STUDENT NUMBER: ……..

THE KING'S SCHOOL

2013
Higher School Certificate
Trial Examination

Biology

Disclaimer:
This is a Trial HSC Examination only. Whilst it reflects and mirrors both the format and topics of the HSC Examination designed by the NSW Board of Studies for the respective sections, there is no guarantee that the content of this exam exactly replicates the actual HSC Examination

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Board approved calculators may be used
- Write using black or blue pen
- Draw diagrams using pencil
- Write your student number at the top of EVERY page
- Use the multiple choice grid provided for your answers to Part A

Total marks – 100

Section I
Total marks (75)
This section has two parts, Part A and Part B

Part A
Total marks (20)
Attempt questions 1 – 20
Allow about 30 minutes for this part

Part B
Total marks (55)
Attempt questions 20 - 34
Allow about 1 hour 45 minutes for this part

Section II - Page 19
Total marks (25)
Attempt ONE question from Questions 35 -39
Allow about 45 minutes for this section

This paper MUST NOT be removed from the examination room

Section I

Part A

Total marks (20)
Attempt questions 1 – 20
Allow about 30 minutes for this part

Select the alternative A, B, C or D that best answers the question and indicate your choice with a cross (X) in the appropriate space on the grid provided.

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1. Which of the following statements is NOT a role of the nervous system in homeostasis?

   A detect changes from the stable state
   B counteract changes from the stable state
   C control the production and activity of enzymes
   D detect and respond to environmental changes

2. Which adaptation assists temperature regulation in plants?

   A increased production of seeds
   B movement of glucose to roots
   C large leaves to shade the plant from the sun
   D evaporation of water from stomates

3. Select the response that correctly matches the way in which carbon dioxide, oxygen and lipids are transported in mammalian blood.

	Carbon dioxide	**Oxygen**	**Lipids**
A	carried by haemoglobin in red blood cells	in plasma as ions, also by haemoglobin and as a dissolved gas	dissolved in plasma
B	in plasma as ions, also in haemoglobin and as a dissolved gas	carried by haemoglobin in red blood cells	enclosed in a protein package
C	dissolved as ions only	carried by haemoglobin in red blood cells	dissolved in plasma
D	in plasma as ions, also by haemoglobin and as a dissolved gas	dissolved as ions only	enclosed in a protein package

4. Organic matter is transported around vascular plants. Such matter includes sugars, amino acids and hormones

   Identify the correct statement about this process.

   A transpiration pull moves substance along the phloem
   B only forms of adhesion and cohesion are needed to transport organic matter
   C translocation moves organic matter from source to sink
   D movement of organic matter is a passive process requiring no energy

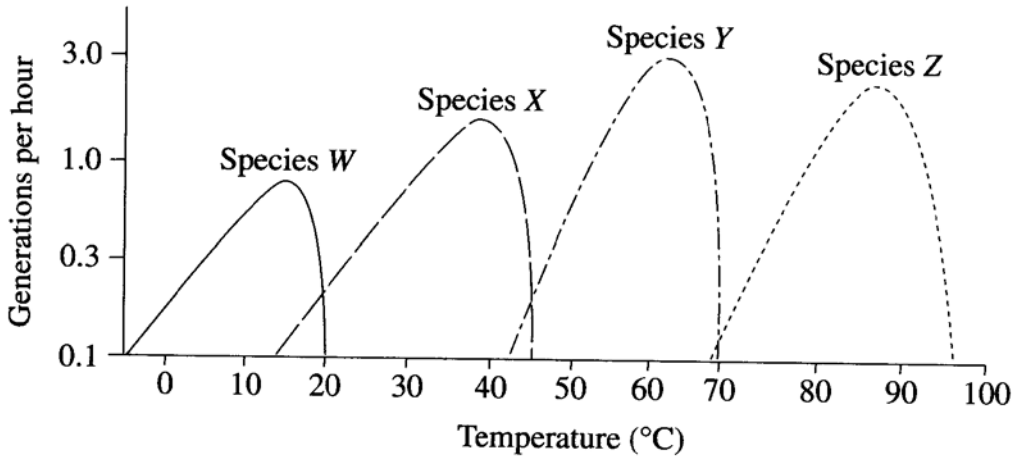
5. If the hypothalamus produces insufficient quantities of ADH then the effect on the body would include:

   A production of dilute urine
   B reabsorption of urea in the tubules of the kidney
   C production of concentrated urine
   D reabsorption of salt in the tubules of the kidney

6. The table shows four different species and the percentage of nitrogen each excretes in various forms. Which of these species is most likely to be an insect?

	% nitrogen excreted			
	ammonia	**uric acid**	**urea**	**other forms**
A	66.5	0.5	3.5	29.5
B	75.5	0.2	9.5	14.8
C	2.5	78.5	0.5	18.5
D	4.5	3.0	83.5	9.5

7. The graph shows information about four species of bacteria and their reproductive rates at different temperatures.



What conclusion can be drawn from this graph?

A all bacterial species can adapt to a broad range of temperatures
B species Y can reproduce across the broadest temperature range
C all bacterial species are limited to a range between 0°C and 100°C
D individual species reproduce in a relatively narrow range of temperatures

8. A student made the following observation during a biology lesson.

"The forelimbs of whales and birds have the same basic structural plan, with modifications"

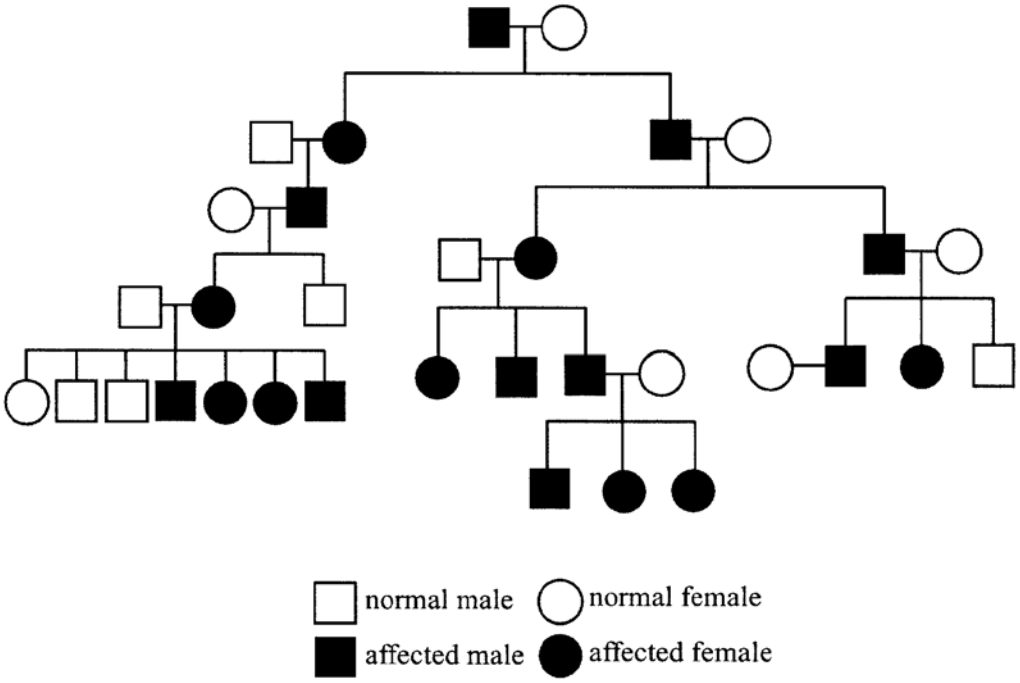
Select the statement that best describes how this observation supports the theory of evolution. These structures are evidence of:

A convergent evolution over time due to the animals being subjected to similar selective pressures
B divergent evolution over time due to the animals being subjected to different selective pressures
C gradual evolution from a common ancestor over time, with some transitional forms evident
D punctuated equilibrium with many rapid small changes and then no change over a long period of time

9. Which of the following is an example of a physical, abiotic change in the environment?

A an increase in the level of ultra-violet radiation
B an increase in the population of an organism
C an increase in nocturnal behaviour patterns
D an increase in levels of oxygen in the atmosphere

10. The pedigree below shows how individuals of a large family are affected with a particular condition.



Based on the pedigree, what is the most likely conclusion?

A the disorder is sex-linked
B the gene causing the disorder is dominant
C the gene causing the disorder is recessive
D the gene causing the disorder is co-dominant

11. Which is the most accurate statement about genes and alleles?

    A genes make up the genotype; alleles make up the phenotype
    B a gene is a segment of DNA on a chromosome; different forms of a gene are termed alleles
    C a gene is a segment of DNA of a chromosome; an allele is a segment of protein from a chromosome
    D genes are inherited characteristics; the alleles result from the interaction of genes with the environment

12. Designer cross breeds such as the "labra-doodle" (half labrador, half poodle) have become popular among dog owners. These types of organisms show the benefit of which of the following?

    A hybridisation
    B pure breeding strains
    C environment influencing phenotype
    D co-dominance over dominant-recessive allele interaction

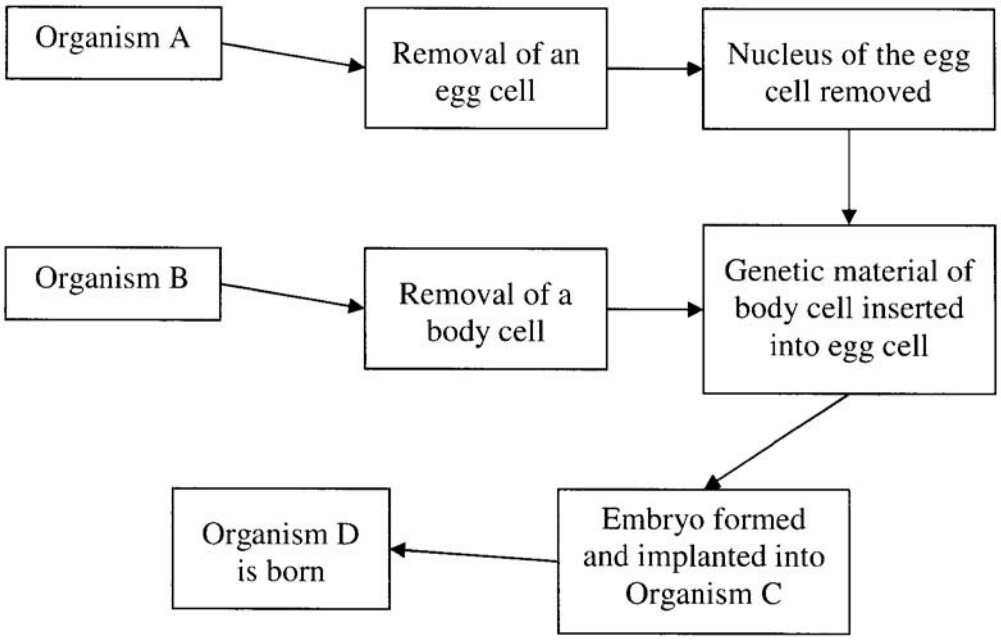
13. Mutations in DNA:

    A are only caused by ionising radiation
    B are only unfavourable
    C may generate new alleles
    D can be used to produce transgenic species

14. The role of Sutton and Boveri in genetics was that they demonstrated how:

    A chromosomes are made of DNA
    B there is no cellular basis to explain the results of Mendel
    C sex-linkage is associated with chromosomes
    D a full set of chromosomes is necessary for normal development and chromosomes carry the hereditary unit

15. The flow diagram represents a simplified method used in Biology.



Which of the following is an example of an application of this method?

A artificial insemination of horses
B artificial pollination of Bt cotton
C cloning of beef cattle
D production of genetically modified salmon containing bovine growth hormone in their genome

16. Which of the following identifies the basic components of a nucleotide?

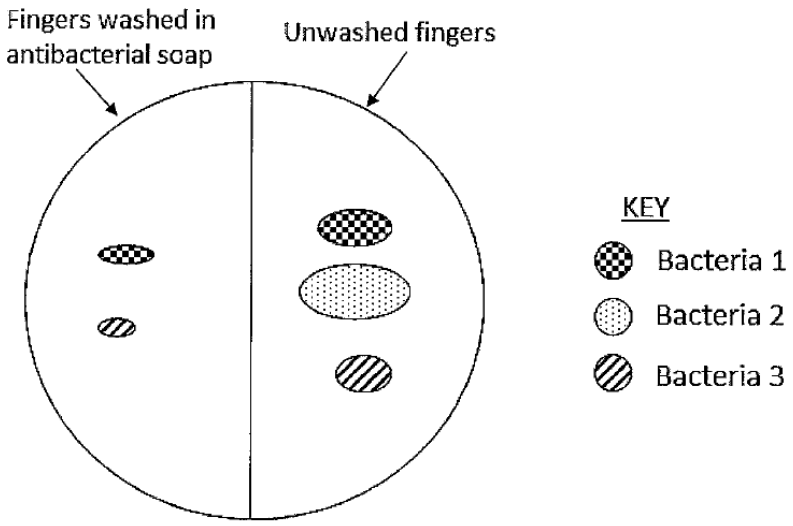
A sugar, phosphate, nitrogenous base
B adenine, thymine, cytosine, guanine
C glucose, nitrate, phosphate base
D sugar, amino acid, nitrogenous base

17. The probable reason why the Chinese and Hebrews advocated cleanliness in food, water and personal hygiene over 3000 years ago was:

A they did not have refrigeration or bottled water
B they did not have any substances to treat disease
C they had learnt to associate poor hygiene with disease
D they understood about the organisms that caused infectious diseases

18. A student placed her unwashed fingers on an agar plates. She then washed her hands with antibacterial soap and touched the agar plate again.

Her results after incubating the plate are shown.



Which explanation best describes why TWO colonies of microbes were still present after hand-washing with antibacterial soap?

A the antibacterial soap was contaminated
B antibacterial soap was effective on some types of bacteria only
C the fungus developed resistance in response to the soap
D antibacterial soap is highly effective on all pathogens

19. Which of the following is a function of mitosis that assists in the maintenance of health?

A ensuring that the correct proteins are produced
B replacing dead and injured cells
C producing a variety of specialised cells
D changing immature cells to specific mature cells

20. Which of the following is the best definition of good health?

A the absence of illness
B the state of physical, mental and social well-being
C having the ability to perform a range of physical tasks
D eating well, exercising regularly and resting appropriately

STUDENT NUMBER: ……..

Part B

Total marks (55)
Attempt ALL questions
Allow about 1 hour 45 minutes for this part

Answer the questions in the spaces provided

Show all relevant working in questions involving calculations.

Question 21 (5 marks) **Marks**

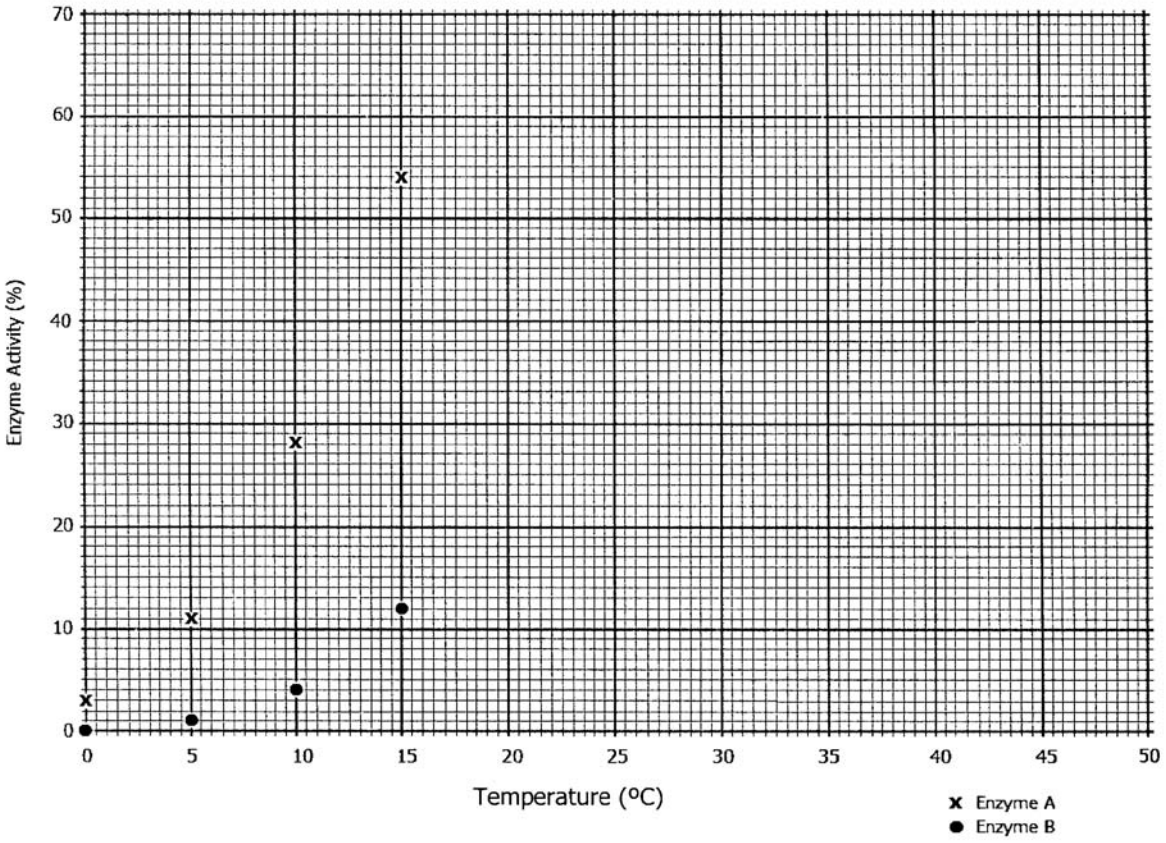
Two plant enzymes were studied by a biologist. **Enzyme A** came from a plant found in warm, temperate parts of Australia. **Enzyme B** came from a plant from hotter, tropical parts of Australia. The biologist gathered the following data on their activity.

Temperature (°C)	Activity of Enzyme A (%)	Activity of Enzyme B (%)
0	3	0
5	11	1
10	28	4
15	54	12
20	65	22
25	70	36
30	59	50
35	9	64
40	0	68
45	0	16
50	0	0

Question 21 continues on the next page

Question 21 continued... **Marks**

(a) Complete the graph below for these TWO enzymes **2**



(b) Using the graph predict the temperature at which both enzymes have a maximum activity greater than 50%. **1**

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(c) Explain why neither enzyme is active at 50°C. **2**

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Question 22 (4 marks) **Marks**

A student carried out a first-hand investigation to observe human blood under a microscope in order to determine the size of red and white blood cells.

(a) Justify ONE procedure used in this investigation to ensure reliability. **2**

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(b) Justify ONE safety precaution that should be used when conducting this investigation. **2**

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Question 23 (2 marks)

Explain how enantiostasis is different from homeostasis. **2**

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Question 24 (6 marks) **Marks**

(a) Describe a recent advance in the development of artificial blood. **1**

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(b) Compare TWO features of artificial blood with donated blood. **2**

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(c) Explain why so much research is conducted into the development of artificial blood. **3**

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Question 25 (3 marks)

Explain why the removal of CO_2 is essential for continued metabolic activity. **3**

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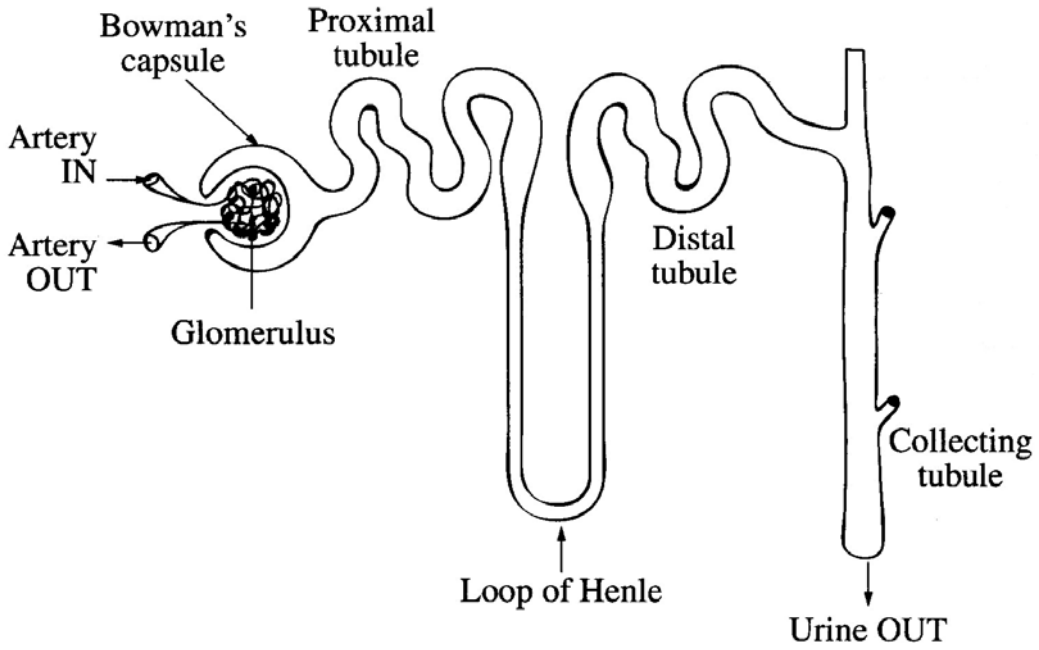
Question 26 (5 marks) **Marks**

The diagram below represents a nephron which is the functional unit of the kidney.



(a) Identify the area of the nephron over which aldosterone acts, by shading it on the diagram. **1**

(b) Discuss the importance of hormone replacement therapy for people who cannot secrete aldosterone. **4**

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Question 27 (4 marks) **Marks**

A gardener noticed that he had many ants on the grass in his backyard. He used a pesticide spray to kill most of the ants. This pesticide worked for a while but after a few years he noticed that the ants no longer appeared to be affected by the pesticide.

(a) Using Darwin's theory of evolution, explain why the number of ants surviving the pesticide began to increase. **3**

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(b) Identify ONE other current or future direction for dealing with plant pests. **1**

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Question 28 (3 marks) **Marks**

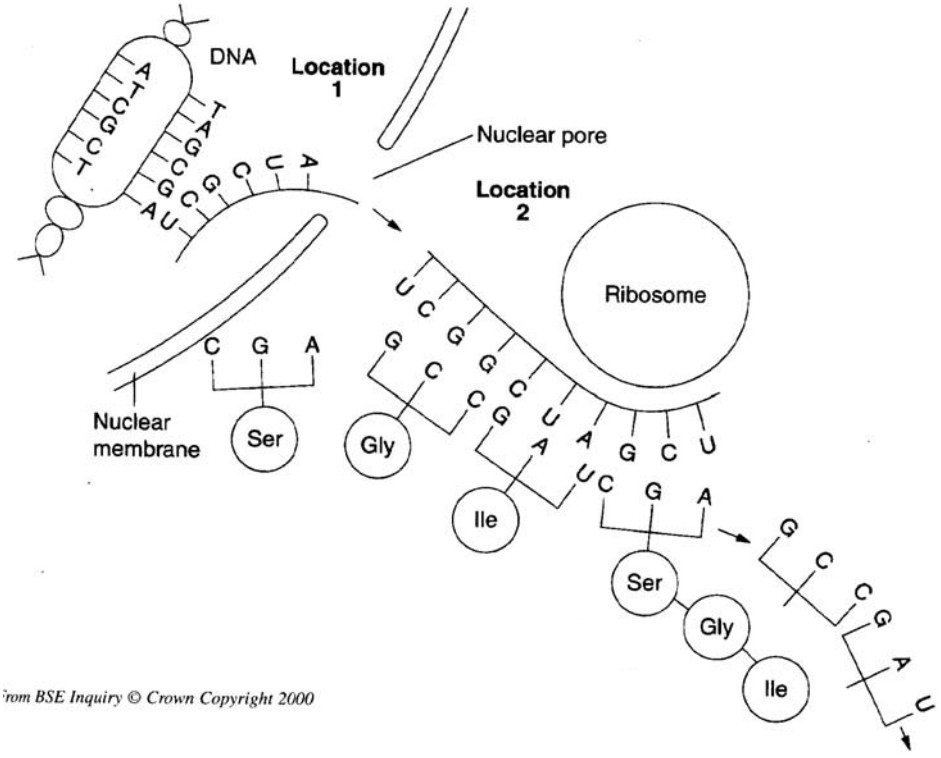
Gregor Mendel and Thomas Morgan both used breeding experiments to deduce fundamental principles of genetics.

Complete the four blank boxes in the table. **3**

	Mendel's Monohybrid Cross	**Morgan's Fruit Fly Experiments**
First cross parents phenotype	greed pod colour × yellow pod colour	red eyed female × white eyed male
First cross parents genotype		$X^R X^R \times X^r Y^-$
First cross Punnet square	g g G Gg Gg G Gg Gg	
F_1 phenotype percentage		

Question 29 (5 marks) **Marks**

The diagram represents a model of protein synthesis.



Describe the processes occurring at each of the locations 1 and 2 in the diagram. **5**

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Question 30 (6 marks) **Marks**

"Many scientists have changed the direction or nature of scientific thinking."

Evaluate this statement in relation to the contributions of each of the following pairs of scientists. **6**

- Beadle and Tatum
- Sutton and Boveri
- Watson and Crick

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Question 31 (4 marks) **Marks**

In the space below construct a flow chart that shows that changes in DNA sequences can result in changes in cell activity. **4**

Question 32 (4 marks)

Most children resemble their parents in a number of characteristics, but there are often some characteristics in the child that are unexpected.

Explain, using TWO examples, how genetics and the environment may affect the phenotype of individuals. **4**

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Question 33 (2 marks) **Marks**

Describe the difference between an infectious and a non-infectious disease. **2**

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Question 34 (2 marks)

Outline the link between gene expression and the repair of body tissue? **2**

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End of Section I

STUDENT NUMBER: ……..

Section II

Total marks (25)
Attempt ONE question from Questions 35 – 39
Allow about 45 minutes for this section

Answer the question on the writing booklet provided. You may ask for extra booklets if required.

STUDENT NUMBER: ……..

Question 35 – Communication (25 marks) **Marks**

(a) Outline the path of a soundwave through the ear and identify the energy transformations that occur. **3**

(b) Describe the relationship between the distribution of hair cells in the organ of Corti and the detection of sounds of high and low frequencies. **2**

(c) (i) Compare the range of wavelengths of the electromagnetic spectrum detected by humans with a named invertebrate. **2**

(ii) Provide a possible reason for this difference. **1**

(d) Tabulate the differences in distribution and function of photoreceptor cells in the human eye. **3**

(e) Evaluate the appropriateness of hearing aids compared to cochlear implants for different types of hearing loss, in terms of the position, conditions under which the technology will assist hearing, and the limitations of each technology. **5**

(f) Explain how cataracts can arise and the technology that can be used to prevent blindness caused by them. Discuss the implications of this technology for society. **5**

(g) Explain why some stimuli do not result in an action potential. Use a graph to support your answer. **4**

End of Question 35

End of Paper