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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE (9–1)

Centre Number | Candidate Number

Thursday 9 May 2019

Morning (Time: 1 hour 45 minutes) | Paper Reference **4HB1/02R**

Human Biology

Unit: 4HB1

Paper: 02R

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.
- 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 ☒.

Information

- The total mark for this paper is 90.
- 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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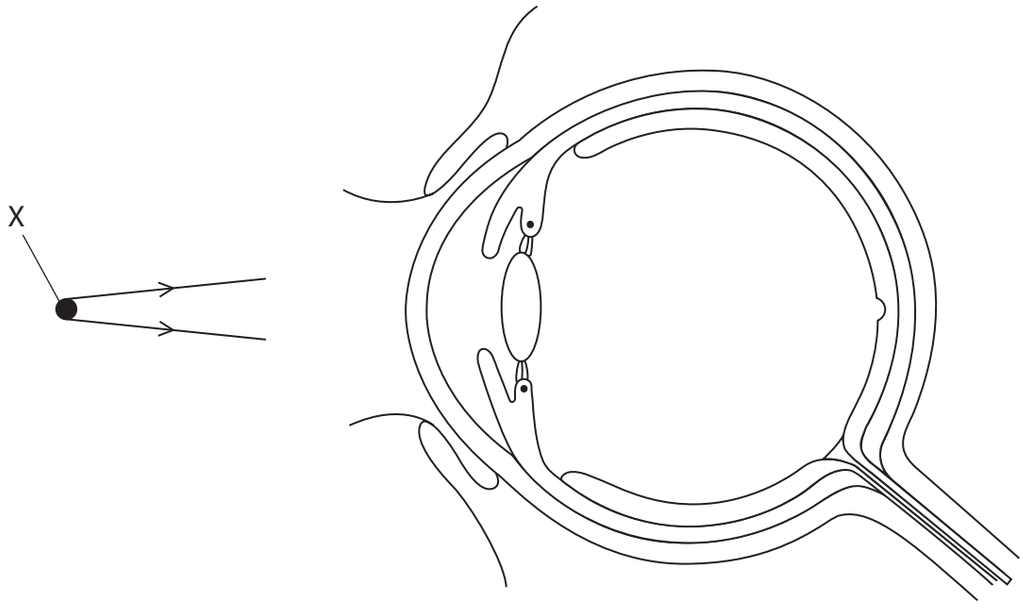
Answer ALL questions.

1 The diagram shows a section through an eye.



(a) The table lists descriptions of parts of the eye.

Use the letters, A, B, C, D and E, to label the parts of the eye on the diagram.

(5)

Description of part	Letter
the layer that contains light sensitive cells	A
the muscles that change lens shape	B
the structure that controls the amount of light entering the eye	C
the structure that carries nerve impulses away from the eye	D
the structure that protects the eye from dust and grit	E

(b) A person looks at object X.

Complete the diagram by continuing the rays of light to show how the image of object X is formed on the retina.

(3)

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(c) Name three defects of the eye that can be corrected by using glasses.

(3)

1 .....

2 .....

3 .....

(Total for Question 1 = 11 marks)

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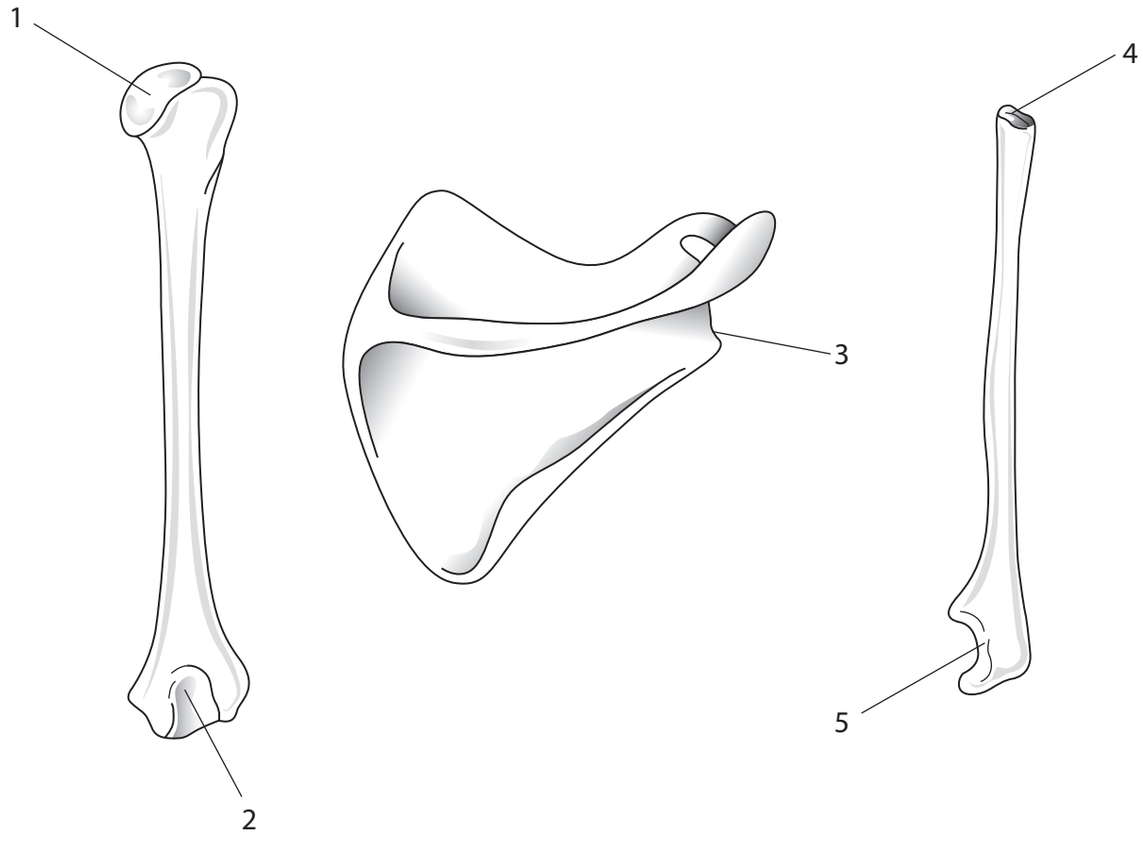
2 (a) The diagrams show three bones from the human skeleton.



Which two numbered regions come together to form a ball and socket joint?

(1)

☒ **A** 1 and 3

☒ **B** 1 and 5

☒ **C** 2 and 3

☒ **D** 2 and 4

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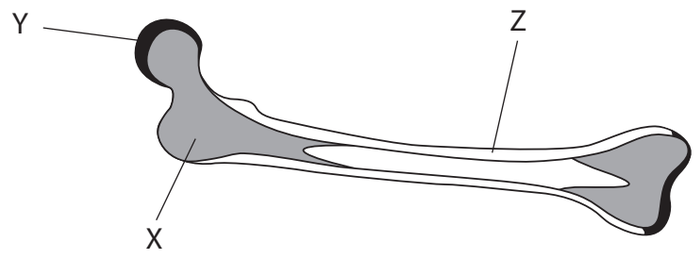
(b) The diagram shows a section through a bone.



(i) Identify the part labelled X.

(1)

- ☒ **A** cartilage
- ☒ **B** compact bone
- ☒ **C** ligament
- ☒ **D** spongy bone

(ii) Identify the part labelled Z.

(1)

- ☒ **A** cartilage
- ☒ **B** compact bone
- ☒ **C** ligament
- ☒ **D** spongy bone

(iii) Name the part labelled Y.

(1)

.....

(iv) Describe the function of the part labelled Y.

(2)

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(c) Describe why a balanced diet is needed for the healthy development of bone and muscle.

(6)

(Total for Question 2 = 12 marks)

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3 A woman who smokes when she is pregnant risks harming her developing fetus.

The table lists the birth masses of 310 children born to non-smoking mothers or to mothers who smoke.

	Birth masses of children in kg					
	Less than 2.4	**2.4 – 3.1**	**3.2 – 3.5**	**3.6 – 3.9**	**More than 3.9**	**Total number of births in sample**
Number of children born to non-smoking mothers	4	42	70	60	34	210
Number of children born to mothers who smoke	3	24	44	23	6	100

(a) (i) What is the most common birth mass in kg?

(1)

☒ **A** 2.4 – 3.1

☒ **B** 3.2 – 3.5

☒ **C** 3.6 – 3.9

☒ **D** More than 3.9

(ii) Calculate the percentage of children with a birth mass of 3.6 kg or more in the sample of non-smoking mothers.

(2)

percentage = ...

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(b) Use data from the table to deduce what can be concluded about the effect of smoking on birth mass.

(2)

(c) Suggest why smoking affects birth mass.

(5)

(Total for Question 3 = 10 marks)

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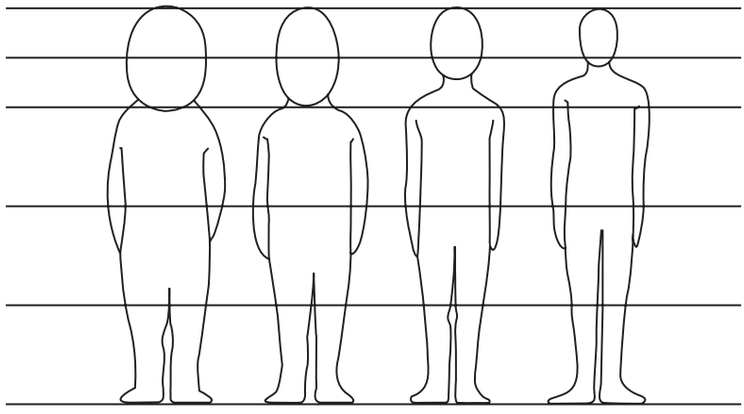
4 The diagram shows the changes in the proportions of different parts of the body of a person over a period of 18 years.



(a) (i) Estimate the proportion of the body that is the head in a newborn baby.

(1)

proportion = ...

(ii) Estimate the proportion of the body that is the legs in an 18-year old person.

(1)

proportion = ...

(b) Describe two main changes in the proportions of the body between birth and 18 years.

(2)

1 .....

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2 .....

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(c) Suggest why it is useful to measure growth of a body part as a proportion of the whole body length.

(2)

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(Total for Question 4 = 6 marks)

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5 Substances move in and out of cells by diffusion, osmosis and active transport.

(a) Describe the process of active transport.

(2)

(b) Water moves in and out of potato cells by osmosis.

Describe a method to determine the concentration of the contents of potato cells.

A large potato is available and also sucrose solutions of various concentrations.

(5)

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(c) The table shows results obtained from an investigation to determine the concentration of the contents of potato cells.

	Concentration of sucrose solution in mol per dm^3				
	0.2	**0.4**	**0.6**	**0.8**	**1.0**
Initial mass in g	8.4	7.9	8.7	8.3	8.4
Mass after soaking in g	8.7	8.0	8.2	7.5	7.3
Change in mass in g	+ 0.3	+ 0.1	– 0.5	– 0.8	– 1.1
Percentage change in mass	+ 3.6		– 5.8	– 9.6	– 13.1

(i) Calculate the percentage change in mass for 0.4 mol per dm^3.

(2)

.....%

(ii) Explain why it is necessary to calculate the percentage change in mass rather than using the change in mass in g.

(2)

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(iii) Explain how the results in the table could be used to determine the concentration of the contents of potato cells.

(4)

(Total for Question 5 = 15 marks)

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6 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Alzheimer's disease is a degenerative disease that usually starts slowly and gets worse over time. Scientists want to understand the causes of the disease and discover treatments for the memory loss that is a major feature of Alzheimer's. Scientists use the brains of people who have died to try to find out what happens in the brains of people who have Alzheimer's.

The most common early symptom is short-term memory loss, which is difficulty in remembering recent events. People with this condition are no longer able to transfer information about their daily life from their short-term to long-term memory. For example, they are unable to remember if they went shopping.

The condition causes plaques of an insoluble protein called B-amyloid to build up in the gap between neurones. Over time, these plaques appear in the neurones themselves in the regions of the brain associated with memory.

The B-amyloid is formed when an essential protein called amyloid precursor protein (APP) is not broken down correctly.

(a) Describe two differences between short-term memory and long-term memory (lines 8 to 9).

(2)

1 .....

.....

2 .....

.....

(b) State the area of the brain responsible for memory.

(1)

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(c) State two symptoms of Alzheimer's disease, other than memory loss.

(2)

1 .....

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2 .....

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(d) Explain why the build-up of B-amyloid disrupts brain function (lines 10 to 11).

(3)

(e) One method of treating the early stages of Alzheimer's is the use of an enzyme inhibitor.

Explain how this treatment could help people with this condition.

(2)

(f) Describe the evidence that shows the amyloid precursor protein (APP) is involved in the development of Alzheimer's disease (lines 10 to 14).

(2)

(Total for Question 6 = 12 marks)

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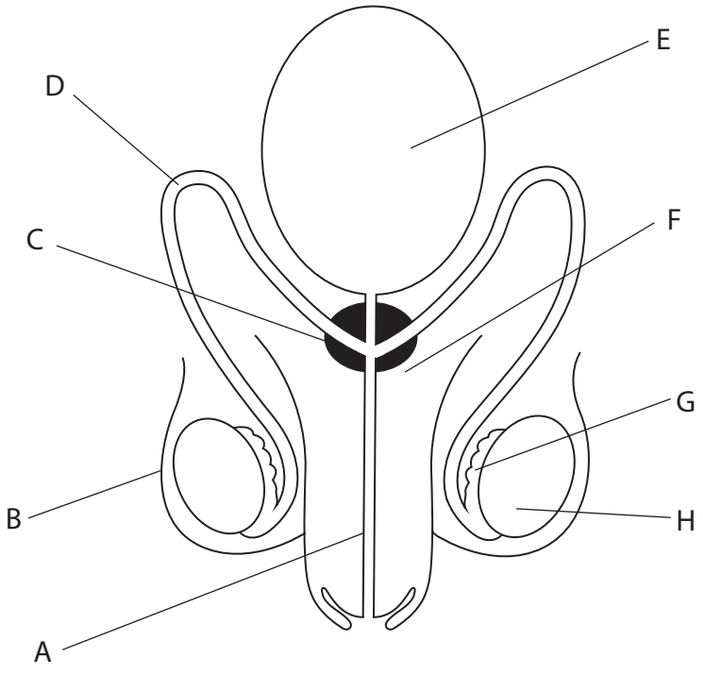
7 (a) The diagram shows the male reproductive system.



The table gives descriptions of structures in the male reproductive system.

Complete the table by giving a letter from the diagram to match each description.

Each letter may be used once, more than once or not at all.

(4)

Description of the structure	Letter
stores sperm	
produces sperm	
produces fluid to help sperm move	
contains cells dividing by meiosis	

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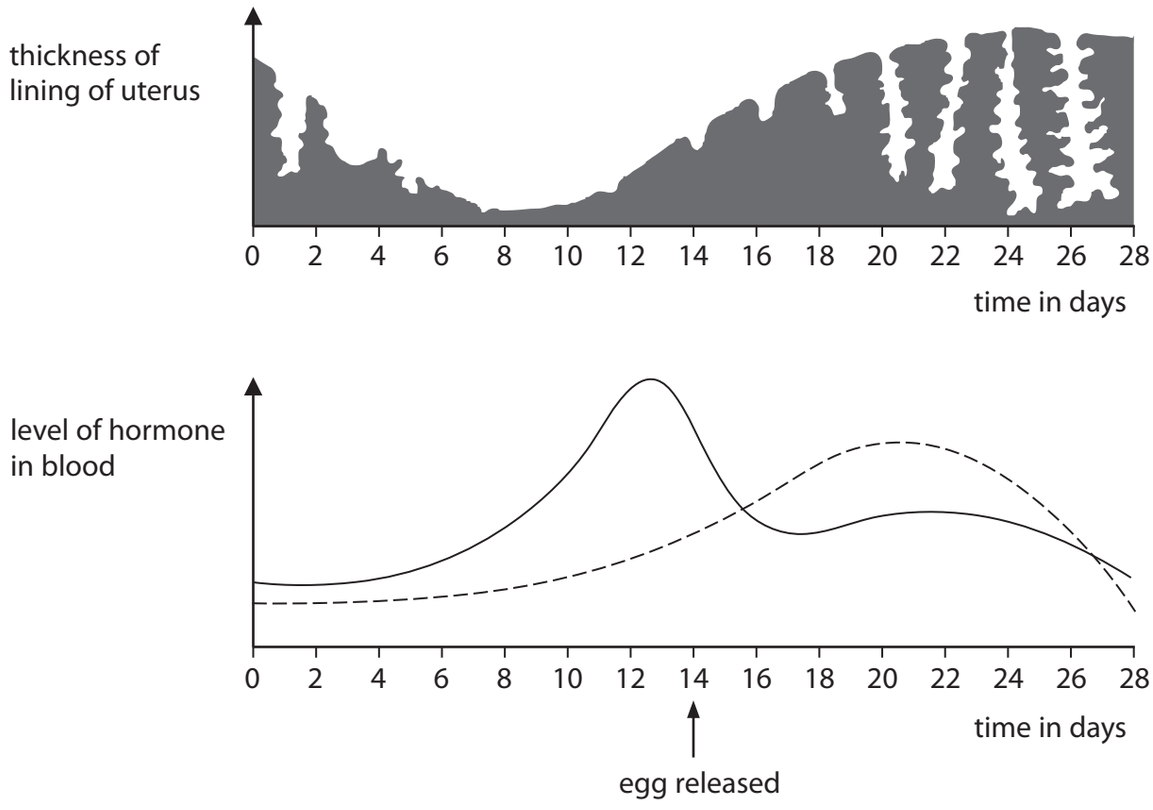
(b) Changes occur in the female body during the menstrual cycle.

The graphs show changes in the lining of the uterus and the levels of two hormones that control these changes.



(i) Use information from the graphs to explain the cause of growth in the lining of the uterus after day 12.

(2)

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(ii) Explain why fertilisation is less likely to occur from intercourse between days 8 and 12.

(2)

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(c) A synthetic oestrogen called oestradiol is used to make contraceptive pills. Natural oestrogen, which is a lipid molecule, could be used but is less effective than oestradiol when taken as a pill.

(i) Suggest why natural oestrogen is not as effective as oestradiol when taken as a pill.

(2)

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(ii) Give a reason why contraceptive pills only need to be taken for 21 days out of the 28-day cycle.

(1)

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(Total for Question 7 = 11 marks)

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8 (a) Alkaptonuria is a condition caused by a gene mutation that produces a recessive allele.

People who have this condition are unable to fully break down two amino acids found in proteins. Instead, an intermediate compound is formed which gives a dark colour to the urine.

This intermediate compound causes damage to cartilage and heart valves.

(i) Explain how amino acids are normally metabolised.

(3)

(ii) A person with alkaptonuria produces a dark coloured urine.

Describe what other symptoms they may develop.

(3)

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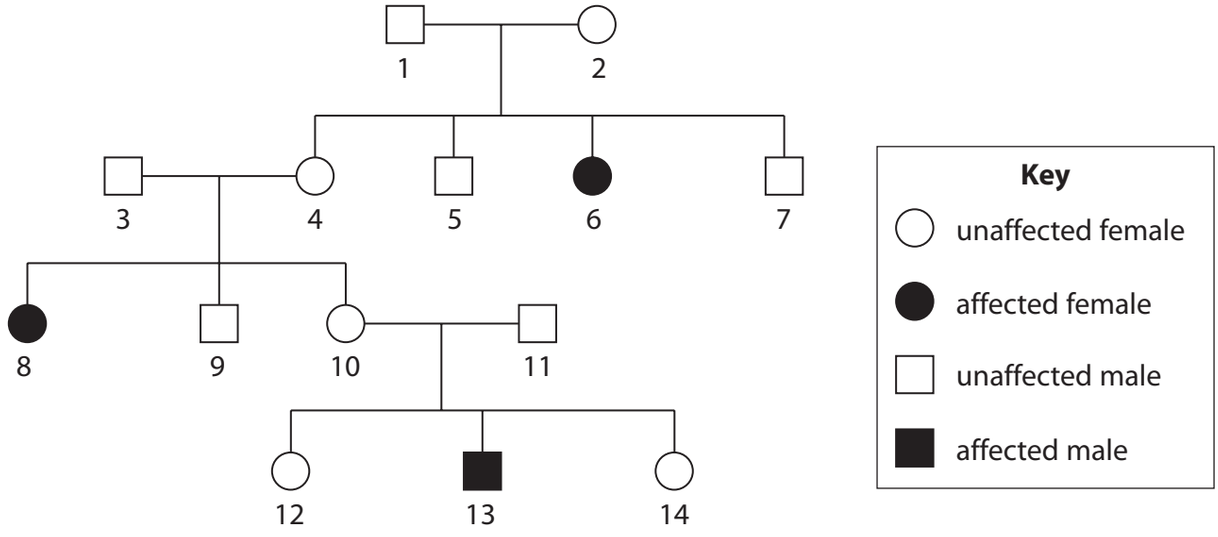
(b) The diagram shows the pedigree of a family affected by alkaptonuria.



(i) Use the family pedigree to explain whether the alkaptonuria condition is sex-linked.

(4)

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(ii) Parents 10 and 11 have another child.

Calculate the probability that this child would be an affected male.

Explain your answer.

(3)

(Total for Question 8 = 13 marks)

TOTAL FOR PAPER = 90 MARKS

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