



SCHOLARSHIP EXAMINATION

BIOLOGY

2016

Time: 30 minutes

Name:

School:

Questions

Q1.

(a) The table shows some of the levels of organisation within an organism.

Complete the table by inserting a tick (✓) to show the level of organisation of each example. The first one has been done for you.

(4)

Example	Level of organisation		
	Organelle	Organ	System
nucleus	✓		
circulation			
chloroplast			
leaf			
bulb			

(b) Place the following human structures in order of size from the smallest to the largest.

liver	red blood cell	eye	white blood cell	kidney
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(2)

Order	Structure
smallest	
↓	
↓	
↓	
largest	

(Total for question = 6 marks)

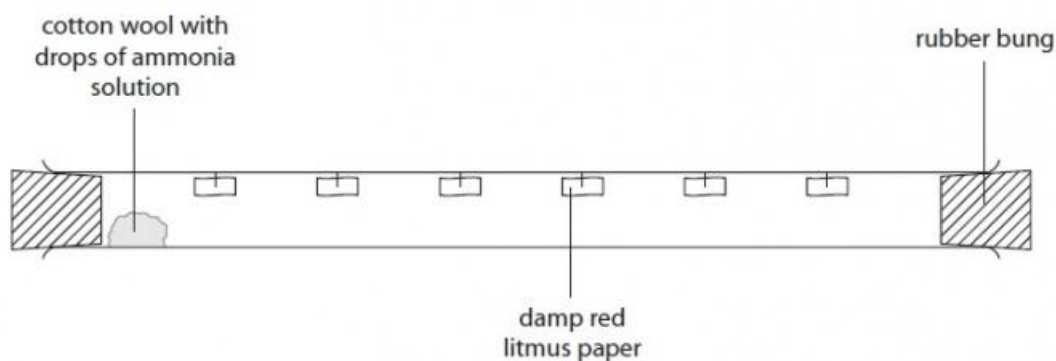
Q2.

Lily investigated the effect of concentration of a substance on the rate of diffusion.

In a fume cupboard she set up a glass tube with small squares of damp red litmus paper spaced at 4 cm intervals along its length.

She added 1 drop of ammonia solution to some cotton wool and used tweezers to place the cotton wool at one end of the tube. She closed the tube with a bung. She timed how long it took for each square of litmus paper to change colour.

She then set up an identical tube and repeated the experiment, but this time she used 3 drops of ammonia solution.



Her results are shown in the table.

Number of drops of ammonia solution	Time taken for litmus paper to change colour in seconds					
	4 cm	8 cm	12 cm	16 cm	20 cm	24 cm
1	7	13	19	26	32	37
3	3	7	10	13	16	20

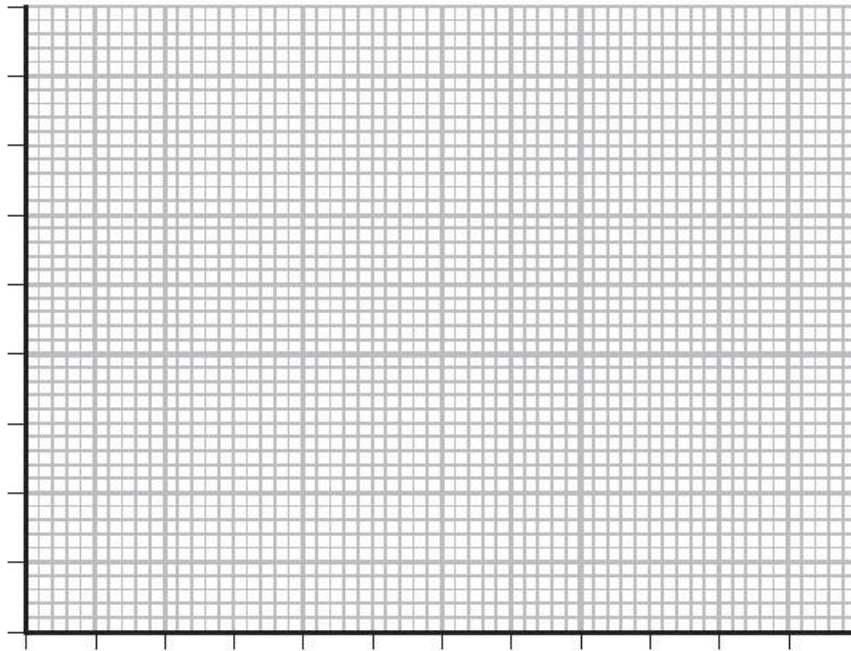
(a) Describe what is meant by the term **diffusion**.

(2)

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(b) Plot these results on the grid. Use straight lines to join the points.

(6)



(c) Describe the results shown by the graph.

(2)

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(d) Calculate the average rate of diffusion, in centimetres per second of ammonia, from the 3 drops of ammonia solution between the litmus papers at 4 cm and 24 cm. Show your working.

(2)

Answer cm/s

(e) Explain the difference in the rate of diffusion between the experiment using 1 drop of ammonia and the experiment using 3 drops of ammonia.

(1)

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(f) Suggest how Lily could modify her experiment to investigate the effect of temperature on the rate of diffusion.

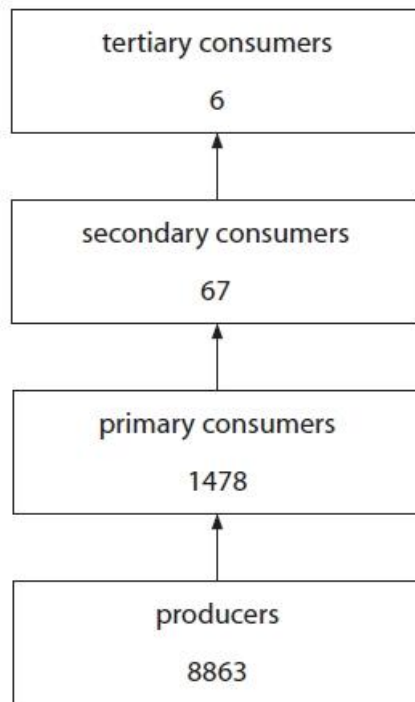
(2)

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(Total for question = 15 marks)

Q3.

The diagram shows the energy transfer in a river ecosystem. The numbers on the diagram refer to the energy in the biomass at each trophic level in arbitrary units.



(a) The formula shows how to calculate energy transfer efficiency as a percentage.

$$\text{percentage energy transfer efficiency} = \frac{\text{total energy in biomass}}{\text{total energy available}} \times 100$$

- (i) The total energy available to the producers from sunlight is 1 700 000 in arbitrary units. Use this information, and the formula, to calculate the percentage energy transfer efficiency from sunlight to plants. Show your working.

(2)

Answer %

(ii) Suggest why the percentage energy transfer efficiency from sunlight to plants is low.

(1)

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(b) The table shows the calculated energy transfer efficiencies between the different trophic levels in the river ecosystem.

Trophic levels	Percentage energy transfer efficiency
plants to primary consumers	16.7
primary consumers to secondary consumers	4.5
secondary consumers to tertiary consumers	9.0

Suggest two reasons why the energy transfer from plants to primary consumers is not 100%.

(2)

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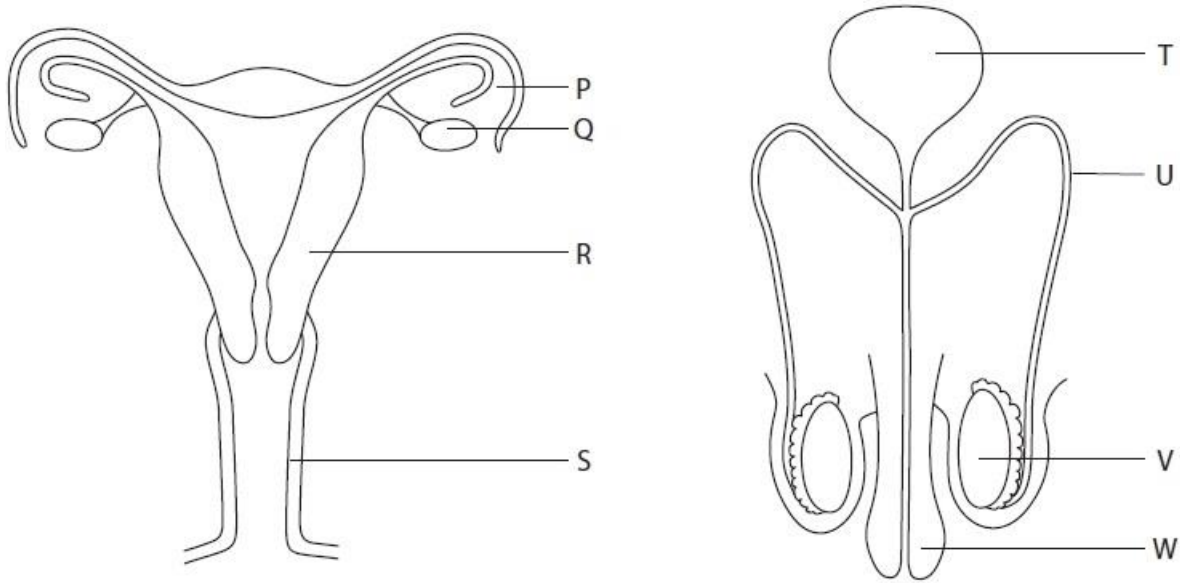
2

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(Total for question = 5 marks)

Q4.

The diagrams show the female and male reproductive systems.



The table lists some events that take place in the female reproductive system, some that take place in the male reproductive system, and some that take place in both.

Complete the table by giving the letter, or letters, to indicate where each event takes place. The first one has been done for you.

(5)

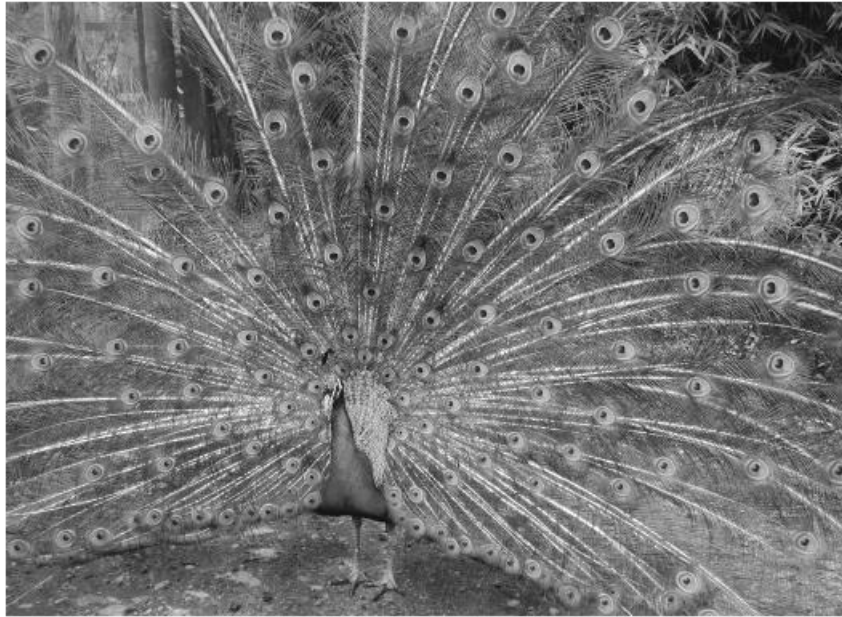
Event	Letter
fertilisation	P
release of oestrogen	
meiosis	
repair of the uterus lining	
implantation of an embryo	
formation of gametes	

(Total for question = 5 marks)

Q5.

The peacock is a bird found in the jungle in India.

The male has a large, colourful tail that he displays during courtship to attract a female to mate with.



Use your knowledge of natural selection to suggest how the peacock's tail has evolved.

(5)

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(Total for question = 5 marks)

Q6.

Bacteria, fungi and viruses have different structures.

The table lists some structures.

In each box, place a tick (✓) if the structure is present or a cross (✗) if the structure is absent.

One has been done for you.

(3)

Structure	Group		
	bacteria	fungi	viruses
cell wall			
nucleus			
chloroplast	✓		

(Total for question = 3 marks)

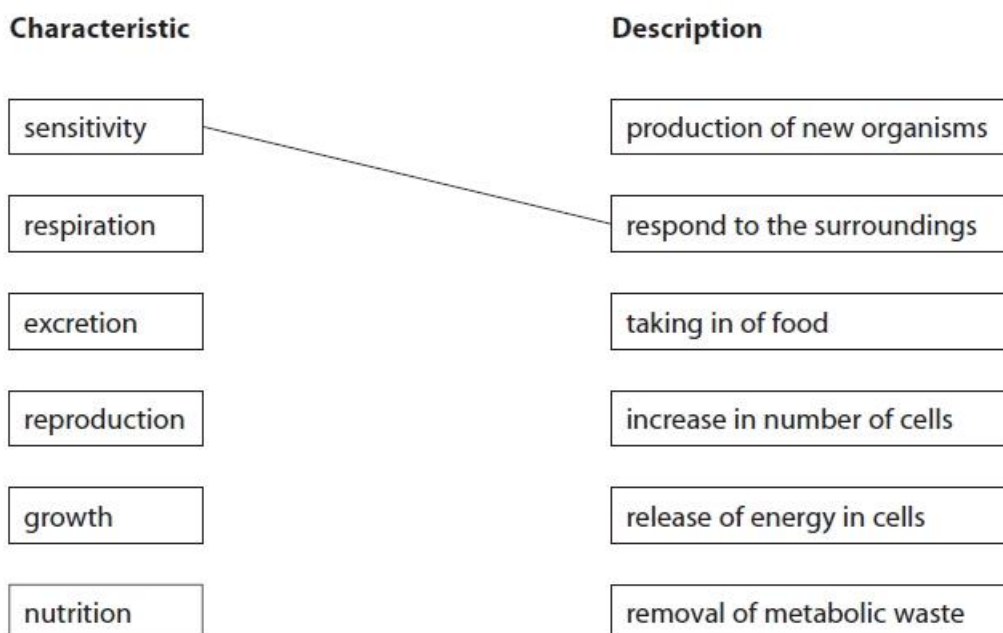
Q7.

Living organisms share some basic characteristics.

Draw a straight line from each characteristic to its correct description.

The first has been done for you.

(4)



(Total for question = 4 marks)