



Birkdale
School

Sixth Form Scholarship Examination

BIOLOGY

TIME ALLOWED: 1 hour 30 minutes

NAME: _____

Instructions:

The examination is in two sections.

Section A (55 marks)

Answer all questions in the spaces provided.

Section B (20 marks)

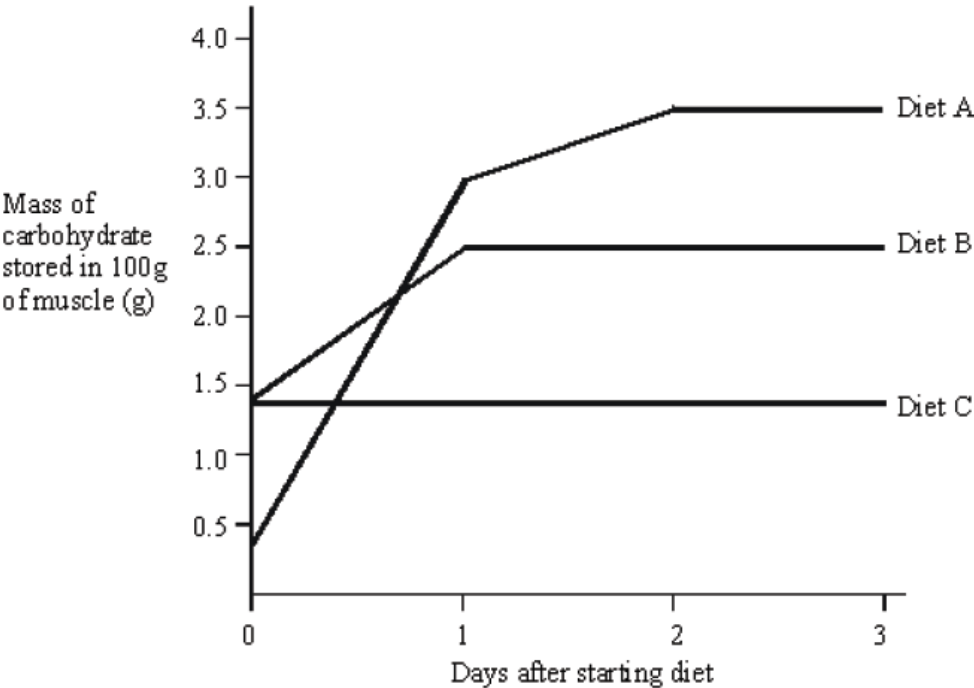
Answer only ONE question from section B.

You should answer on the lined paper provided.

You are advised to spend at least 35 minutes on section B.

Section A

Q1. The graph below shows the effect of a high carbohydrate diet on the stored carbohydrate in the muscles.



Diet A – High carbohydrate diet, started after several days of eating a diet without carbohydrate.

Diet B – High carbohydrate diet, started after normal mixed diet.

Diet C – Normal mixed diet.

What advice would you give the athlete about the best diet preparation for a long race?
Explain why you would give this advice.

Diet

Explanation

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(Total 2 marks)

Q2. The brain and the skin are involved in monitoring and controlling body temperature.

(a) Describe the parts played by the brain and the skin in monitoring body temperature.

(i) The brain

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(2)

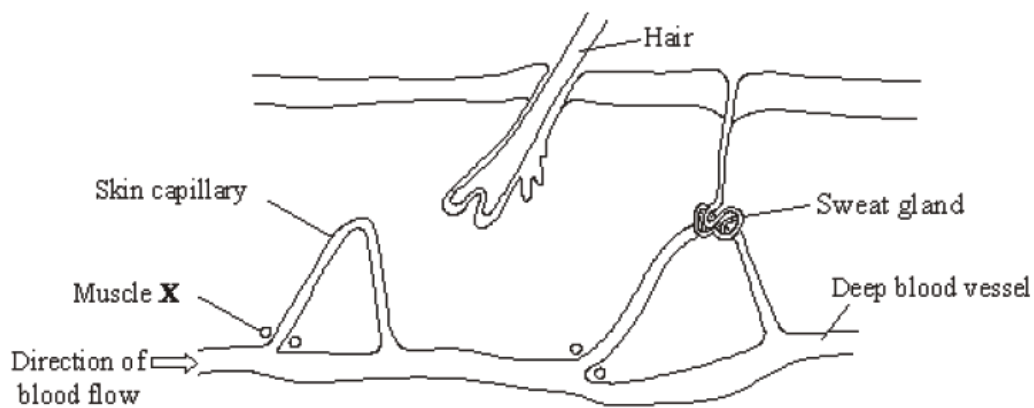
(ii) The skin

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(1)

(b) The diagram shows a section through part of the skin.



The muscle labelled **X** controls the flow of blood into the skin capillary. When muscle **X** contracts, the flow of blood into the skin capillary is reduced.

Explain the role of muscle **X** in the control of body temperature.

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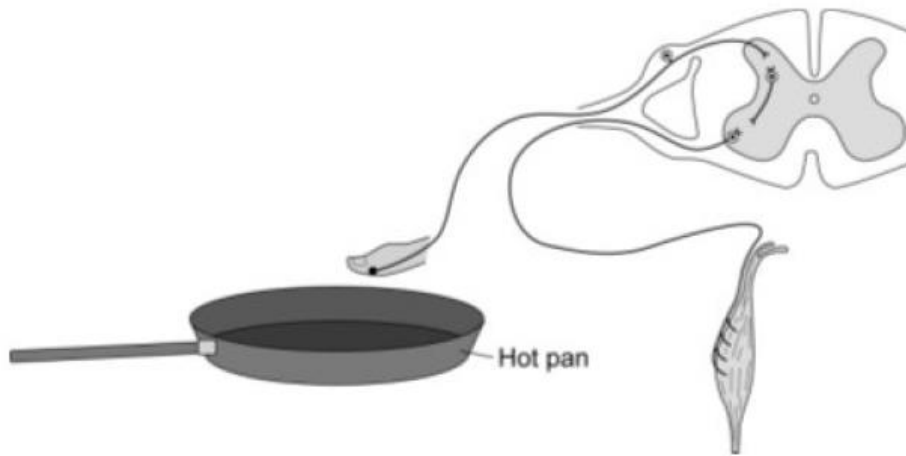
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(3)

(Total 6 marks)

Q3. A person accidentally touches a hot pan.
Her hand automatically moves away from the pan.
The diagram shows the structures involved in this action.



(a) Describe fully how the structures shown in the diagram bring about this reflex action.

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(6)

(b) (i) The nerve pathway in this reflex action is about 1.5 metres in length.
A nerve impulse travels at 75 m s^{-1} .
Use this information to calculate the time taken for this reflex action to occur.
Show clearly how you work out your answer.

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Time intervals s **(2)**

(ii) The actual time interval is longer than the interval you have calculated in part (i).
Suggest an explanation for the difference.

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(1)

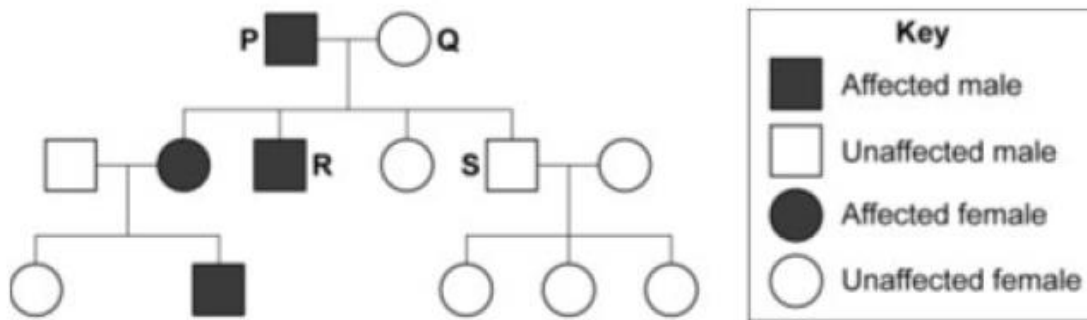
(Total 9 marks)

Q4. Sometimes babies are born with extra fingers or toes as shown in the photograph. This condition is called polydactyly.



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The diagram shows the inheritance of polydactyly in a family.



(a) Polydactyly is caused by a dominant allele, **D**.

The recessive allele of the gene is represented by **d**.

Use **one** genetic diagram to show the inheritance of the polydactyly gene by **R** and **S**.

(b) In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Embryos can be screened for genetic disorders.
Many people would favour the use of embryo screening for cystic fibrosis but not for polydactyly.

Compare the issues involved in the use of embryo screening for cystic fibrosis and for polydactyly.

You should use your knowledge and understanding of the process and the two conditions.

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(Total 10 marks)

Q5. Tetra is the first monkey to be cloned.



The method is described below.

- A sperm and an egg were combined and the resulting embryo was allowed to split into two cells, then four, then eight cells.
- At the eight-cell stage, the embryo itself was split by scientists to produce four two-cell embryos.
- The four embryos were then implanted into surrogate mothers. Three of the embryos did not survive. The fourth, Tetra, was born 157 days later. Her name means ‘one of four’.

(a) Explain why this method could produce several identical monkeys.

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(b) Suggest **two** reasons why these monkeys would be valuable in trials of new treatments for human diseases.

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(2)

(Total 4 marks)

Q6. Meiosis and mitosis are different types of division in human cells. Compare the two processes by referring to where each takes place and the kind of products that are made.

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(Total 6 marks)

Q7. There is a large amount of evidence that evolution is taking place.

(a) Scientists are uncertain about how life started on Earth.

Explain why.

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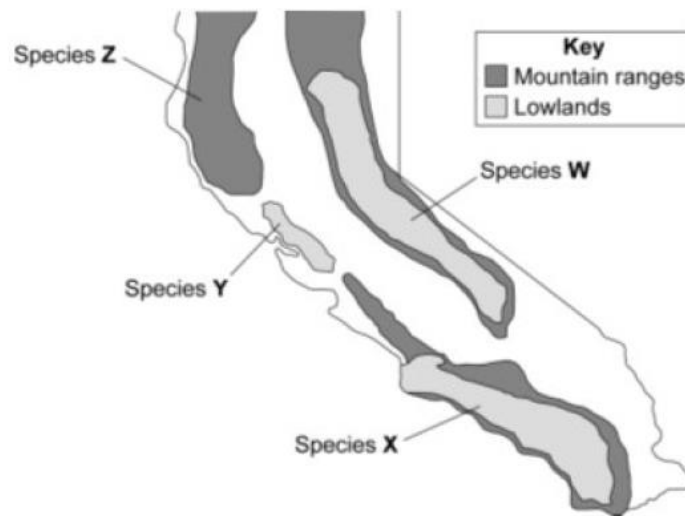
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(b) Salamanders are terrestrial amphibians.

The diagram shows the distribution of four different species of salamander in a country.



Originally, there was only one species of salamander in the country.

Suggest an explanation for the development of the four different species.

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(Total 7 marks)

Q8. The kidneys regulate the concentration of substances in the blood.

(a) Glucose is found in the blood but not in the urine.

Describe the processes that prevent glucose being excreted in the urine.

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(b) The table shows the concentrations of dissolved substances in the urine of a healthy person and the urine of a person with one type of kidney disease.

Substance	Concentration in grams per dm ³	
	Urine of a healthy person	Urine of a person with kidney disease
Protein	0	6
Glucose	0	0
Amino acids	0	0
Urea	21	21
Mineral ions	19	19

(i) Suggest an explanation for the difference in composition of the urine between the healthy person and the person with kidney disease.

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(2)

(ii) In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

The person with the kidney disease could be treated either by using a dialysis machine or by a kidney transplant operation.

Compare the **advantages** and **disadvantages** of these two methods of treatment. Use your knowledge and understanding of the two methods in your answer.

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(Total 11 marks)

Section B

Answer only **ONE** of the following questions on lined paper.

Your answer should include as much relevant detail as possible.

If diagrams are useful, include them.

Each question is marked out of 20.

Either

1. 'Cells are all the same but they are all different'

Discuss this statement.

or

2. Briefly outline the biological importance of water.

or

3. Outline, with examples from Biology, the factors that can affect rates of reaction.