

Write your name here

Surname

Other names

**Pearson**  
**Edexcel GCSE**

Centre Number

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Candidate Number

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**Biology**  
**Unit B3: Using Biology**

**Higher Tier**

Monday 20 June 2016 – Morning  
**Time: 1 hour**

Paper Reference

**5BI3H/01**

**You must have:**  
Calculator, ruler

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*

### Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed  
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

### Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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**PEARSON**

**Answer ALL questions**

**Some questions must be answered with a cross in a box ☒.  
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.**

**Biofuels**

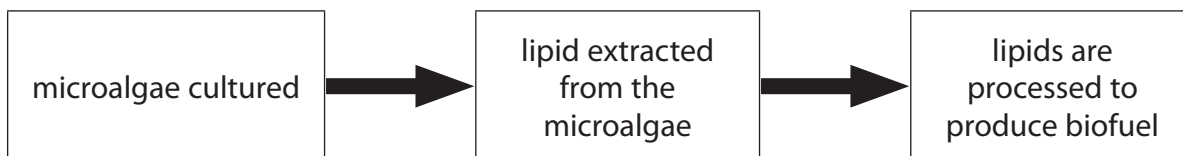
**1** Photosynthetic microalgae and other plants can be used to produce biofuels.

Microalgae grow in water.

The photograph shows microalgae being cultured in closed systems.



The flow diagram shows how biofuels are produced from microalgae.



(a) (i) Suggest one advantage of using microalgae rather than other plants to make biofuels.

(1)

(ii) Name the gas that would be supplied to the closed system to allow the microalgae to grow.

(1)

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(iii) Closed systems require aseptic precautions.

Explain the benefit of maintaining aseptic conditions.

(2)

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(iv) Suggest two other factors that would need to be maintained in a closed system to allow the microalgae to grow.

(2)

1 .....

2 .....

(b) Biofuels can be used instead of fossil fuels as an energy resource.

Describe the advantages of using biofuels rather than fossil fuels.

(2)

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**(Total for Question 1 = 8 marks)**

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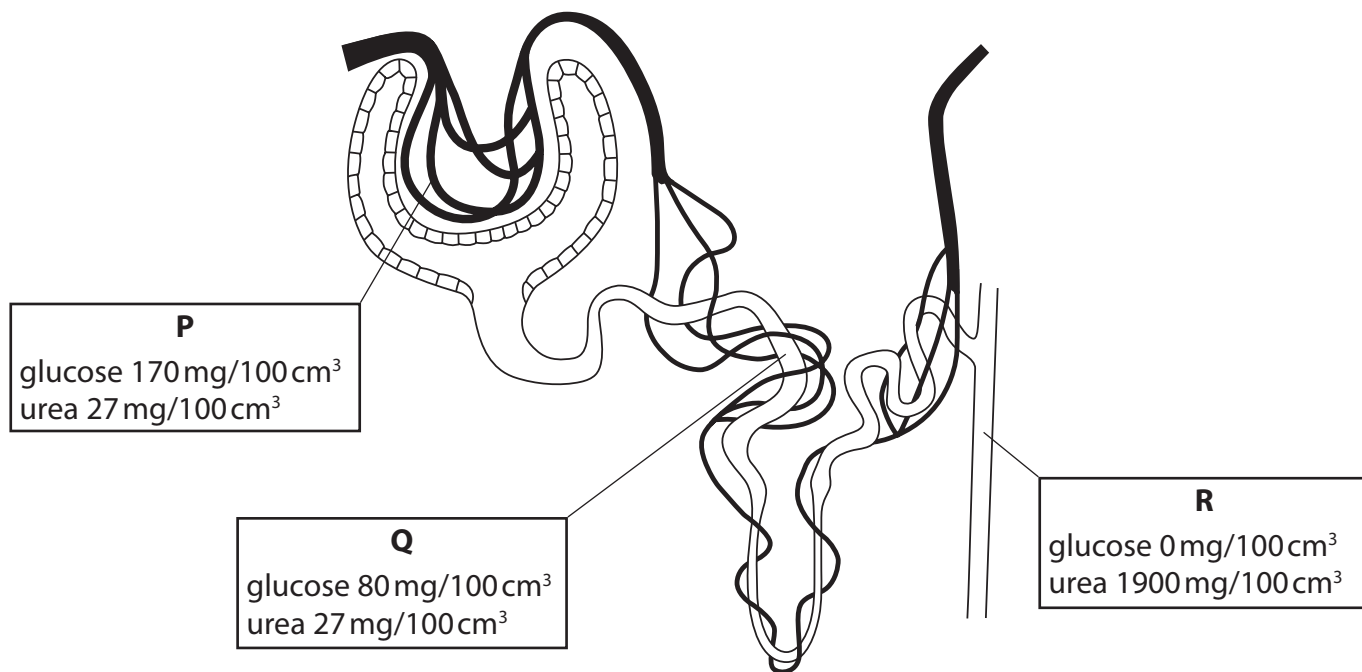
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### The kidney

2 Glucose and urea are transported in the blood to nephrons.

The diagram shows a nephron with the glucose and urea concentrations at locations labelled **P**, **Q** and **R**.



(a) (i) Calculate the percentage decrease in glucose concentration between location **P** and location **Q**.

(2)

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(ii) Describe how glucose is removed from the nephron.

(2)

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(iii) Explain the change in the concentration of urea between location **Q** and location **R**.

(2)

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(b) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Urea enters the nephron through the

(1)

- A Bowman's capsule
- B bladder
- C collecting duct
- D loop of Henlé

(ii) Which hormone controls the permeability of the collecting duct?

(1)

(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Urine is transported from the bladder through the

(1)

- A renal artery
- B renal vein
- C ureter
- D urethra

**(Total for Question 2 = 9 marks)**



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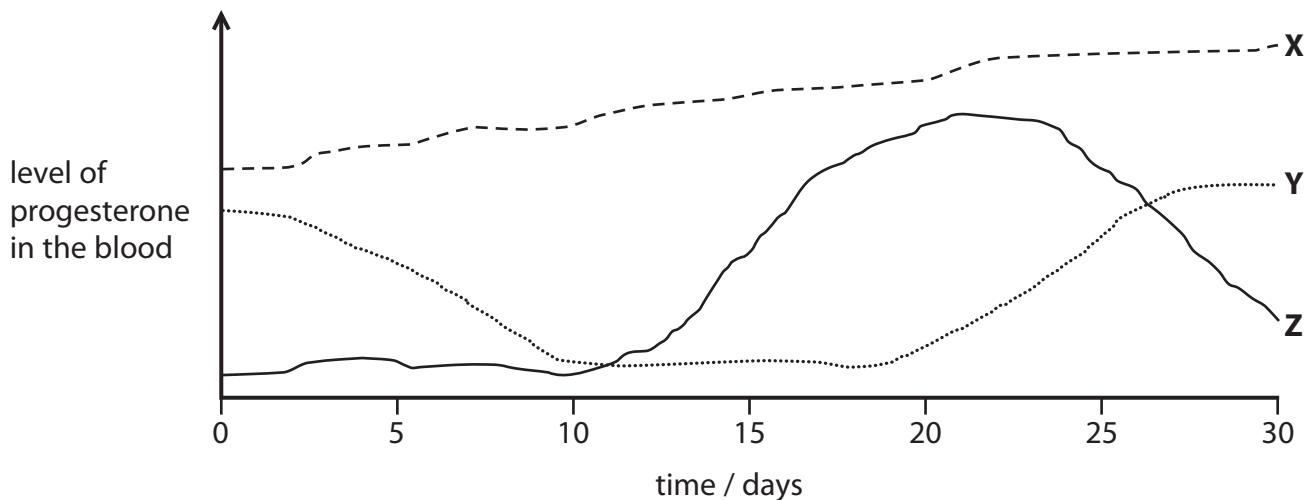
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### Hormones

3 Progesterone is a hormone involved in the control of the menstrual cycle.

The graph shows the level of progesterone in the blood of three women, labelled **X**, **Y** and **Z**, for 30 days.



(a) (i) Which stage of the menstrual cycle is occurring for person **Y** on day 10?

Put a cross (☒) in the box next to your answer.

- A** menstruation
- B** ovulation
- C** uterus lining thickening
- D** fertilisation

(1)

(ii) Suggest a reason for the increasing progesterone level of person **X**.

(1)

(iii) Explain the role of progesterone in the menstrual cycle.

(3)

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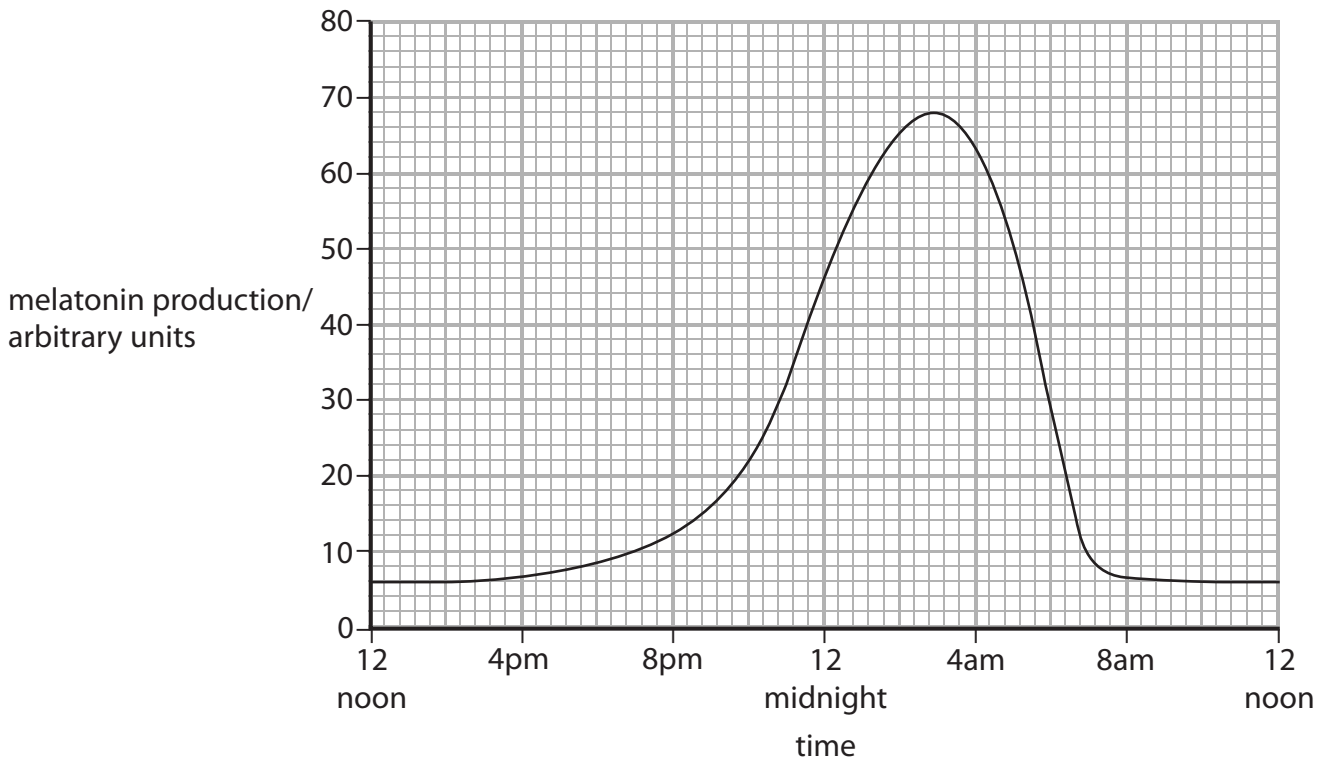
(iv) Which hormone is responsible for triggering the release of the egg in the menstrual cycle?

(1)

(b) Melatonin is a hormone involved in the regulation of sleep cycles.

Light affects the production of melatonin.

The graph shows the level of melatonin in the blood of a person for 24 hours.



(i) Using information from the graph, describe the effect of light on melatonin levels in the blood.

(2)

(ii) Some biological activities in mammals follow a daily rhythm.

State the term used to describe this type of rhythm.

(1)

(Total for Question 3 = 9 marks)

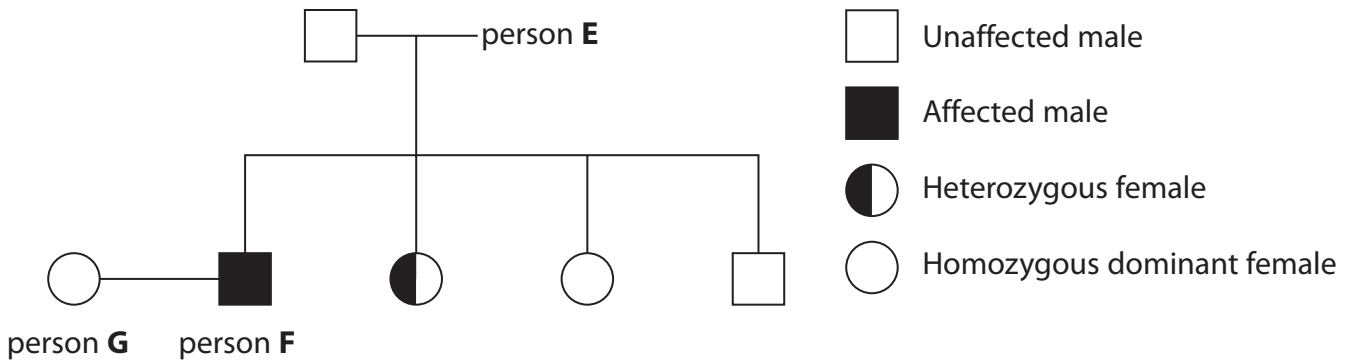


**Blood disorders**

4 Haemophilia is a recessive sex-linked genetic disorder.

The letter **h** is used for the recessive allele and **H** for the dominant allele.

The diagram shows the inheritance of haemophilia in a family.



(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The genotype of person **E** is

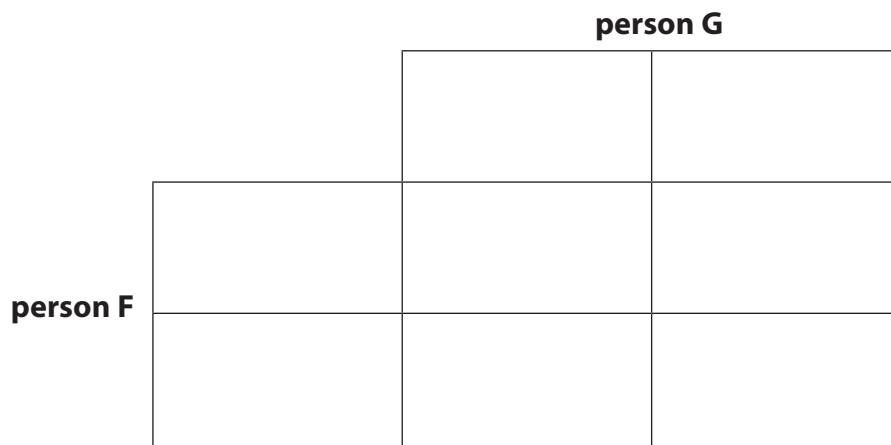
(1)

- A**  $X^hX^H$
- B**  $X^HX^H$
- C**  $X^hY$
- D**  $X^HY$

(ii) Calculate the probability of person **F** and person **G** having a child with haemophilia.

Use the Punnett square for your answer.

(3)



Probability of having a child with haemophilia .....

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(b) Blood clots can be detected using monoclonal antibodies.

(i) Describe how monoclonal antibodies are produced.

(4)

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(ii) Describe how monoclonal antibodies can be used to detect blood clots.

(2)

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**(Total for Question 4 = 10 marks)**

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### Human evolution and migration

5 The history of human migration can be tracked by analysing mitochondrial DNA.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

Mitochondrial DNA is inherited down the female line because the mitochondria are found in the

(1)

- A egg cytoplasm
- B egg nucleus
- C sperm cytoplasm
- D sperm nucleus

(b) Explain the effect of the Ice Age on human migration.

(3)

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\* (c) Many fossils of early humans have been discovered in Africa, including Lucy from 3.2 million years ago.

Leakey found many early human fossils in Africa from 1.6 million years ago.

Describe how Leakey used the fossils and surrounding environment to reach the conclusion that his fossils were from a species more recent than Lucy.

(6)

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(d) Human evolution has been influenced by parental care.

Explain how parental care contributes to evolution.

(2)

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**(Total for Question 5 = 12 marks)**

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**DNA technology**

6 Recombinant DNA technology is used to insert the insulin gene into bacteria.

The same technology is used to transfer a toxin gene from the bacterium *Bacillus thuringiensis* into *Agrobacterium tumefaciens*.

(a) Describe how the toxin gene from *Bacillus thuringiensis* is transferred to *Agrobacterium tumefaciens*.

(3)

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(b) *Agrobacterium tumefaciens* can be used to transfer the toxin gene to the cells of crop plants.

Complete the sentence by putting a cross (☒) in the box next to your answer.

In this process, *Agrobacterium tumefaciens* acts as (1)

- A** an enzyme
- B** a hybridoma
- C** an antigen
- D** a vector

(c) Explain how *Agrobacterium tumefaciens* transfers the toxin gene to the crop plants. (2)

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\***(d)** Cells containing the toxin gene produce a chemical that kills insects.

Explain the advantages and disadvantages of introducing the toxin gene into crop plants.

**(6)**

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**(Total for Question 6 = 12 marks)**

**TOTAL FOR PAPER = 60 MARKS**



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