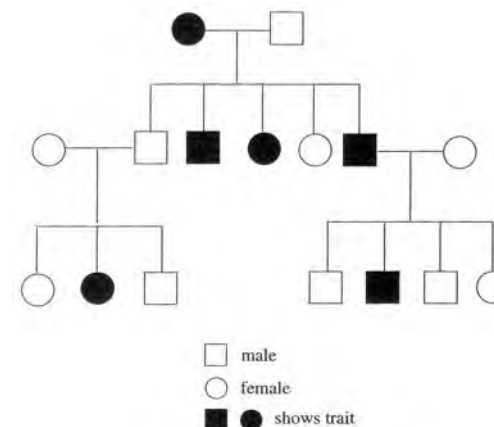
- a) Increasing oxygen concentration slows breathing rate  
 b) Increasing oxygen concentration increases breathing rate  
 c) Increasing carbon dioxide concentration increases breathing rate  
 d) Nitrogen in the air has little effect on breathing rate
5. Which nitrogenous wastes are mainly excreted by terrestrial organisms?
- a) Urea and uric acid  
 b) Uric acid and ammonia  
 c) Ammonia and urea  
 d) Urea and faeces
6. Which of the following alternatives includes all of the factors that are essential for osmosis to occur?
- a) A selectively permeable membrane in water  
 b) A selectively permeable membrane separating solutions of equal concentrations of solutes in water  
 c) An impermeable membrane separating solutions of unequal concentrations of solutes in water  
 d) A selectively permeable membrane separating solutions of unequal concentrations of solutes in water
7. The following base sequence of DNA is the result of the replication of a double-stranded segment of DNA.

**G A A T T C**  
**C T T A A G**

Which of the base sequences below is the original DNA?

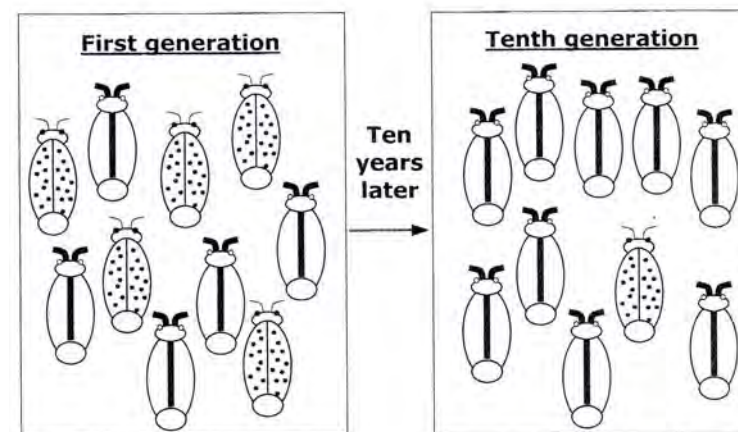
- a) G A A T T C                      b) C T T A A G  
 G A A T T C                      C T T A A G
- c) G A A T T C                      d) C A T T A C  
 C T T A A G                      G T A A T C

8. The following pedigree is of a family in which a certain trait is known to occur.



This trait is

- a) dominant  
 b) recessive  
 c) sex-linked  
 d) incompletely dominant
9. The diagram below depicts the change that occurred in the **frequency of phenotypes** in a beetle population over a ten year period.

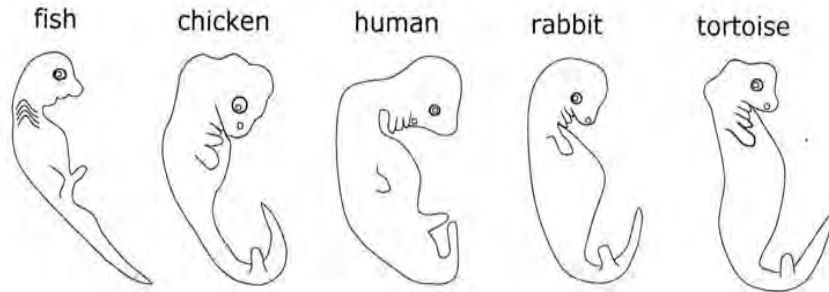


The selection pressure which was operating here over that time was likely to have been

- a) a disease  
 b) availability of food  
 c) a predator  
 d) climate

10. The diagram shows the early embryonic development of five animals.

### Embryos of 5 species



What is the most reasonable explanation for the presence of gill slits and tails in the embryos of these five animals?

- Gills and tails are required in the liquid embryonic environment
- Ancestral vertebrates had the genes to produce gill slits and tails and these remain active in embryonic development in all of these species
- It is an example of convergent evolution. There is a selective advantage in these structures and so diverse species have developed them
- These species have all evolved from modern fish and so possess fish-like structures

11. Some of the events involved in the production of a protein are listed below:

- V - Production of mRNA from a DNA template**
- W - Attachment of mRNA to ribosome**
- X - Transfer of mRNA to cytoplasm**
- Y - Amino acids are bonded together**
- Z - Loaded tRNA bonds to a specific codon**

The correct sequence of events is:

- V → Z → Y → X → W
- Z → W → X → Y → V
- V → X → W → Z → Y
- V → Z → Y → X → W

12. In mice, black fur (B) has dominant expression over white fur (b). A cross between two mice that are hybrids (Bb) for this condition produced some mice that were black and some that were white. The genotypes of the offspring show the genetic concept of

- variability
- segregation
- codominance
- multiple alleles

13. People with the disease cystic fibrosis are unable to produce normal CFTR proteins due to a mutation in the CFTR gene. Scientists have used gene delivery systems to insert the normal CFTR gene into the lung cells of people with cystic fibrosis to produce altered lung cells.

Which of the following statements is a direct result of this therapy?

- children of someone with altered lung cells will inherit the normal CFTR gene
- altered lung cells can produce the CFTR protein
- all lung cells must be altered if the treatment is to be successful
- the mutated CFTR protein will not be produced in any lung cell

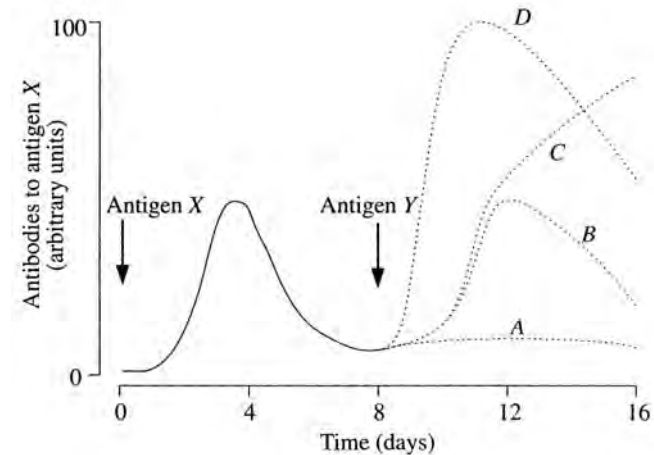
14. As part of the body's specific immune response, human cells infected by viruses may be killed by:

- antibodies
- helper T-cells
- complement proteins
- cytotoxic T-cells

15. A person was exposed to antigen X on day 0.

On day 8 the same person was exposed to a completely different antigen, antigen Y.

The graph shows the number of antibodies to antigen X measured in the person's blood up to day 8.



Which line best depicts the level of antibodies to antigen X from day 8 to day 16?

- A
- B
- C
- D

16. Two inherited diseases are

- tetanus, sickle cell anaemia
- phenylketonuria (PKU), venereal disease (VD)
- rhesus baby, Down Syndrome
- haemophilia, Huntington's Chorea

17. All plants have their own range of pest. The Australian wattles are particularly susceptible to attack from borers. One of the first symptoms is the early death of a young limb.

Identify the most likely evidence of borers.

- a) Holes with trails of sawdust in the bark of the stem
- b) Discolouration of the central vein of a leaf
- c) Distortion of leaves
- d) Hardwood cocoons like small lumps on the stems

18. Which of the following is a measure to prevent the Queensland fruit fly from spreading to other States?

- a) Spraying all people who cross the border with insecticide
- b) Preventing untreated fruit being taken north into Queensland
- c) Preventing untreated fruit being taken south out of Queensland
- d) Introduction of Mediterranean wasp to border areas as a predator of the fruit fly

19. Identify the correct pair in this table.

	Stimulus	Sense Organs	Receptors	Response
a)	eye	light	photoreceptors	thinking
b)	pressure	skin	mechanoreceptors	pleasure
c)	skin	mechanoreceptors	pressure	pleasure
d)	light	photoreceptors	eye	blinking

20. Platypus can detect small electrical fields in other moving animals nearby. Therefore it can catch its prey.

Identify the type of receptors used for this purpose.

- a) Photoreceptors
- b) Mechanoreceptors
- c) Thermoreceptors
- d) Electroreceptors

**End of Section I**

Candidate Number: .....

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# Biology

**Section I – Multiple Choice**

Circle the letter A, B, C or D which best answers the question

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

Section II – Extended Response

80 marks

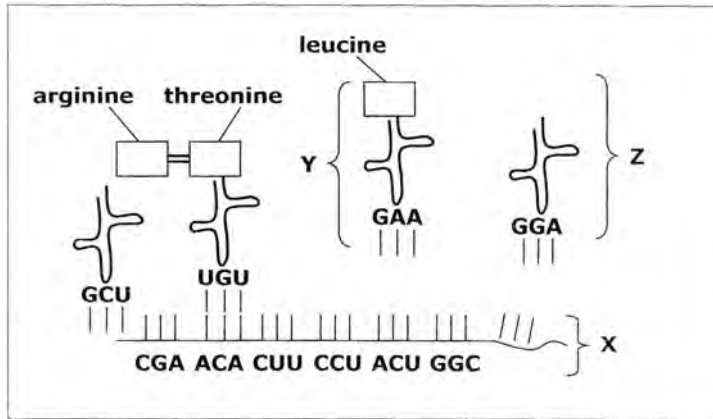
Write your answers in the spaces provided

Mark values are indicated for individual questions

Question 21 (6 marks)

Marks

The following diagram is of a biochemical process that occurs in living cells.

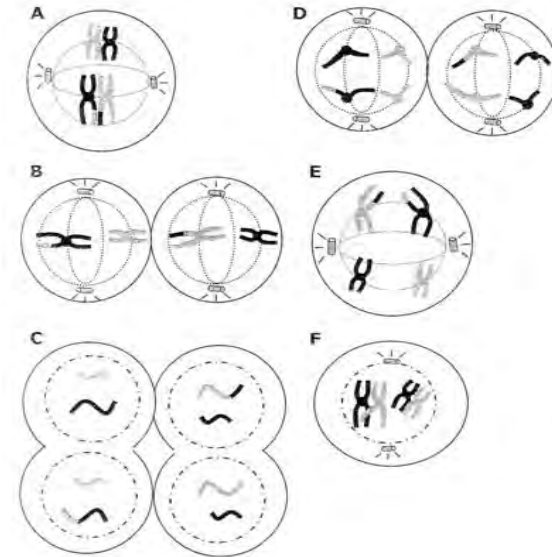


- a) What name is given to molecule X 1  
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- b) What is the purpose of this molecule? 1  
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- c) Describe how molecule X is formed. 3  
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- d) From the figure above, identify the codon that codes for the amino acid, threonine. 1  
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Question 22 (5 marks)

Marks

The following diagrams show some of the events which occur in a cell undergoing gamete production.



- a) i) By what process is gamete production occurring in these diagrams? 1  
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- ii) Use the letters A-F corresponding to the diagrams above, to put these six stages in order, from the earliest event to the latest event. 1  
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- b) The process which leads to the production of gametes is sometimes called reduction division. Explain why this process is referred to as reduction division. 2  
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- c) Two of the chromosomes in diagram F show crossing over the recombination. What is the result of this recombination? 1  
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**Question 23 (4 marks)**

**Marks**

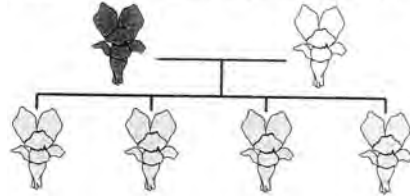
Flower colour in snapdragons is determined by a single gene with two alleles:

**RR produces red flowered plants**

**R'R' produces white flowered plants**

When red and white flowered plants are crossed, the offspring all bear pink flowers, as shown below.

**A cross between red and white snapdragons**



- a) What type of inheritance is involved in the control of petal colour in snap dragons? **1**

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- b) When these pink flowered snapdragons are bred with each other, what are the phenotypes of the offspring? **3**

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**Question 24 (4 marks)**

Describe a named molecular biological technique that can alter the information transferred from one generation to the next. **4**

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**Marks**

**Question 25 (6 marks)**

Evaluate the impact of major advances in scientific understanding and technology in the field of genetics on the development in reproductive technology. **6**

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Marks

**Question 26 (3 marks)**

Outline how vaccines prevent infection.

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**Question 27 (4 marks)**

Inflammation is a defence adaptation that may occur when a pathogen has entered the body. Inflammation often leads to localised increase in temperature and sometimes general fever.

a) In terms of enzyme activity, propose how an increase in temperature might act as a defence mechanism against an infection. 2

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b) Identify two other ways in which our bodies may respond to infection. 2

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Marks

**Question 28 (12 marks)**

In your studies you gathered and processed information to trace the historical development of our understanding of the cause and prevention of malaria.

a) Outline the historical development of the understanding of the causes of malaria. 5

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b) Name a parasite that causes malaria. 1

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c) Construct a diagram/flow chart to show the life cycle of this parasite. 5

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Question 28 (continued)

Marks

e) Suggest one method of controlling this parasite.

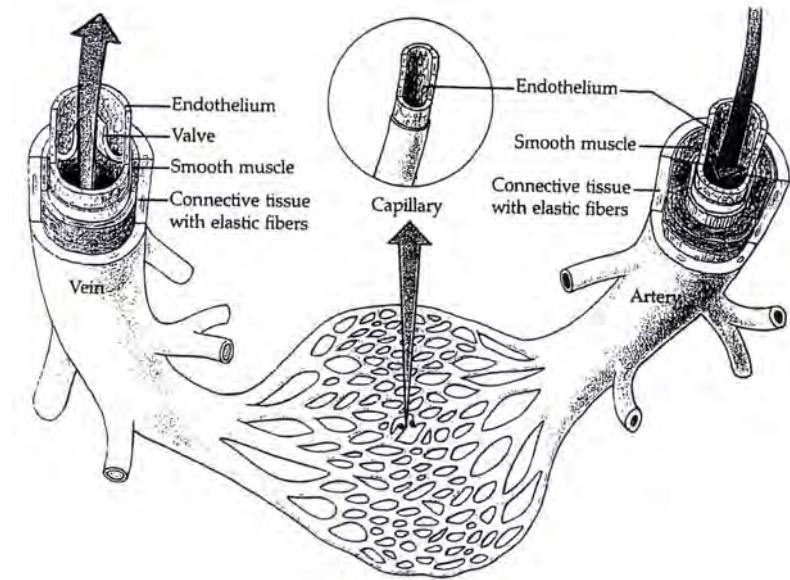
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Question 29 (9 marks)

Marks

The diagram represents part of the mammalian circulatory system.



a) Draw a labelled scientific diagram of a cross section of a capillary.

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b) Describe the role of valves in veins.

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c) Explain why the smooth muscle layer is much thicker in the artery than the vein.

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Question 29 (continued)

d) Identify two products that are isolated from donated human blood. Discuss the medical application of each of these products.

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Question 30 (3 marks)

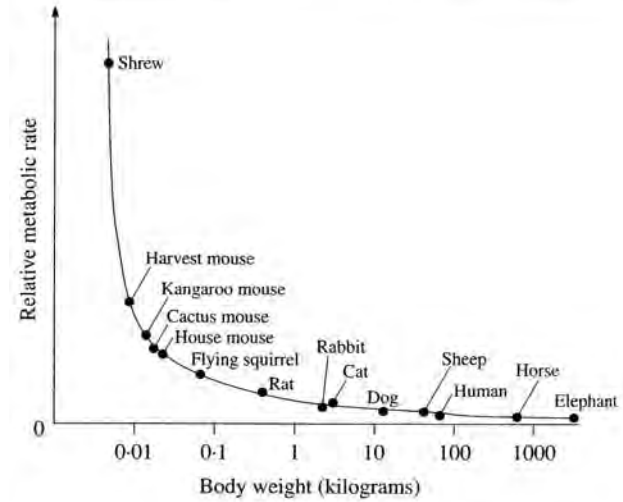
Explain why the concentration of water in cells should be maintained within a narrow range for optimal function.

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Question 31 (7 marks)

Metabolic rate is a term that can be used as an indicator of the rate at which animals use energy to maintain their body temperature. The graph shows the relationship between metabolic rate and body weight in endothermic animals.



a) Describe the relationship between body weight and metabolic rate as shown in the graph. 1

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b) Explain the shape of the graph in terms of the surface area to volume ratio of endotherms. 2

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c) Consider an ectotherm the same weight as a house mouse. Would its metabolic rate be higher, lower or the same as that of the house mouse? Explain. 2

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d) Describe two ways in which ectotherms regulate their body temperature. 2

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Question 32 (4 marks)

One of the probable consequences of rising sea levels is the occasional inundation of low lying coastal land. This will have an effect on the types of plant which are able to live in these areas.

- a) Explain why conventional crops such as wheat cannot survive if the water they receive is too salty. 2

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- b) Some flowering plants are able to live with high levels of salinity. Describe one way in which a named species of plant is adapted to live in salty water. 2

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Question 33 (7 marks)

- a) Distinguish a stimulus from a response. Give examples of each. 3

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- b) Describe a stimulus-response pathway. 4

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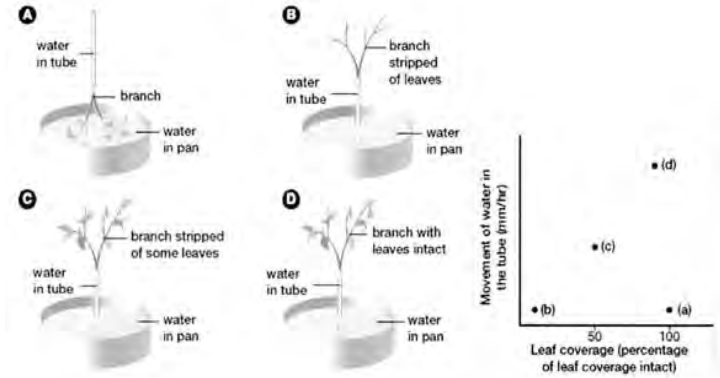
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Question 34 (6 marks)

The following diagrams illustrate an experiment conducted in the eighteenth century to explore the movement of water within a plant. The accompanying graph record the results.



- a) What is the independent variable? 1

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- b) What is the dependent variable? 1

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- c) Is there a control in this experiment? If so, what is it? If not, how could you design a control? 2

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- d) This experiment used cut tree branches. Would the results be different if a whole plant, with roots intact, had been used instead? 2

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End of Paper