



General Certificate of Secondary Education  
2019–2020

Centre Number

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Candidate Number

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# Single Award Science: Biology

Unit 1  
Higher Tier

<b>MV18</b>
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[GSA12]

**WEDNESDAY 26 FEBRUARY 2020, MORNING**

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## **Time**

1 hour, plus your additional time allowance.

## **Instructions to Candidates**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

**You must answer the questions in the spaces provided.**

**Do not write on blank pages.**

Complete in black ink only.

Answer **all nine** questions.

## **Information for Candidates**

The total mark for this paper is 60.

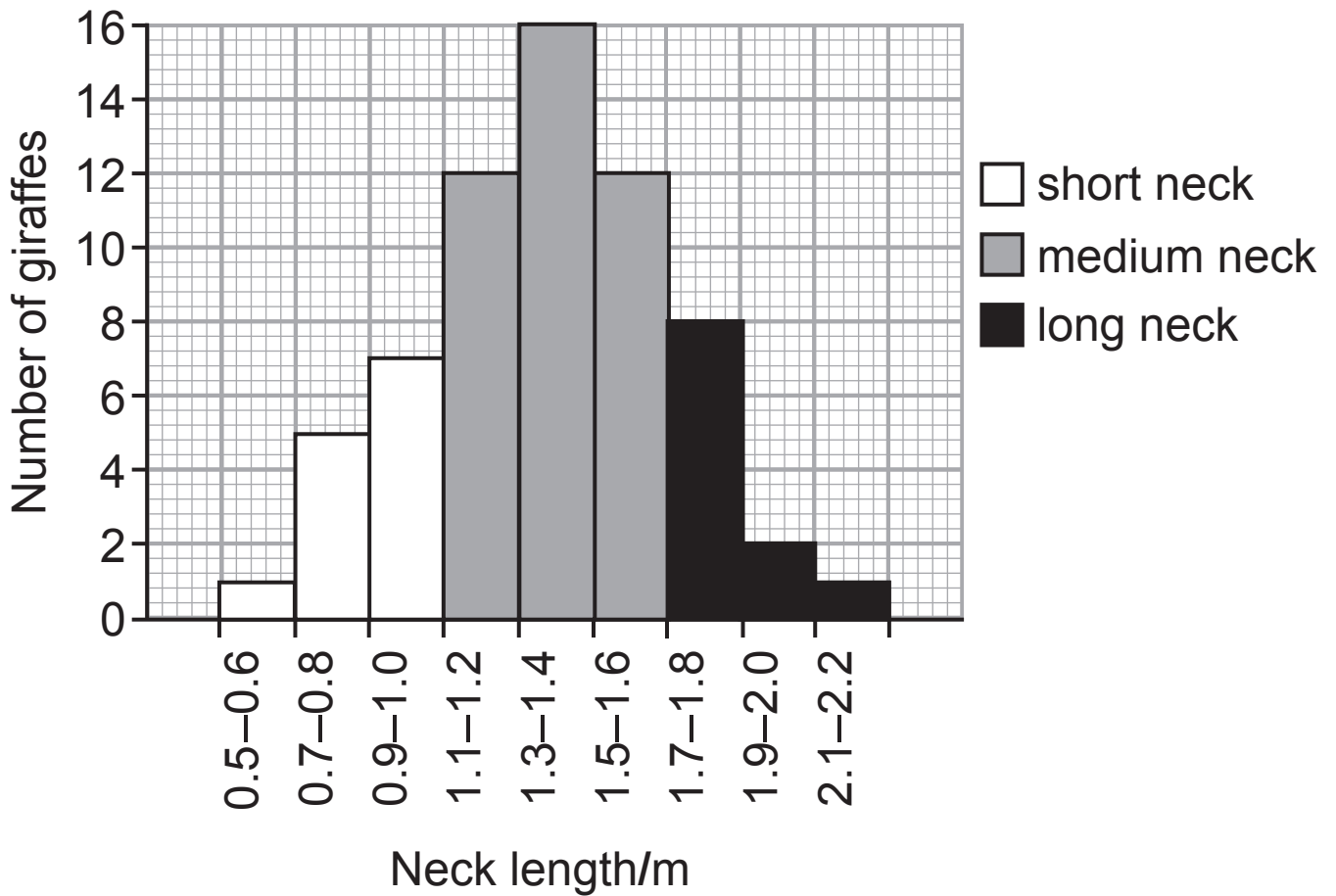
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **2(c)**.

1 (a) A giraffe is an animal with a long neck.



The graph below shows the neck lengths of **64 giraffes**.



(i) What type of variation is shown by the results in this graph? [1 mark]

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(ii) Calculate the percentage of giraffes with a **medium** neck length. [2 marks]

(Show your working out.)

\_\_\_\_\_ %

(b) Give **one** cause of variation in a population. [1 mark]

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- 2 (a) One method of genetic screening involves using a sterile cotton bud to collect cheek cells.



sterile cotton bud

The sample of cheek cells is then sent to a laboratory so that the DNA can be extracted and analysed.

- (i) Suggest **one** advantage of this simple method of genetic screening. [1 mark]

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- (ii) Name the part of a cell that contains DNA. [1 mark]

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- (iii) What term is used to describe all the genetic material within an organism? [1 mark]

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(b) The results from a genetic screening test showed David may have health problems in the future. Give **two** ways life insurance companies may disadvantage him.

[2 marks]

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

(c) Skin cancer is caused by a mutation in skin cells. Explain what is meant by the term mutation and how this can lead to cancer. [6 marks]

Your answer should include:

- one factor that triggers skin cancer
- **two** reasons for the increase in skin cancer rates in the UK
- the name of **one** other condition caused by a mutation.

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

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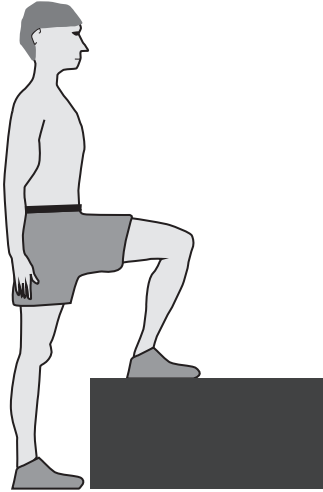
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- 3 (a) Five students investigated the number of step-ups they could do in 1 minute. They repeated this three more times taking a short break between each test.



The results are shown in the table below.

	<b>Step-ups in 1 minute</b>			
<b>Student</b>	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>	<b>Test 4</b>
<b>A</b>	58	54	48	46
<b>B</b>	56	51	49	45
<b>C</b>	58	53	52	49
<b>D</b>	59	54	51	50
<b>E</b>	56	50	46	40

- (i) State the trend shown by this information.  
[1 mark]

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(ii) Suggest which student (**A**, **B**, **C**, **D** or **E**) does **not** exercise regularly. Explain your answer. [2 marks]

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(iii) The students took part in a four week fitness program and then repeated this investigation. Suggest **one** way their results might be different. [1 mark]

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(b) Continuous exercise produces heat energy due to respiration.

(i) Complete the word equation for respiration. [2 marks]



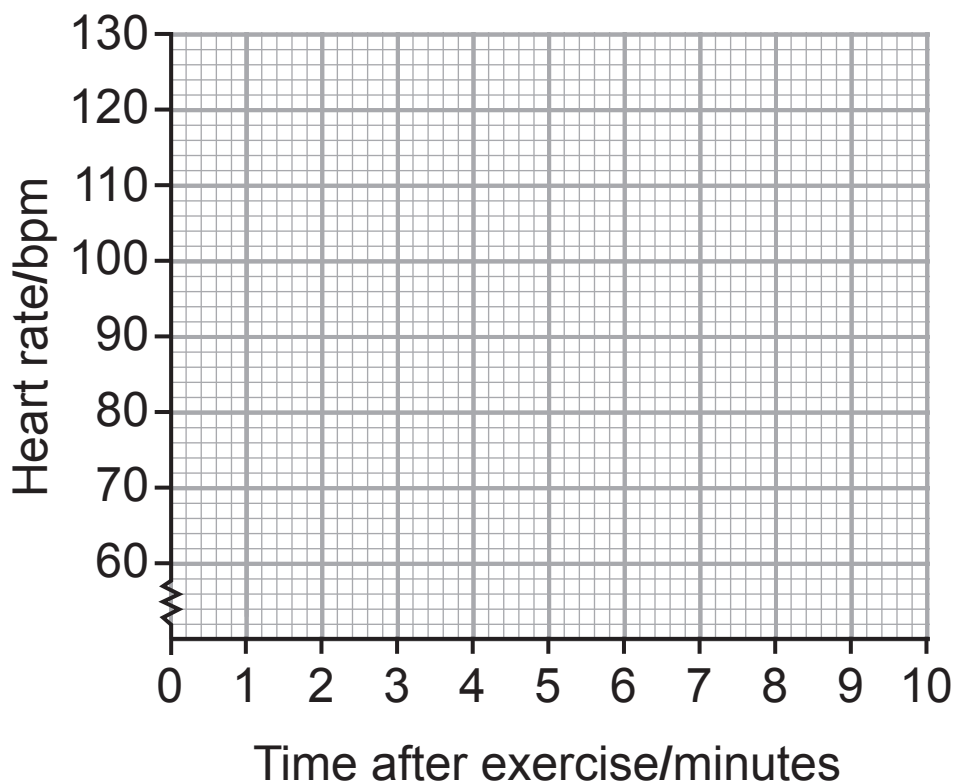
(ii) What term describes the release of heat energy in respiration? [1 mark]

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(c) The students then investigated how long it took for their heart rates to return to normal after exercise. The results for one of the students is shown below.

Time after exercise/minutes	0	2	4	6	8	10
Heart rate/bpm	125	102	85	74	70	70

(i) Using the grid below plot and draw a line graph of these results. [3 marks]



(ii) Suggest how long it took for this student's heart rate to return to normal. [1 mark]

\_\_\_\_\_ minutes

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**(Questions continue overleaf)**

- 4 The table below shows the mass of sugar in  $100 \text{ cm}^3$  of four different orange juice drinks (**A**, **B**, **C** and **D**).

Orange juice drink	Mass of sugar in $100 \text{ cm}^3/\text{g}$
<b>A</b>	16.3
<b>B</b>	14.0
<b>C</b>	11.5
<b>D</b>	12.0

The recommended daily intake of sugar for an adult should not be more than 30 g.

- (a) Calculate the volume ( $\text{cm}^3$ ) of orange juice drink **D** that would give 30 g of sugar. [2 marks]

(Show your working out.)

\_\_\_\_\_  $\text{cm}^3$

The government has recently introduced a tax on the amount of sugar in drinks.

The table below shows how the tax added depends on the mass of sugar in the drink.

<b>Tax band</b>	<b>Mass of sugar in 100 cm<sup>3</sup>/g</b>	<b>Tax added per litre/pence</b>
<b>1</b>	less than 5	0
<b>2</b>	between 5–8	18
<b>3</b>	more than 8	24

(b) How many of the orange juice drinks shown in the table opposite would be in **Tax band 3**? [1 mark]

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(c) (i) Apart from obesity name **one** health condition that is linked to eating too much sugar. [1 mark]

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(ii) Suggest **one** impact that the introduction of the sugar tax will have on the National Health Service (NHS). [1 mark]

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5 (a) In pea plants the allele for tallness (T) is dominant to the allele for dwarfism (t).

(i) Complete the Punnett square below to show how two tall pea plants could produce a dwarf pea plant. [2 marks]


(ii) State the ratio of tall plants to dwarf plants. [1 mark]

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(iii) Give the genotype of a homozygous tall pea plant. [1 mark]

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(b) Alleles are alternative forms of a gene. Explain fully what is meant by the term **gene**. [2 marks]

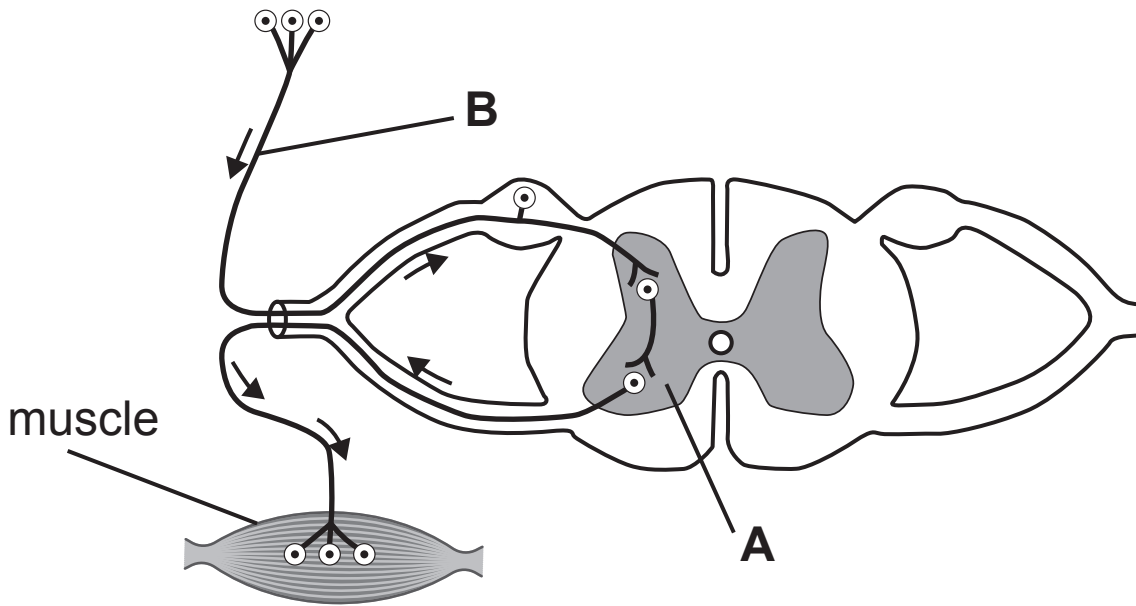
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6 The diagram below shows the nerve pathway involved in a reflex action.



(a) Name the part of the central nervous system labelled **A** in the diagram. [1 mark]

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(b) Name the neurone labelled **B** in the diagram. [1 mark]

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(c) What term is used to describe the **muscle** in a reflex arc? [1 mark]

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(d) Explain fully why a reflex action is faster than a voluntary action. [2 marks]

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7 Lichen can be used as biotic pollution monitors.



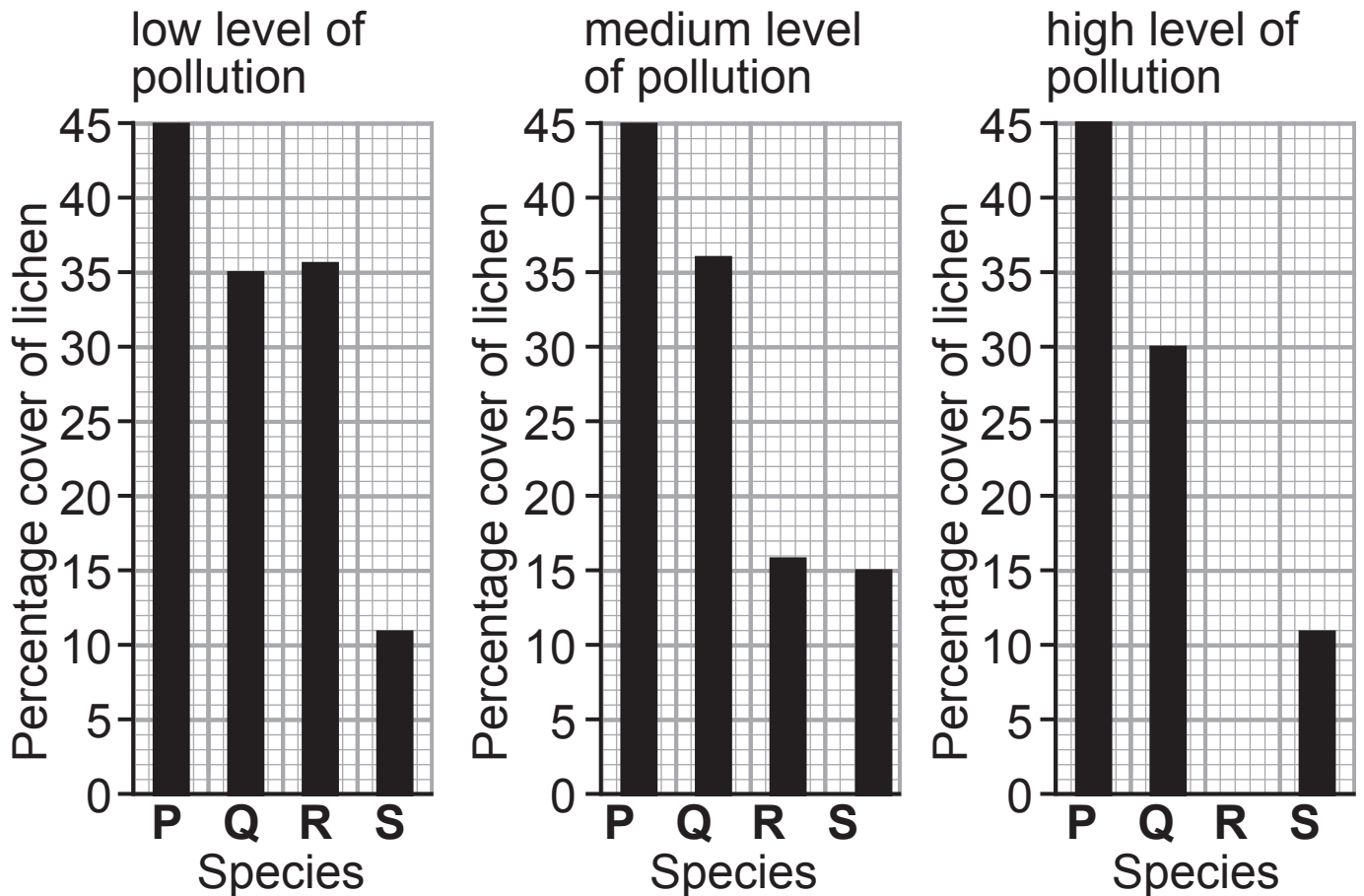
lichen on tree

(a) What is meant by the term **biotic**? [1 mark]

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The graphs below show the percentage cover of four different lichen (**P**, **Q**, **R** and **S**) growing in different levels of pollution.



**(b) (i)** Which species (**P**, **Q**, **R** or **S**) can best tolerate high levels of pollution? [1 mark]

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**(ii)** Which species (**P**, **Q**, **R** or **S**) is the best indicator of pollution levels? [2 marks]  
Explain your answer.

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**(c)** Abiotic factors are also used as pollution monitors. Give **one** example of an abiotic factor. [1 mark]

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8 (a) Bone marrow transplants can be used to treat leukaemia. Stem cells from the bone marrow are transplanted from a donor to the patient.

(i) What is a **stem cell**? [2 marks]

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(ii) Give **two** potential risks involved in the use of stem cells in the treatment of diseases such as leukaemia. [2 marks]

1. \_\_\_\_\_

2. \_\_\_\_\_

(b) For many conditions adult stem cells are not suitable and researchers are hoping to use stem cells from an embryo (a fertilised egg that has divided into a ball of cells).

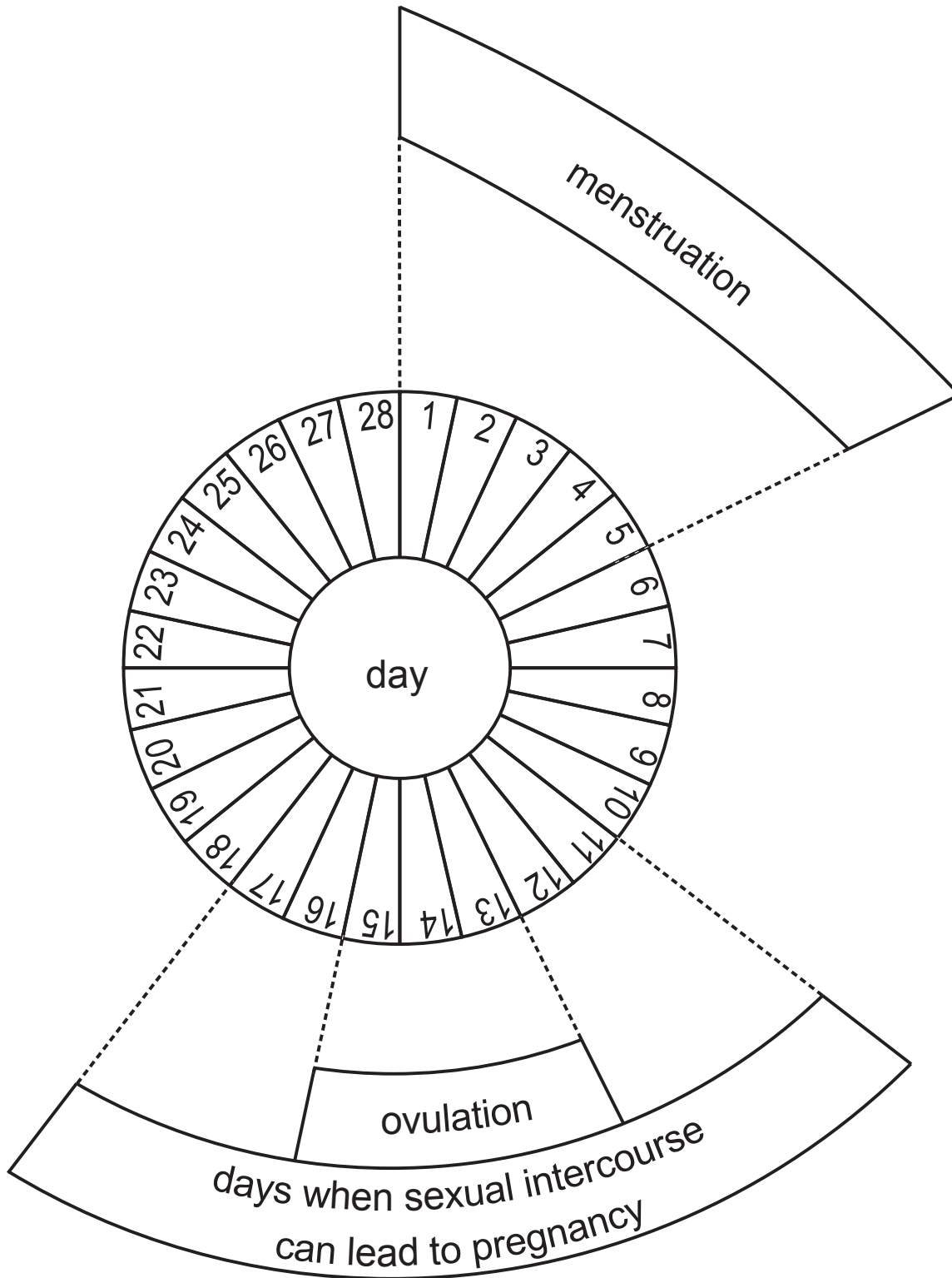
Suggest **one** ethical issue with the use of embryos in research. [1 mark]

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9 The diagram below shows the menstrual cycle.



**(a)** The menstrual cycle is controlled by hormones.

**(i)** Explain what is meant by the term **hormone**.  
[2 marks]

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**(ii)** Name the hormone that stimulates ovulation.  
[1 mark]

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**(iii)** Describe fully the changes that would happen in the uterus between day 1 and day 12. [2 marks]

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**(iv)** Explain why it would be possible for a female to become pregnant if sexual intercourse took place on day 16. [1 mark]

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**(b)** Describe fully how the female contraceptive pill prevents pregnancy. [2 marks]

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**This is the end of the question paper**

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Q3(a) .....Source: Principal Examiner

Q6.....Source: Principal Examiner

Q7.....© *Getty Images*

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Question Number	Marks
1	
2	
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9	

<b>Total Marks</b>	
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Examiner Number

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