ST EDWARD'S

OXFORD

16+ ENTRANCE EXAMINATION

For entry in
September 2018

BIOLOGY

(Use of a calculator is permitted)

Time: 1 hour

Candidate First Name: ……

Candidate Surname: ……

Total Marks available: 58 marks

For St Edwards us only:

Total Marks: _____ /58

Q1.

Two students, X and Y, investigated how exercise affected breathing rate.

They recorded their breathing rate at rest.

Their breathing rate was then measured each minute during 5 minutes of exercise.

The results of the investigation are shown in the table.

exercise time / minutes	breathing rate / breaths per minute	
	student X	student Y
0 (at rest)	11	12
1	14	17
2	17	24
3	23	27
4	26	32
5	28	35

(a) The breathing rate of student X increased by 17 breaths per minute during the investigation.

Calculate the increase in the breathing rate of student Y from rest to 5 minutes of exercise.

(1)

..... breaths per minute

(b) Suggest a reason for the difference in the overall increase in the breathing rate between students X and Y.

(1)

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(c) Explain why the breathing rate of the students changed during the exercise.

(2)

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

During the exercise gases pass into and out of the blood by

(1)

☒ **A** active transport

☒ **B** diffusion

☒ **C** osmosis

☒ **D** transpiration

(e) The students extended their investigation by exercising for 20 minutes.

During this exercise the students' muscles produced lactic acid, which caused cramp.
Suggest why their muscles produced lactic acid.

(2)

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(f) Which substance supplies the energy used by muscles during exercise?

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

(1)

☒ **A** water

☒ **B** oxygen

☒ **C** glucose

☒ **D** lactic acid

(Total for question = 8 marks)

Q2.

Mass can be used to measure the growth of babies.

The table shows the mass of baby X and baby Y from birth to 24 months.

	mass / kg	
age / months	**baby X**	**baby Y**
0	2.5	3.4
6	6.4	8.0
12	7.8	9.6
18	9.0	11.0
24	10.8	12.2
mass gained		8.8

(i) Calculate the mass gained by baby X from birth to 24 months.

(2)

mass gained =. . . . . .kg

(ii) Suggest **one** way, other than mass gained, that can be used to measure the growth of babies.

(1)

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Q3.

The mean reaction times of males and females of different ages are recorded in the table.

age / years	mean reaction time / milliseconds	
	male	**female**
10	190	220
20	160	200
30	180	220
40	180	240
50	200	250
60	250	270

(i) Using the data in the table, state the age of males with the fastest mean reaction time.

(1)

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(ii) Compare the effect of age on the mean reaction times of males with females.

(3)

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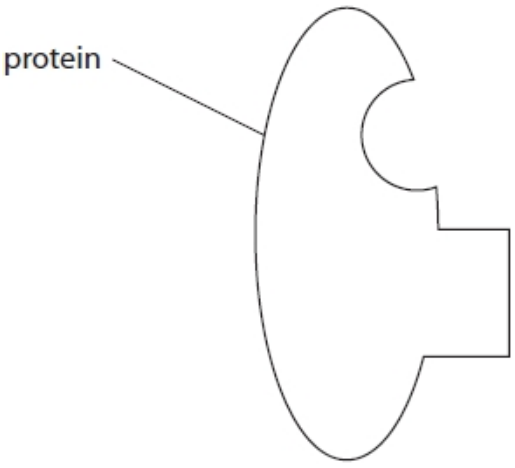
Q4. The lock and key hypothesis explains the complementary shape of enzymes and substrates.

Protein is digested by the enzyme pepsin. The diagram shows a model of a protein.



Draw the complementary shape of pepsin on the diagram.

(1)

(Total for question = 1 mark)

Q5. State **two** factors, other than temperature, that affect enzyme activity. **(2)**

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Q6. Leaf cells produce glucose. Plants can use glucose to make oils, cellulose and DNA.

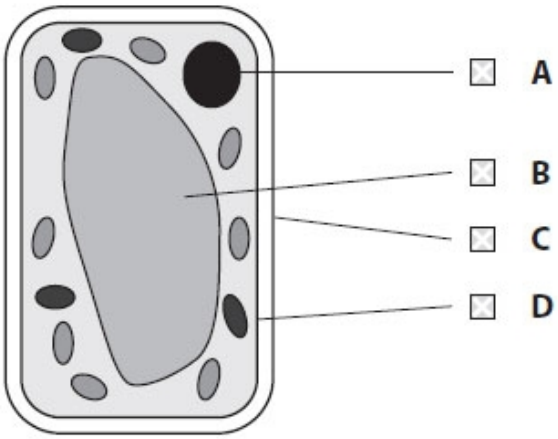
(a) (i) Oils are needed to make cell membranes.

The diagram shows a plant cell.

Which label on the diagram shows the cell membrane?

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

(1)



(ii) Cellulose is found in plant cell walls.
Describe the function of cell walls in plant cells.

(2)

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(iii) The nucleus contains chromosomes.
Chromosomes are made up of DNA.
Describe the structure of DNA.

(2)

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(b) The table shows the concentration of glucose found in plant cells at different times of the day.

time of day	6am	9am	midday	3pm	6pm	midnight
concentration of glucose / mg per g	2	6	18	12	2	2

(i) Calculate the change in the concentration of glucose from 6am to midday.

(1)

answer = ...mg per g

(ii) Describe the pattern shown in the concentration of glucose from 6am to midnight.

(2)

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(iii) Suggest **two** reasons why the concentration of glucose in the plant cells changes between 3pm and 6pm.

(2)

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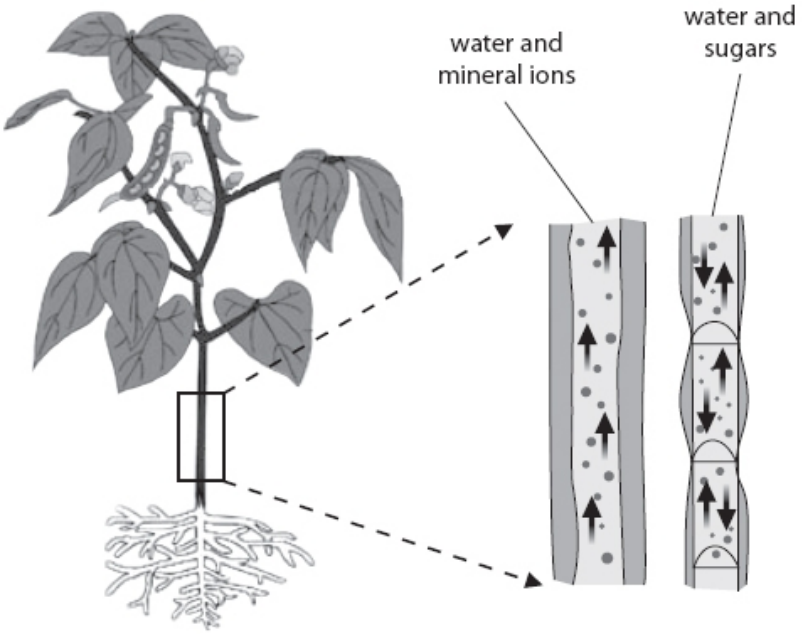
Q7

(a) The diagram shows two vessels found in the stems of plants.



(i) Name the vessel that transports water and mineral ions through the plant.

(1)

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(ii) Energy is needed to transport sugars through the plant.

Which cell component supplies energy that can be used for the transport of sugars through the plant?

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

(1)

☒ **A** cell wall
☒ **B** mitochondria
☒ **C** nucleus
☒ **D** vacuole

(b) The table shows how the percentage of a person's blood that goes to each body part changes when they exercise.

	percentage of blood delivered to each part (%)	
body part	**at rest**	**during exercise**
brain	17	5
liver	27	7
muscles	15	66

(i) Suggest why the percentage of blood going to each of the body parts changes when a person exercises.

(3)

.....(pto)

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(ii) Muscle cells can carry out anaerobic respiration during exercise.

State a disadvantage of anaerobic respiration.

(1)

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(c) Describe how the circulatory system transports substances around the body.

(6)

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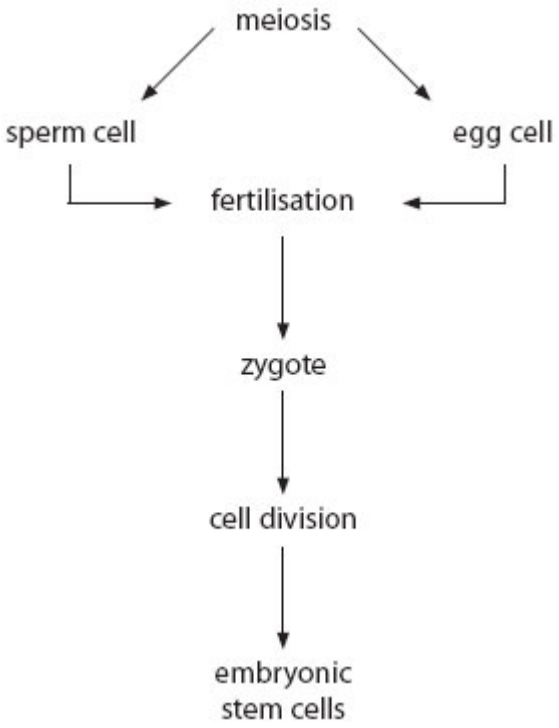
(Total for Question = 12 marks)

Q8. The diagram shows how embryonic stem cells are produced.



(a) (i) Describe how the cells produced by meiosis are different from body cells.

(2)

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(ii) Describe what happens to the sex cells during fertilisation.

(2)

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(b) Suggest **one** advantage and **one** disadvantage of using embryonic stem cells in scientific research.

(2)

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(c) The diagram shows a section of a DNA molecule.

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

A gene is a section of DNA that codes for a

(1)

☒ **A** chromosome

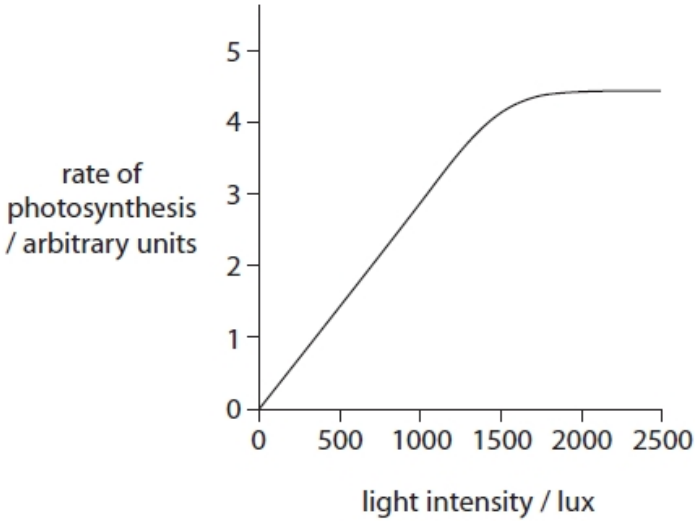
☒ **B** plasmid

☒ **C** protein

☒ **D** sugar

(Total for Question is 10 marks)

Q9. The graph shows how light intensity affects the rate of photosynthesis.



Explain why the rate of photosynthesis does not increase after 1750 lux.

(2)

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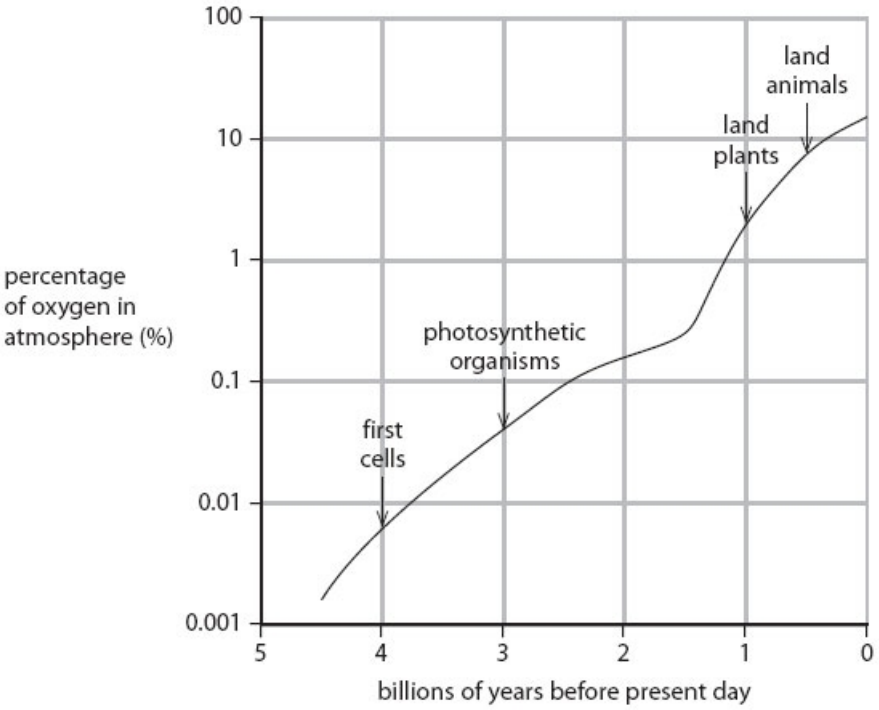
(Total for question = 2 marks)

Q10.

The graph suggests that the level of oxygen in the atmosphere was important for the evolution of many living organisms.



(i) How much oxygen was needed in the atmosphere for the evolution of land animals?
Put a cross (☒) in the box next to your answer.

(1)

☒ **A** 0.009%
☒ **B** 0.09%
☒ **C** 0.9%
☒ **D** 9.0%

(ii) Suggest how photosynthesis could have changed the gas content of the atmosphere.

(2)

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(iii) Suggest why such a high percentage of oxygen in the atmosphere was needed for large land animals to evolve.

(2)

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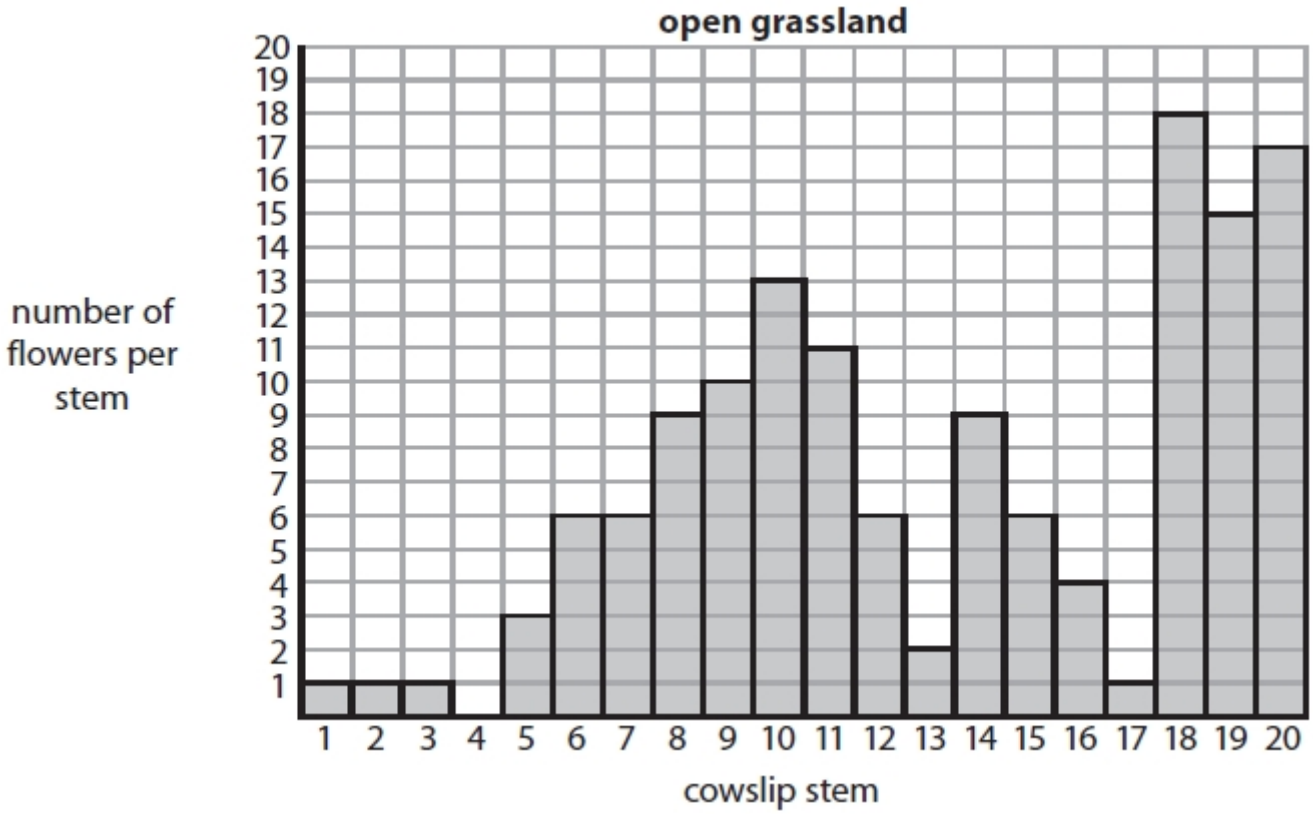
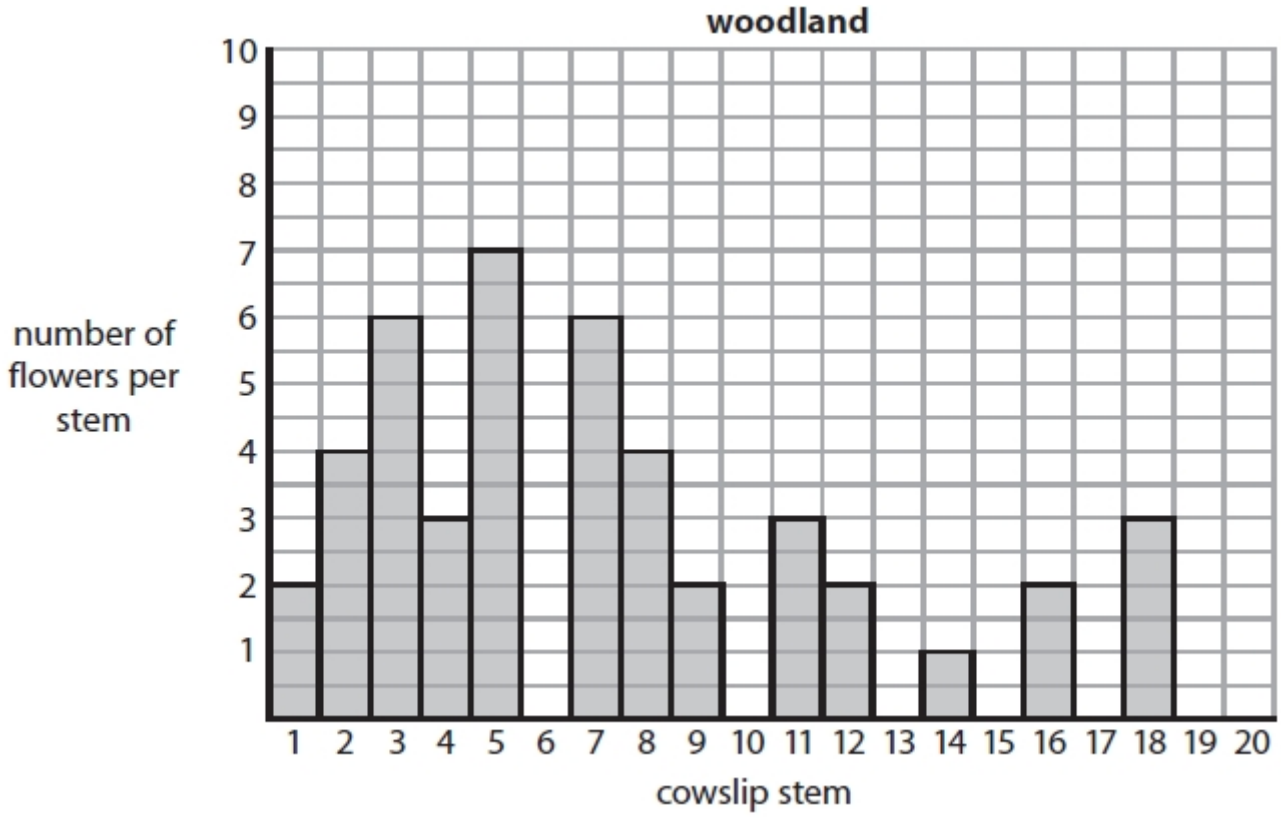
Q11.

Cowslips are flowering plants. Each cowslip stem can produce different numbers of flowers.

The graphs show the number of flowers on 20 stems of cowslip growing in open grassland and 20 stems of cowslip growing in woodland.





(i) In the open grassland, 60% of cowslips have stems with five or more flowers.

Use the information from the graph to calculate the percentage of cowslips in the woodland that have stems with five or more flowers.

(2)

..... %

(ii) Suggest reasons why there are more stems with five or more flowers in the open grassland.

(2)

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