Write your name here

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Centre Number | | | | | |

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Biology

Unit: KBI0/4BI0
Science (Double Award) KSC0/4SC0
Paper: 1B

Tuesday 17 May 2016 – Afternoon
Time: 2 hours

Paper Reference
KBI0/1B 4BI0/1B
KSC0/1B 4SC0/1B

You must have:
Ruler
Calculator

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.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 120.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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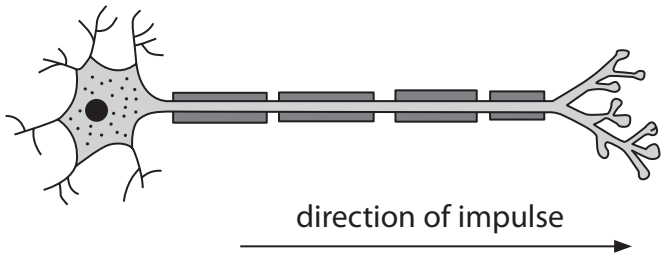
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Answer ALL questions.

1 The diagram shows an animal cell called a neurone.



(a) Name the three structures found in a plant cell that are not found in a neurone.

(3)

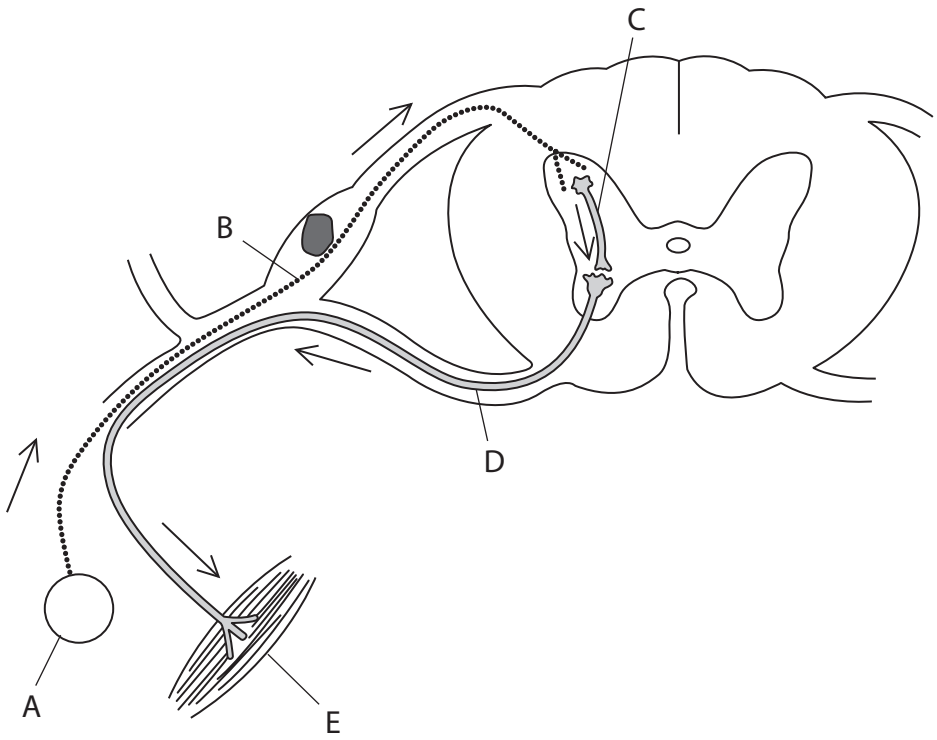
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(b) Neurones are involved in the reflex arc that helps humans respond to stimuli.

The diagram shows a reflex arc with parts labelled A, B, C, D and E.
The arrows show the direction of the nerve impulse.



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(i) Complete the table by naming each part of the reflex arc.
One has been done for you.

(4)

Part	Name
A	
B	sensory neurone
C	
D	
E	

(ii) There is a small gap between neurone B and neurone C.

What is the name of the small gaps between neurones?

(1)

.....

(c) Nerve impulses can travel along neurones at 120 m/s.
The distance between the spinal cord and the foot of a human is 90 cm.

Calculate the time, in seconds, that it would take a nerve impulse to travel from the spinal cord to the foot of this human.
Show your working.

(2)

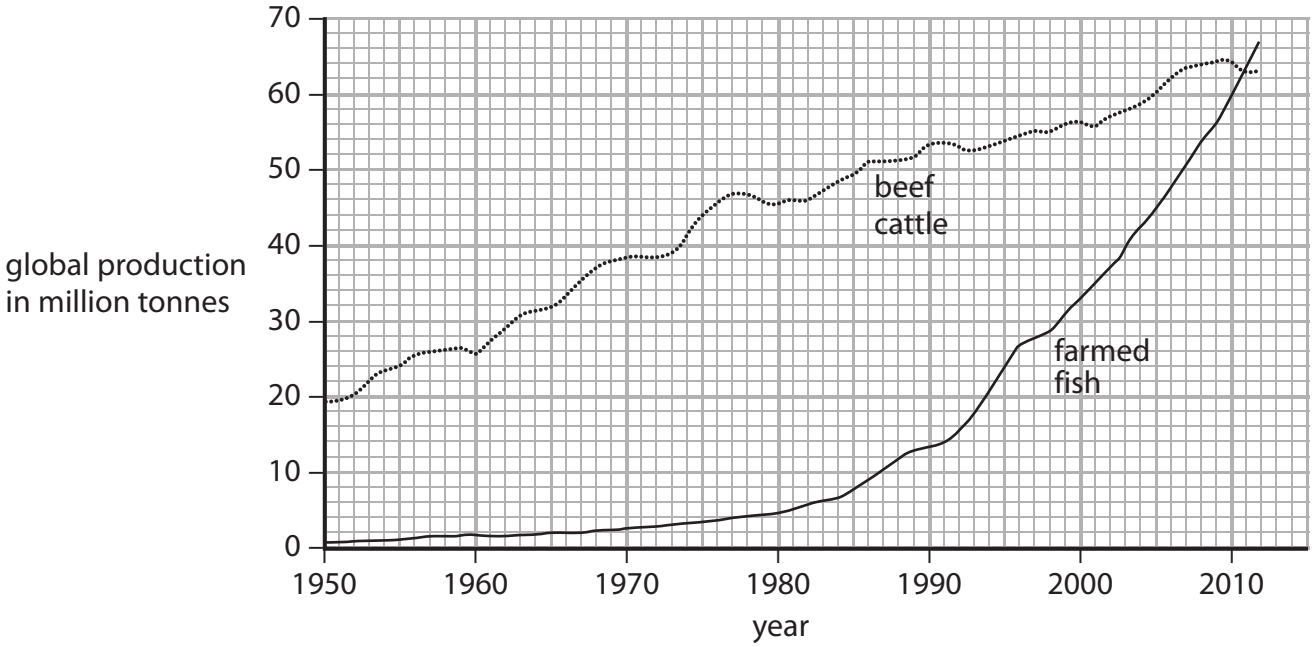
time = ... seconds

(Total for Question 1 = 10 marks)

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2 Fish and beef cattle are farmed to provide a source of protein for humans.

The graph shows changes in the global production of farmed fish and beef cattle since 1950.



(a) (i) Describe the changes in the global production of farmed fish and beef cattle since 1950.

(3)

(ii) By 2020, the production of farmed fish is expected to be six times greater than in 1990. Calculate the mass of farmed fish expected to be produced in 2020. Show your working.

(2)

mass of farmed fish = ... million tonnes

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(b) Describe what happens to fish protein in the human stomach.

(4)

(c) Many molecules in the human body are made from protein.

The table lists some protein molecules, the function of each molecule and the place where each molecule is made.

Complete the table by giving the missing information.

(6)

Protein molecule	Function of protein molecule	Place where protein molecule is made
haemoglobin		red blood cells
	digest starch	salivary gland
insulin		
	binds to antigens on pathogens	

(Total for Question 2 = 15 marks)

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3 Carbon dioxide, methane and nitrous oxide are all greenhouse gases.

(a) (i) Name a source of nitrous oxide.

(1)

.....

(ii) Name one other greenhouse gas.

(1)

.....

(b) The table shows the masses of three different greenhouse gases released into the atmosphere in the United Kingdom from 1990 to 2010.

Year	Mass of gas released each year in millions of tonnes		
	carbon dioxide	methane	nitrous oxide
1990	590.3	4.6	0.2
1995	566.7	4.0	0.2
2000	550.5	3.0	0.1
2005	552.0	2.2	0.1
2010	496.0	2.1	0.1

(i) Calculate the percentage decrease in the mass of carbon dioxide released between 1990 and 2010.
Show your working.

(2)

percentage decrease in mass = ... %

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(ii) Suggest why the mass of carbon dioxide released has decreased from 1990 to 2010.

(3)

(iii) Describe the changes in the mass of methane released between 1990 and 2010.

(2)

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(c) Explain the advantages of reducing the mass of greenhouse gases released into the atmosphere.

(5)

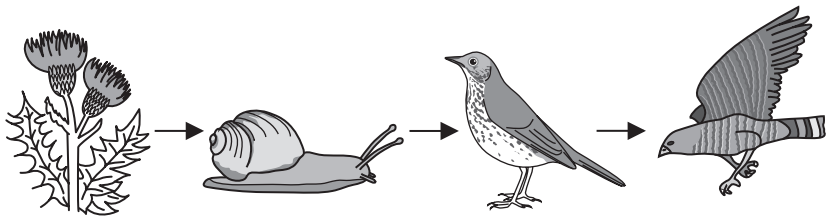
(Total for Question 3 = 14 marks)

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4 The diagram shows a food chain.



thistle garden snail song thrush sparrowhawk

(a) (i) Name the producer in this food chain.

(1)

.....

(ii) Name the secondary consumer in this food chain.

(1)

.....

(b) The sparrowhawk uses its eyes to see its prey. The photograph shows a sparrowhawk's eye.



(i) Name the parts labelled A and B.

(2)

A .....

B .....

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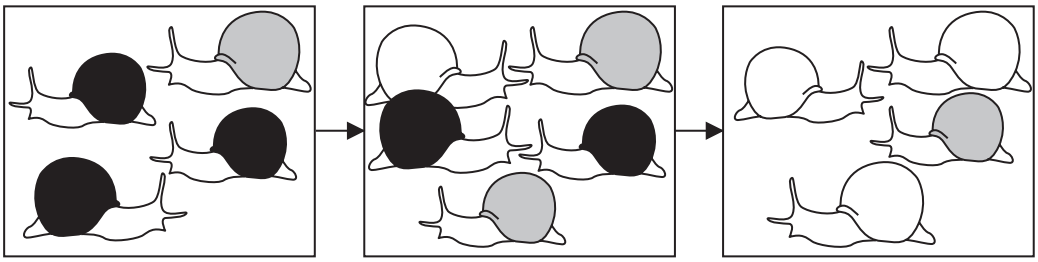
(ii) The table describes other parts of the eye.
Complete the table by naming each part that is described.

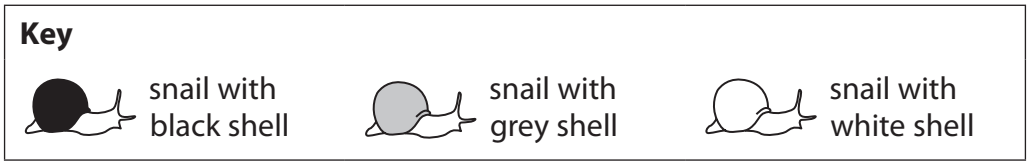
(3)

Description	Name of part of eye
the tough protective outer layer	
the nerve from the eye to the brain	
focuses light onto the retina	

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(c) A student put these drawings in her book to help her understand how natural selection affects shell colour in a snail population.





(i) What is meant by the term **population**?

(1)

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(ii) Use the information in the drawings to explain the process of natural selection.

(5)

(Total for Question 4 = 13 marks)

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5 During the cloning of mammals unfertilised eggs are collected from the female.

These unfertilised eggs are stored in a special nutrient solution before they are fertilised.

Design an investigation to find the best storage temperature for the survival of the unfertilised eggs.

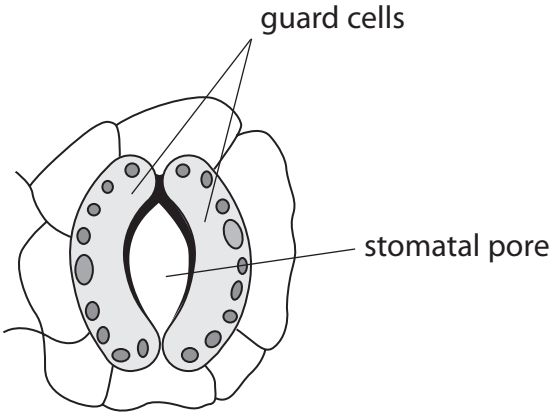
Your answer should include experimental details and be written in full sentences.

(6)

(Total for Question 5 = 6 marks)

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6 Stomata are pores found mainly on the underside of leaves.



(a) Explain the role of the stomata in

(i) transport in plants

(2)

(ii) gas exchange in plants

(2)

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(b) An experiment is carried out to examine the effect of the size of stomatal pores on the rate of transpiration.

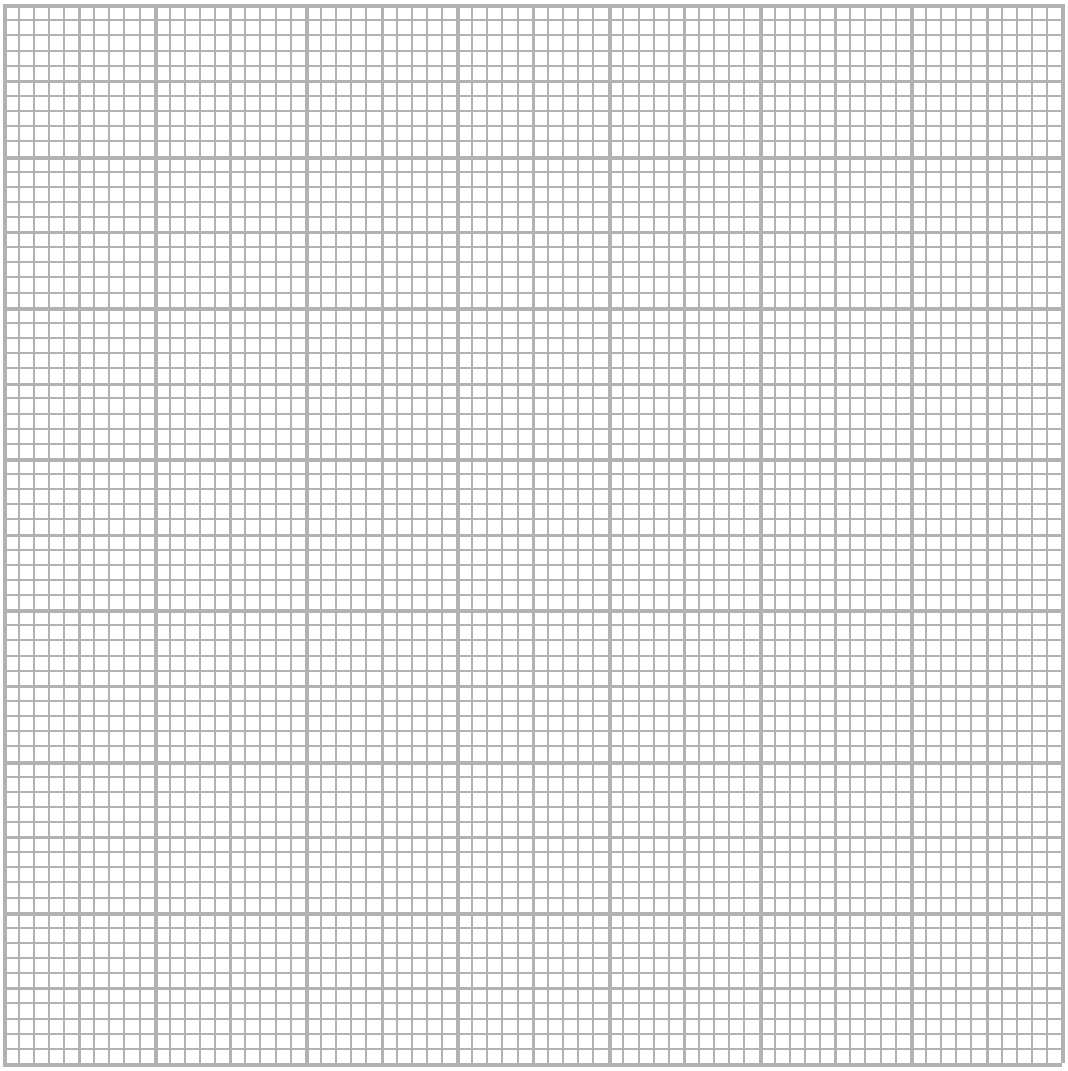
The data were collected in still air and in moving air.

Size of stomatal pore in µm	rate of transpiration in mg / m² / s	
	still air	moving air
0	0	0
4	22	38
8	46	140
12	48	165
16	50	210
20	50	248
24	50	264

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(i) Plot a graph to show the effect of stomatal pore size on transpiration rate in still and moving air.
Use a ruler to join your points with straight lines.

(6)



(ii) Use the graph to compare the effect of increasing stomatal pore size on transpiration rate in still and moving air.

(2)

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(iii) Explain the effect that moving air has on transpiration rate.

(3)

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(Total for Question 6 = 15 marks)

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7 The passage describes tissue culture in plants.

Complete the passage by writing a suitable word or words in each of the spaces.

(10)

Plant scientists use the technique of micropropagation to produce large numbers of genetically ..... plants.

A small fragment of plant, called an ....., is cut using a scalpel.

The scalpel needs to be ..... to reduce the risk of contamination by ..... .

The fragment is then placed in a vessel containing a ..... medium.

This medium needs to contain ....., to provide the growing plants with energy. It also contains mineral ions such as magnesium for ..... production and ..... for amino acids. The advantages of micropropagation include the ability to produce ..... numbers of plants and it can be done at ..... time of year.

(Total for Question 7 = 10 marks)

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8 (a) An experiment was carried out to look at the effect of exercise on heart rate.

The experimental results were collected from a group of children, both boys and girls.

The children's heart rate was measured three times.

- at rest
- just before exercise (in anticipation of exercise)
- immediately after carrying out one minute of exercise

	Heart rate in beats per minute		
	at rest	**just before exercise**	**after exercise**
Henry	72	76	87
Megan	116	120	175
Laura	79	84	96
David	97	99	100
John	90	93	176
Michael	67	75	132
Sarah	115	116	176
Claire	82	83	141
Rosanna	95	98	113
Rachel	82	87	136
Hattie	77	82	96
Rosie	105	110	153
Alex	79	82	90
Katheryn	99	102	152
Rebecca	82	89	156
Siobhan	87	94	170
Mark	82	94	128
Thomas	98	76	172
Lougie	80	92	132
Richard	95	115	141
Average (mean)	**89**	**93**	

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(i) Calculate the average (mean) for the student data after exercise.

Show your working.

(2)

average (mean) = ... beats per minute

(ii) Name the child with an anomalous result in the data for heart rate just before exercise.

(1)

.....

(iii) Suggest why the mean value of heart rate just before exercise is different to the mean value at rest.

(2)

.....

.....

.....

.....

(iv) Name two variables that should be controlled in this experiment.

(2)

1 .....

.....

2 .....

.....

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(b) Long distance runners and cyclists usually have a lower than average resting heart rate.

Suggest why a low heart rate has developed in these people.

(4)

(Total for Question 8 = 11 marks)

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9 (a) The table shows features found in three groups of living organisms.

Complete the table using a tick (✓) to show that the group of living organisms shows the feature and a cross (✗) if the feature is absent.

(4)

Group	Feature			
	Cell wall	**Plasmid**	**Cytoplasm**	**Nucleus**
bacteria			✓	
fungi				✓
protoctists	✗	✗		

(b) Some bacteria, fungi and protoctists are pathogens.

(i) Name another type of pathogen.

(1)

.....

(ii) Give an example of a disease caused by a protoctist.

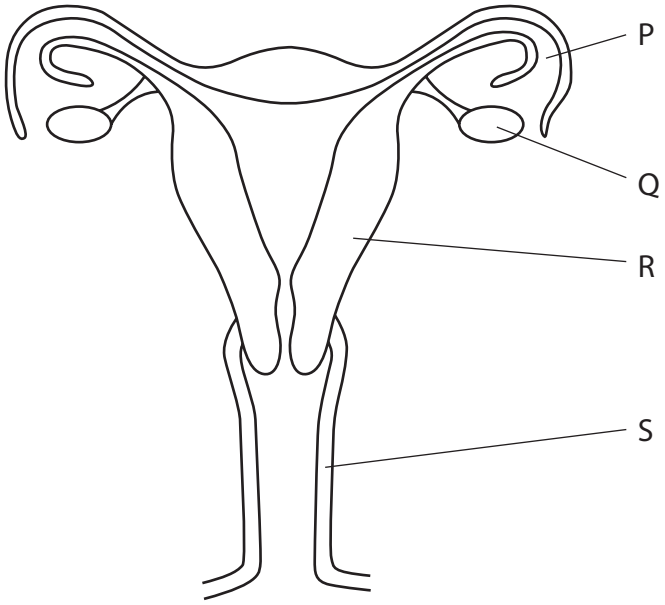
(1)

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(Total for Question 9 = 6 marks)

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10 The diagram shows the structure of the female reproductive organs.



(a) Name the structures labelled in the diagram.

(4)

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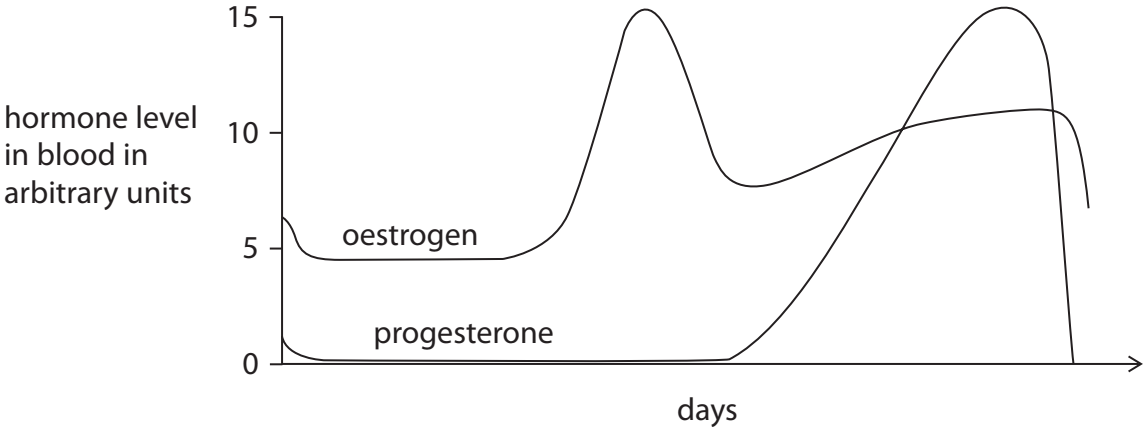
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R .....

S .....

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(b) The graph shows changes in the hormones oestrogen and progesterone during a woman's menstrual cycle.



On the graph indicate using

(i) a letter O, the day when ovulation is most likely to occur.

(1)

(ii) a letter M, the day when menstruation is likely to start.

(1)

(iii) Describe the changes that take place in structure R during the menstrual cycle.

(3)

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(c) Some women only have sexual intercourse at certain times of their menstrual cycle in order to avoid pregnancy.

Explain why this may not be a reliable method of birth control.

(2)

(d) Describe the role of oestrogen at puberty.

(3)

(Total for Question 10 = 14 marks)

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11 The sex of a baby is determined by the chromosomes it inherits from its parents.

(a) Explain which parent determines the sex of the baby.

(2)

(b) Describe how cell division by meiosis is different from cell division by mitosis.

(4)

(Total for Question 11 = 6 marks)

TOTAL FOR PAPER = 120 MARKS

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