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Answer ALL questions in the spaces provided.

1. Read through the following account of meiosis and fertilisation, then write the most appropriate word or words on the dotted lines to complete the account.

During spermatogenesis, a diploid cell called a

divides in meiosis I to form two

Each of these then divides in meiosis II, forming four haploid

....., which mature into spermatozoa.

The random fusion of gametes during fertilisation is one way in which

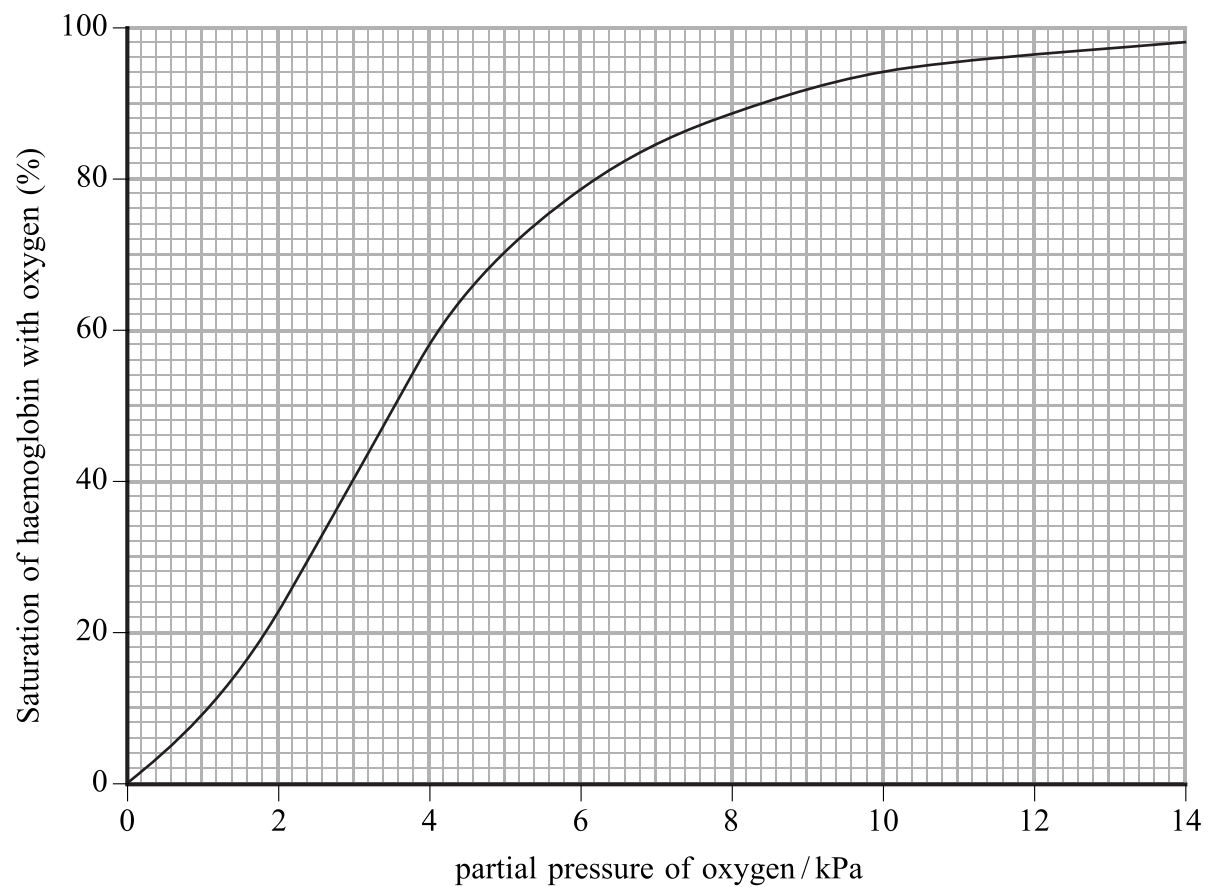
..... variation is increased.

Q1

(Total 4 marks)



2. (a) The graph below shows the oxygen dissociation curve for adult human haemoglobin.



Using the graph, find the partial pressure of oxygen at which the haemoglobin is 90% saturated with oxygen.

..... kPa
(1)

(b) Give **three** ways in which carbon dioxide is transported in the blood.

- 1
- 2
- 3
(3)



(c) Describe the role of **myoglobin**.

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(3)

(Total 7 marks)

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Q2



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3. (a) Describe the roles of each of the following hormones.

(i) Oestrogen

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(2)

(ii) Prolactin

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(2)



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(b) The table below shows the concentration of progesterone in the blood during the first 32 weeks of pregnancy.

Time / weeks	Concentration of progesterone in the blood / arbitrary units
0	7
4	8
8	9
16	11
24	15
32	30

(i) Using the table, describe the changes in the concentration of progesterone during the first 32 weeks of pregnancy.

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(2)

(ii) Suggest why it is important that these changes occur during pregnancy.

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(1)

(Total 7 marks)

Q3



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4. (a) When food is chewed, it is mixed with saliva. Saliva contains amylase, water and mucus. Describe the functions of water and mucus in saliva.

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(2)

- (b) The table below refers to the digestion of three carbohydrate substrates: starch, sucrose and lactose. Complete the table by writing the most appropriate word or words in the empty boxes.

Carbohydrate substrate	Enzyme	Product(s)
Starch	Amylase	
Sucrose	Sucrase	
Lactose		

(4)



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(c) Describe how the structure of the ileum is adapted for the absorption of monosaccharides.

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(3)

(d) Suggest why disaccharides, such as sucrose and lactose, are not absorbed in the ileum.

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(1)

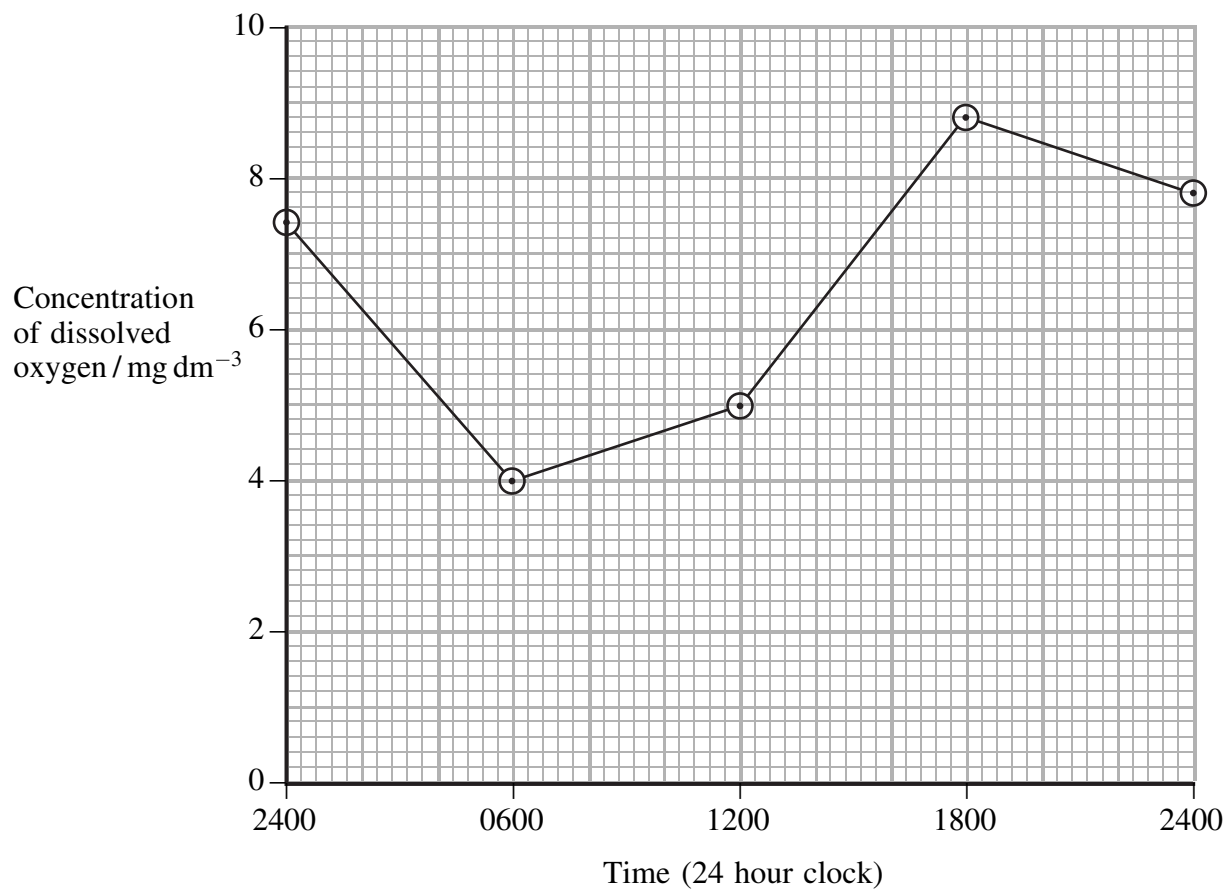
(Total 10 marks)

Q4

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5. (a) The graph below shows changes in the concentration of dissolved oxygen, over a period of 24 hours, in the surface water of a lake.



(i) Using the graph, describe the changes in the concentration of dissolved oxygen in the lake.

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(2)



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(ii) Suggest an explanation for the change in the concentration of dissolved oxygen between the hours of 0600 and 1800.

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(2)

(b) *Chironomus* larvae live in the silt at the bottom of ponds and lakes, where there is a low concentration of oxygen. Suggest how each of the following features enables *Chironomus* larvae to live in conditions of low oxygen concentration.

(i) Presence of external gills

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(2)

(ii) Presence of a respiratory pigment

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(2)

(Total 8 marks)

Q5



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6. (a) Explain how each of the following features of a wind-pollinated flower is an adaptation to wind pollination.

(i) Production of large quantities of light pollen grains

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(2)

(ii) Presence of branched and feathery stigmas

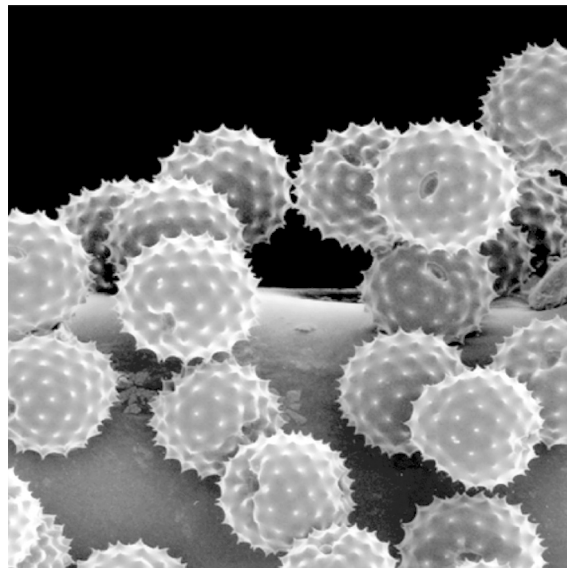
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(2)



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(b) The photograph below shows pollen grains, as seen using an electron microscope.



Magnification $\times 1000$

Suggest whether these pollen grains are from an insect-pollinated flower or a wind-pollinated flower, giving an explanation for your answer.

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(3)

Q6

(Total 7 marks)



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7. (a) Describe a method to determine the mean number of stomata per unit area in the lower epidermis of a leaf.

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(4)

(b) The table below shows the mean numbers of stomata per mm² in the upper epidermis and in the lower epidermis of leaves from three different species of plants.

Type of plant	Mean number of stomata per mm ²	
	Upper epidermis	Lower epidermis
Sunflower	120	175
Tobacco	50	190
Castor oil	182	270

(i) Compare the mean numbers of stomata in the upper epidermis of these three plants.

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(2)



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(ii) Using the data in the table, suggest which type of plant is least well-adapted to growing in dry conditions. Give an explanation for your answer.

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(3)

Q7

(Total 9 marks)



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8. (a) Explain what is meant by the term **implantation**.

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(2)

(b) Describe the roles of the placenta.

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(4)



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(c) The table below shows changes in the permeability of the placenta during pregnancy. Permeability is expressed as a percentage of the maximum permeability.

Duration of pregnancy / weeks	Permeability of placenta as percentage of maximum (%)
8	2
12	10
20	25
24	50
28	75
32	90

Suggest explanations for the change in permeability of the placenta as shown in the table.

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(2)

Q8

(Total 8 marks)

TOTAL FOR PAPER: 60 MARKS

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