



EDEXCEL INTERNATIONAL GCSE (9–1)

BIOLOGY

Student Book

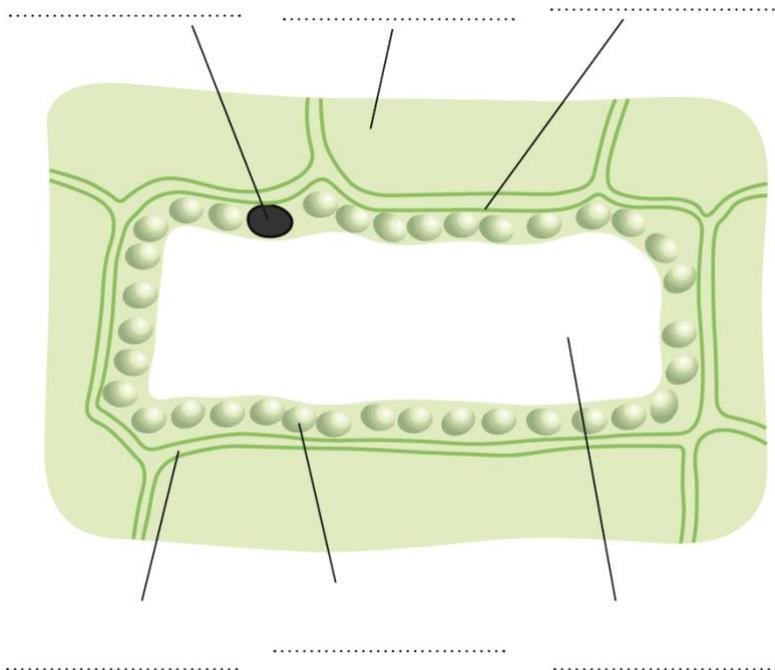
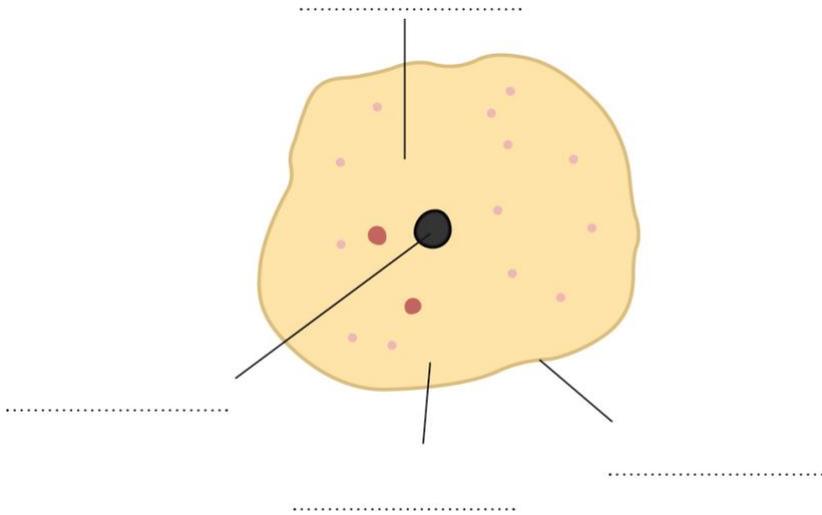
Phil Bradfield and Steve Potter



TEACHER RESOURCE PACK

Chapter 1: Life Processes

1. The diagrams show an animal and a plant cell.



(a) Label the structures shown on the diagrams.

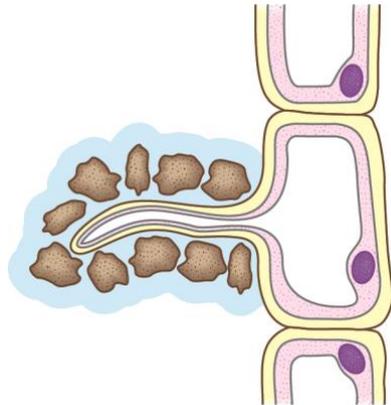
(b) Complete the table below to indicate whether the structures are present or absent.

Structure	Animal cell	Plant cell
cell membrane		
cellulose cell wall		
mitochondria		
cytoplasm		
vacuole		
nucleus		
chloroplast		
ribosome		

(c) Complete the table listing the functions of different organelles.

Organelle	Function
cell wall	
cell membrane	
cytoplasm	
	contains genetic material
	protein synthesis
	aerobic respiration
chloroplast	
large vacuole	

2. Identify each of these specialised cell types and suggest how they are adapted for their function.



Name of cell:

Adaptations

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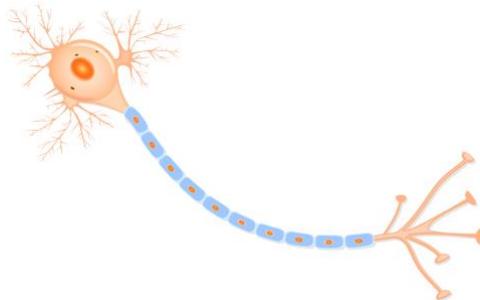
Name of cell:

Adaptations

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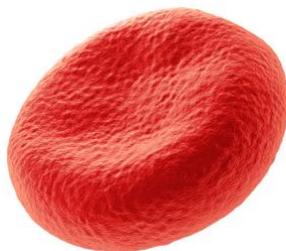
Name of cell:

Adaptations

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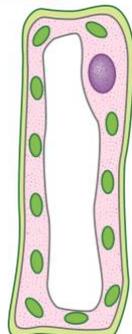
Name of cell:

Adaptations

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Name of cell:

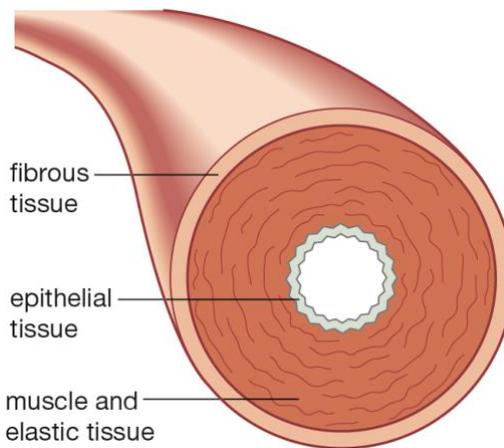
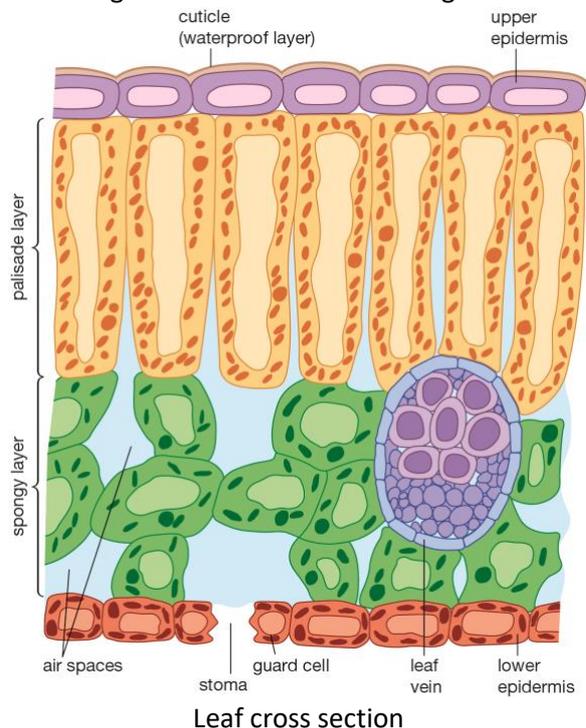
Adaptations

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3. The diagram shows a section through a leaf and an artery.



(a) Define the terms tissue, organ and system.

tissue

organ

system

(b) Explain whether a leaf is a tissue, organ or system.

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4. Read the passage below:

In 2014, at the age of 14, Hannah had a horse riding accident resulting in a broken spine and damaged spinal cord. She has been left unable to walk and has lost all the feeling in her legs. Her mobility is now very restricted and she must rely on a wheelchair, needing support and care from her family. There is currently no cure for people with severe spinal cord damage.

Most body tissues can heal themselves when damaged, but nervous tissue cannot as nerve cells lose the ability to divide soon after birth. Scientists are trying to develop a technique that could offer hope to many people like Hannah. They think that embryonic stem cells taken from very early human embryos could be turned into nerve cells and used to heal damaged spinal cords and enable people to walk again. The embryos used are spare ones from fertility treatments that would otherwise be allowed to perish.

It is difficult to make sure that these cells only make nerve cells and there is a danger that they could turn into cancer cells. The research is expensive and, so far, has had limited success in animal trials.

(a) Explain what stem cells are:

.....

(b) Use the information in the passage and your own knowledge to evaluate the use of embryonic stem cells by completing the table.

Benefits	Drawbacks
My Conclusion:	

(c) Some types of stem cells, such as heart stem cells, can be taken from adults. These stem cells can still divide but are already specialised.

Explain why these cells may be better to use than embryonic stem cells.

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5. Complete the sentences about the properties of enzymes using the words in the box.

denatured catalysts two chemical reactions pH
 active site optimum seven shape specific

Enzymes are biological _____. They speed up _____ without being changed themselves. A substrate binds to a region of the enzyme called the _____. Usually only one substrate will fit so enzymes are highly _____. All enzymes have a temperature at which they work fastest, this is called the _____ temperature. If the temperature becomes too hot, they stop working because they have _____. This means that the _____ of the enzyme has changed and the substrate no longer fits. Enzymes also work best at a particular _____. An enzyme such as pepsin that works in the stomach works best at a pH of approximately _____. An enzyme such as salivary amylase that is found in the mouth works best at a pH of approximately _____.

6. A student carried out an experiment into the effect of temperature on the time taken to digest starch. The results are shown in the table.

Temperature / °C	Time taken for starch to be completely digested / s			
	1	2	3	mean
0	200	220	180	
10	140	140	120	
20	100	120	120	
30	60	80	80	
40	40	60	40	
50	100	120	100	
60	280	260	60	

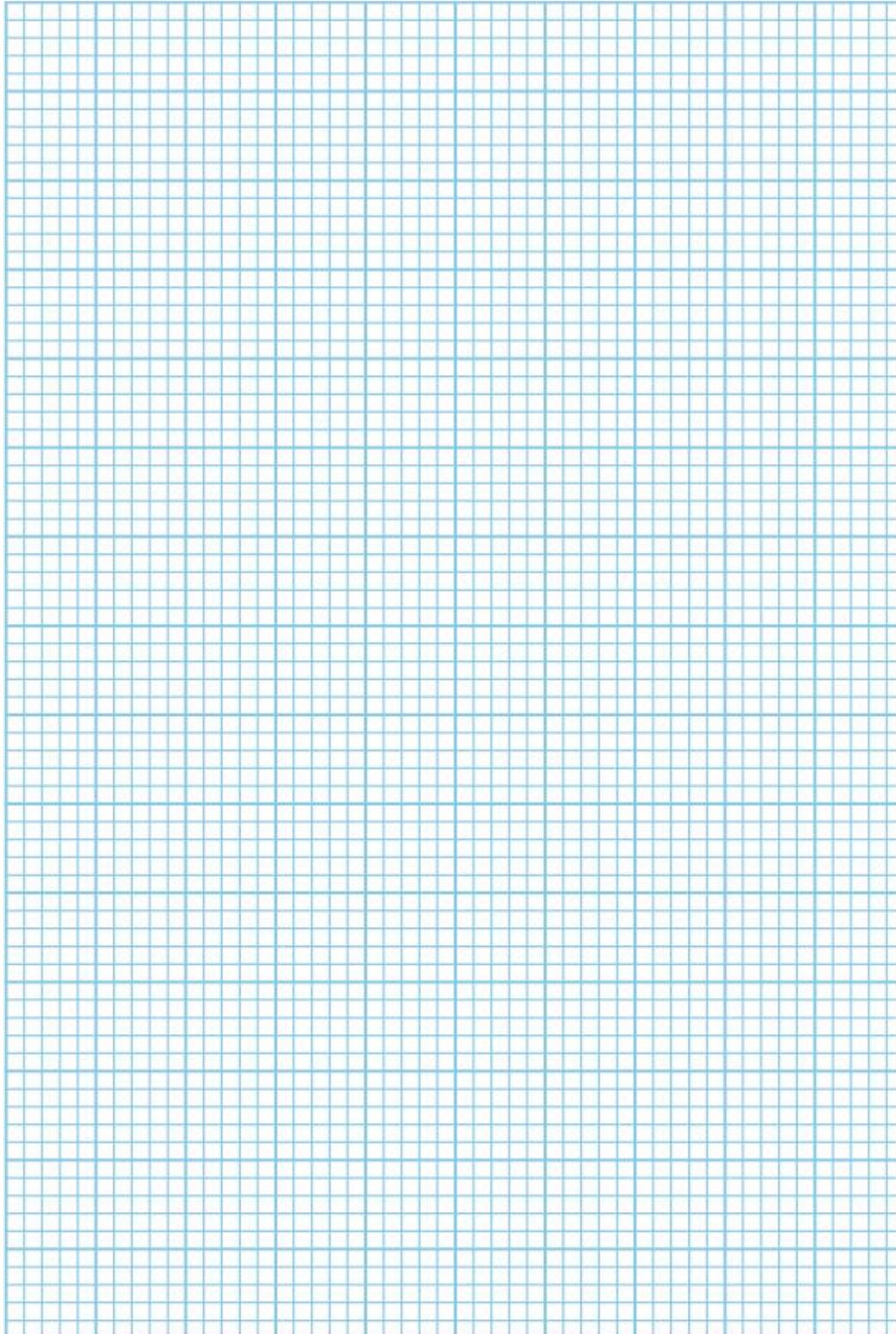
The student thought that one of the results was an anomaly.

(a) State what is meant by an anomalous result and identify the anomalous result in the table.

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(b) Calculate the mean times taken for the starch to be completely digested and write them in the table. Do not include the anomalous result.

(c) Plot a graph to show the effect of temperature on the mean time taken to completely digest the starch.



(d) Describe the effect of temperature on the mean time taken to digest the starch.

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(e) Explain the effect of temperature on the mean time taken to digest the starch.

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The student tested samples of the starch and amylase mixture for the presence of starch every 20 s until no more starch was present.

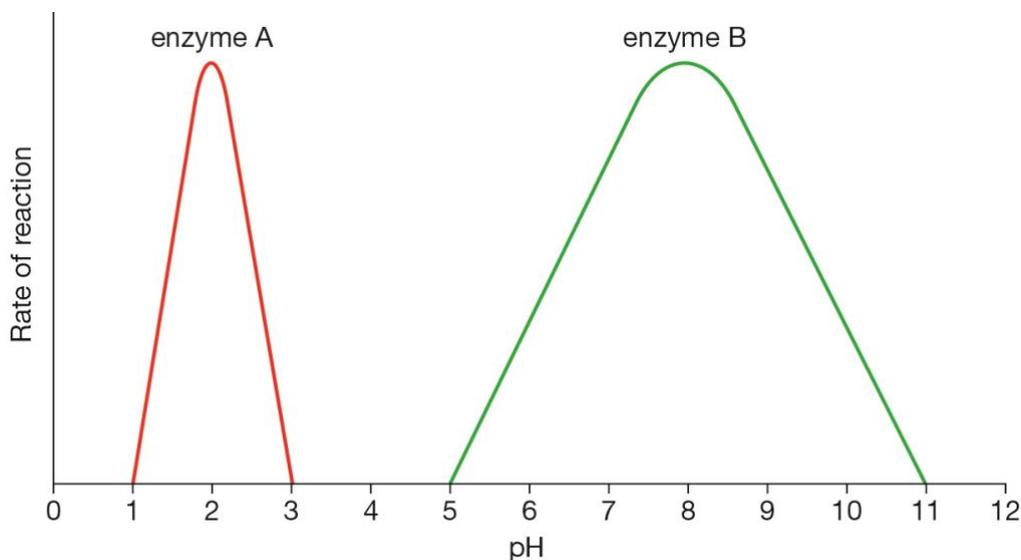
Suggest how the student could have tested for the presence or absence of starch.

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(f) Suggest why the times calculated by the student may not be accurate.

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7. The graph shows the effect of pH on two protease enzymes, pepsin that is made by the stomach and trypsin that is made by the pancreas.



(a) State the optimal pH for enzyme A and enzyme B.

Enzyme A

Enzyme B

(b) Identify each of the enzymes:

Enzyme A:

Enzyme B:

(c) Biological washing powders often contain protease enzymes.

Devise an experiment to test the effect of pH on the activity of biological washing powder.

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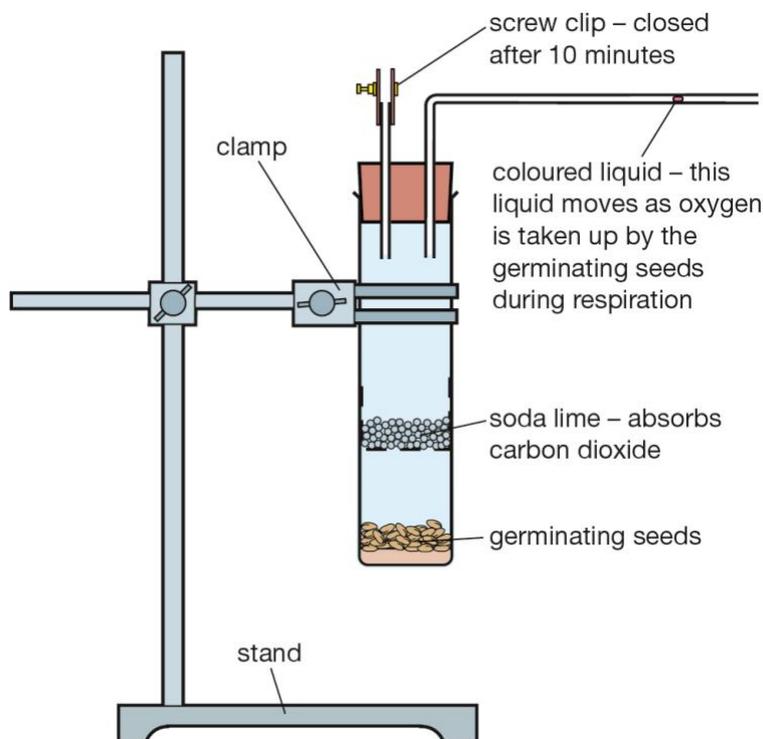
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8. An experiment was carried out into the effect of temperature on the respiration rate of germinating seeds. The apparatus used is showed in the diagram.



(a) Write down the balanced chemical equation for aerobic respiration below:



(b)(i) Explain why the coloured liquid moves towards the seeds as oxygen is taken up.

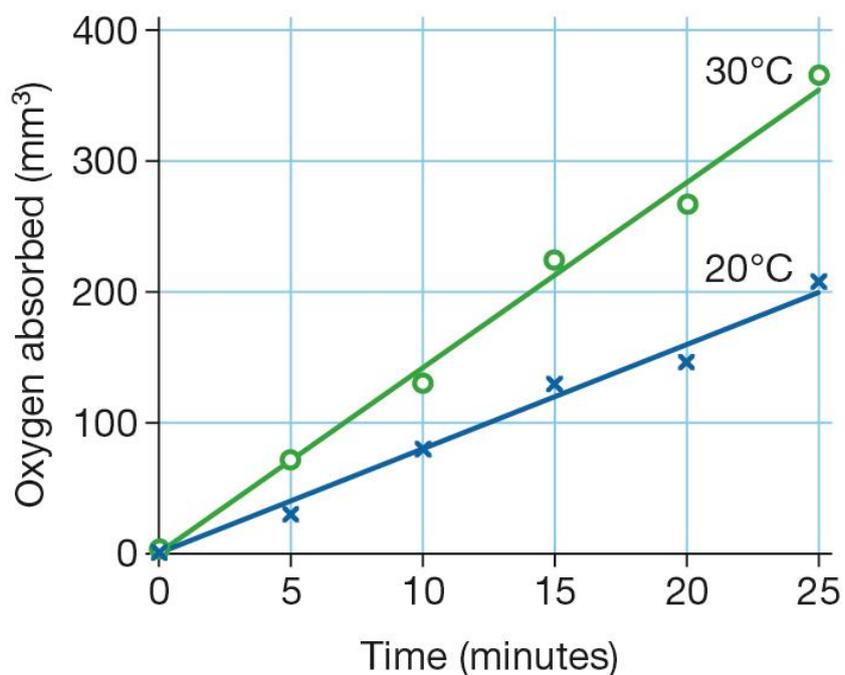
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(ii) Suggest the function of the screw clip.

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The volume of oxygen absorbed was measured every 5 minutes for 25 minutes at a temperature of 20°C. This was then repeated at 30°C.

The results are shown on the graph.



(c)(i) Calculate the slope of the lines of best fit at 20°C and 30°C to determine the mean rates of respiration. Show your working.

Mean rate of respiration at 20°C = mm³ oxygen / min

Mean rate of respiration at 30°C = mm³ oxygen / min

(ii) Explain the effect of temperature on the mean rate of respiration.

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(iii) Suggest how the reliability of the experiment could be improved.

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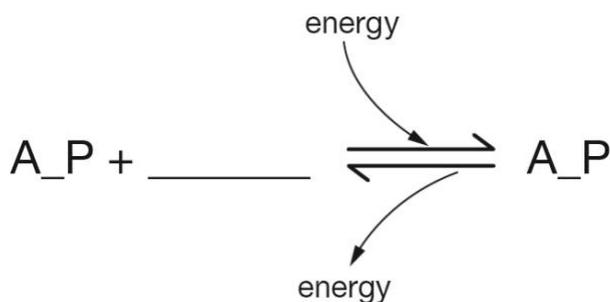
(iv) Suggest a suitable control experiment.

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(v) Explain whether the graphs suggest if the seeds were beginning to respire anaerobically at the end of the experiment.

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9.(a) Complete the following equation for ATP synthesis and breakdown.



(b) The ATP concentration in muscles and the respiration rate of an athlete were measured before and during exercise.

The results are shown in the table below.

Exercise	ATP concentration / mg per dm ³	respiration rate / cm ³ oxygen per hour
before exercise	0.4	0.6
during exercise	0.38	1.8

Comment on the results explaining the effect of exercise on ATP concentration.

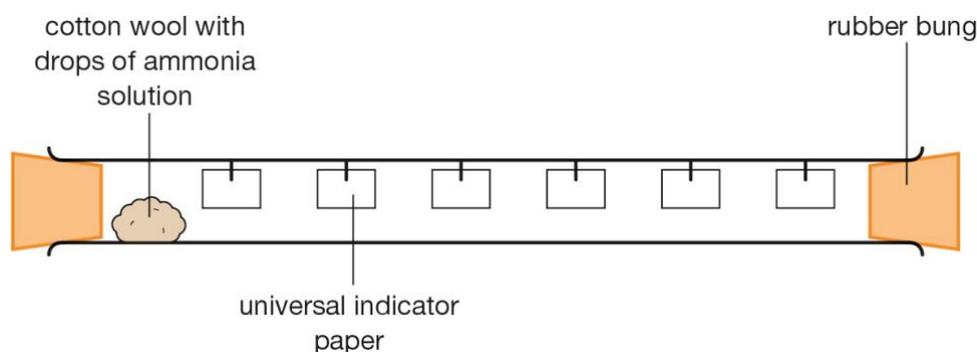
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10. An experiment was carried out into the effect of temperature on the rate of diffusion of ammonia along a glass tube.

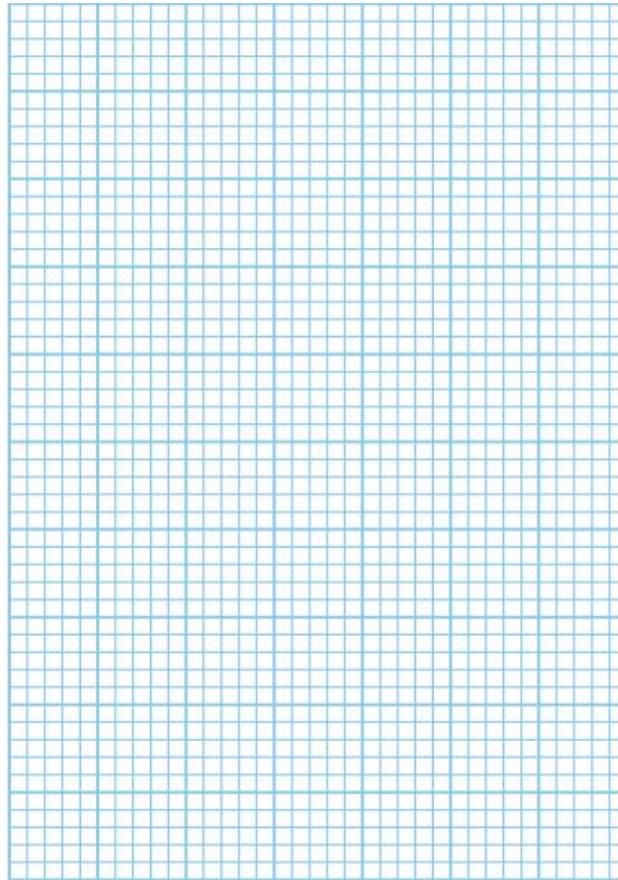
Pieces of universal indicator paper were placed at 5 cm intervals along the tube.
 A piece of cotton wool with drops of ammonia was placed in one end of the tube and the times taken for each piece to change colour recorded.
 The experiment was carried out at 15°C and 25°C.
 The apparatus is shown in the diagram.



The results are shown in the table below.

temperature / °C	Time taken for universal indicator paper to change colour / s					
	5 cm	10 cm	15 cm	20 cm	25 cm	30 cm
15	12	25	36	47	60	71
25	7	13	21	29	36	43

(a) Plot a line graph to show the effect of temperature on the time taken for the ammonia to diffuse along the glass tubes. Join the points with straight lines.



(b) Explain the effect of temperature on the time taken for the universal indicator paper to change colour.

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(c) Explain one factor that would need to be controlled.

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11.(a)(i) Define the terms diffusion and active transport.

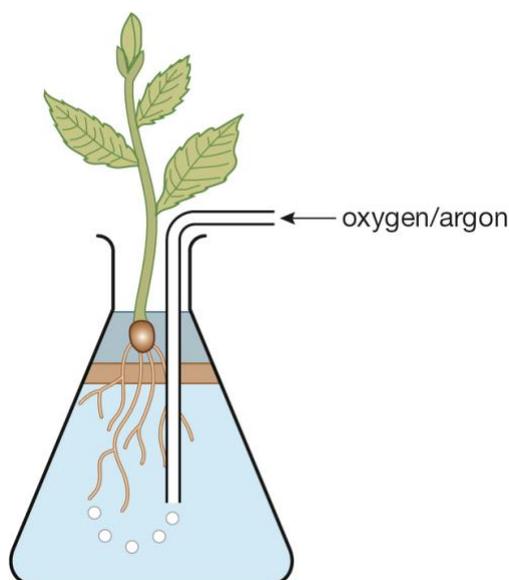
diffusion

active transport

(ii) Complete the table, by writing yes or no, to make a comparison of diffusion and active transport.

Feature	diffusion	active transport
particles move down a concentration gradient		
particles move against a concentration gradient		
always requires living cells		
always requires membrane proteins		
requires ATP		

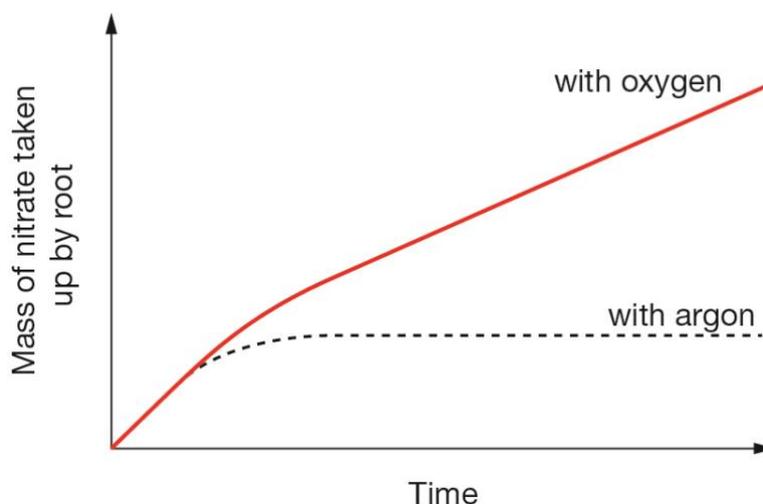
(b) The effect of oxygen on the uptake of radioactive nitrate ions by a plant root was investigated. Two barley seedlings were each placed into solutions of radioactively labelled nitrate ions as shown in the diagram.



Oxygen was bubbled through the solution of one plant. Argon was bubbled through the solution of the second plant (this ensures that the oxygen levels in the water are very low).

The mass of radioactive nitrate taken up by the root was measured over time for both plants.

The results are shown in the diagram.



(i) Compare and contrast the changes in mass of nitrate taken up by the root over time with oxygen with the changes in mass of nitrate taken up the root over time with argon.

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(ii) Explain whether the nitrate ions are taken up by the root by diffusion, active transport or both processes. Justify your answer.

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(c) Use your knowledge of active transport to explain the following:

(i) Why waterlogged soils cause poor crop growth.

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(ii) Why ploughing and aerating fields improves crop growth.

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Chapter 19: Natural Selection and Evolution

Textbook pages

261–267

Chapter overview

This topic covers the work of Charles Darwin, evolution, natural selection and the reasons for the increase in bacterial resistance to antibiotics.

What to expect

Specification areas covered:

3.38 explain Darwin's theory of evolution by natural selection

3.39 understand how resistance to antibiotics can increase in bacterial populations, and appreciate how such an increase can lead to infections being difficult to control.

Although this seems a short chapter and does not have a great deal of factual learning, the concepts are very important. Students need to have a secure knowledge and understanding of the process of natural selection in order to be able to explain exam questions that may use unfamiliar situations. Homework tasks can include research on Charles Darwin and his work, answering worksheet questions and explaining examples of the adaptations of organisms in terms of natural selection.

Teaching notes

- Students should have studied chapters 16, 17 and 18 and have a good understanding of the nature of genetic variation.
- A good starting point is to introduce Charles Darwin and his work. Darwin's observations (page 262 of textbook) could be given to students and they could then deduce the theory of natural selection.
- Evidence for evolution could be considered by students including: bringing in fossils or showing pictures of fossils (*Archaeopteryx* is a good example for students to identify both reptile and bird features) and demonstrating pictures of the peppered moth and Galapagos finches (or tortoises).
- Students could be given a range of different scenarios and asked to apply the stages of natural selection (mutation, variation, adaptations, survival, reproduction, repeat over generations, increased allele frequency).
- A range of animals and plants with different adaptations could be presented to students who then identify how they survive. This could be done by placing photographs (or plants such as cacti) around the room and students then rotate around the room explaining the adaptations of each. The value of camouflage can be tested practically (see practicals). A trip to a zoo or botanical garden would be a good experience for students.
- Antibiotic resistance can be introduced by looking through newspaper articles that describe its increase. It is possible to purchase non-pathogenic bacteria that have resistance to different antibiotics. Students could carry out research into the spread of antibiotic resistance and methods that could reduce it. A practical can be carried out by placing antibiotic discs on plates of these bacteria to identify resistance.

Possible misunderstandings

- Some students confuse alleles and genes – this should be reinforced when considering the process of natural selection.

- Some students think that organisms are mutated deliberately or change deliberately to survive better. This is best illustrated by having many different coloured blocks to start with and ‘killing off’ certain colours.

Differentiation

- For extension, students could research the work of Lamarck and explain how it compares to Darwin’s findings. They could also research epigenetics and how it affects Darwin’s work.
- Less-able students could produce posters or leaflets to describe Darwin’s work and / or bacterial resistance to antibiotics. A sentence sorting exercise on the stages of natural selection would help them appreciate the order of events. Less-able students often benefit from seeing real-life examples and, if possible, trips to zoos and safari parks would be very useful – or even carrying out an Internet project on the adaptations of particular species.

Practicals

Practicals listed in the textbook

There are no practicals in this chapter.

Additional practicals

- Camouflage. Pieces of drinking straw of different colours (or dyed pasta) can be placed into a tank or box of sawdust. The same number of pieces of each colour should be used (about 20 or 30, depending on the size of the tank or box). Students should try to remove as many straws as possible in 10 seconds. This is repeated until no more straws are left. A graph can be plotted of the remaining number of straws of each colour against time. This can then be considered in terms of allele frequency.
- Bacterial resistance. Some non-pathogenic strains of bacteria can be purchased that have different antibiotic resistances. They can be grown on plates with antibiotic discs and the results demonstrated to students.

MCQs UNIT 2

1. In which one of the following structures does gas exchange occur?

- A alveolus
- B bronchiole
- C bronchus
- D trachea

2. Which of the following occurs in the thorax during inhalation?

- A volume decreases and pressure decreases
- B volume decreases and pressure increases
- C volume increases and pressure decreases
- D volume increases and pressure increases

3. Which of the following will occur when blowing exhaled air through hydrogen carbonate indicator?

- A indicator turns red due to increased carbon dioxide gas
- B indicator turns red due to decreased oxygen gas
- C indicator turns yellow due to increased carbon dioxide gas
- D indicator turns yellow due to decreased oxygen gas

4. Some consequences of cigarette smoking are listed below.

1. reduced oxygen transport in the blood
2. babies with smaller birth mass
3. lung cancer

Which of these consequences could be caused by carbon monoxide gas?

- A 1 and 2
- B 1 and 3
- C 2 and 3
- D 3 alone

5. A student carried out food tests on a meal. The results are shown in the table.

test solution	final colour
iodine solution	black
Benedict's solution	blue
biuret solution	lilac

Which substances were present in the food?

- A glucose and protein
- B glucose and starch
- C protein and starch
- D protein and glucose

6. Which of these conditions is caused by a deficiency of vitamin C in the diet?

- A night blindness
- B obesity
- C rickets
- D scurvy

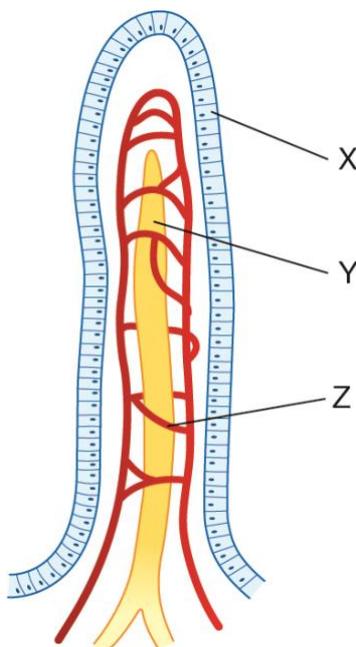
7. Below are some statements about digestion.

1. protein is digested in the duodenum
2. protein is digested in the stomach
3. protein is digested in the mouth

Which of the statements are correct?

- A 1 and 2
- B 1 and 3
- C 2 and 3
- D 1, 2 and 3

8. The diagram shows a villus.



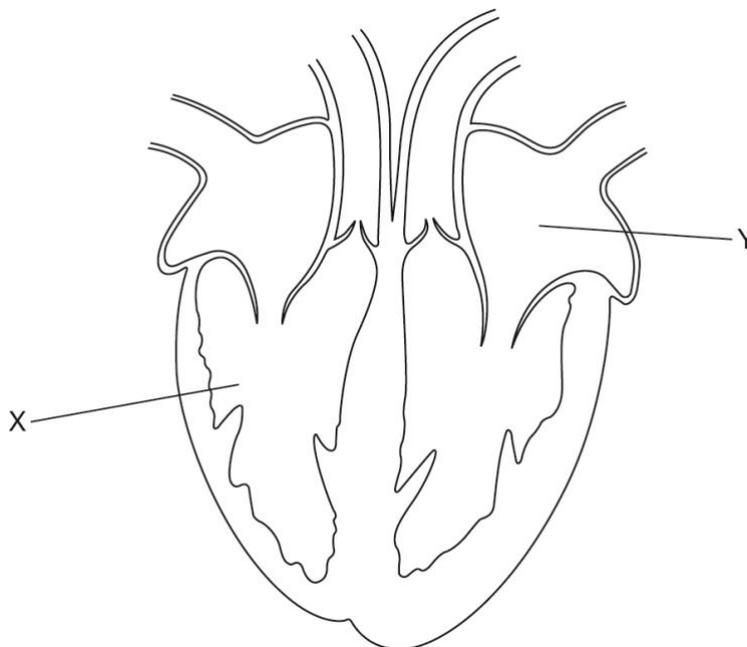
Which line gives the correct names of the structures X, Y and Z?

	X	Y	Z
A	capillary	microvilli	lacteal
B	lacteal	capillary	microvilli
C	microvilli	lacteal	capillary
D	microvilli	capillary	lacteal

9. Which of the following states the correct order of structures that food passes through?

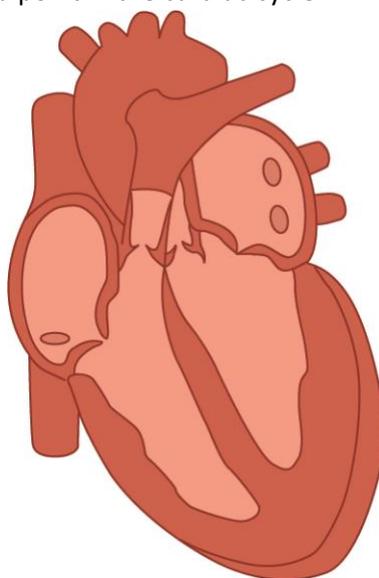
- A duodenum, ileum, colon, rectum
- B duodenum, colon, ileum, rectum
- C ileum, colon, rectum, duodenum
- D ileum, duodenum, rectum, colon

10. Which line states the correct names for structures X and Y?



	X	Y
A	left atrium	right ventricle
B	left ventricle	right atrium
C	right atrium	left ventricle
D	right ventricle	left atrium

11. The diagram shows a heart at a point in the cardiac cycle.



Which of the following is correct?

- A the atria are contracting and blood is flowing into the ventricles
- B the atria are contracting and blood is flowing into the veins
- C the ventricles are contracting and blood is flowing into the arteries
- D the ventricles are contracting and blood is flowing into the atria

12. A student suggested the following risk factors for coronary heart disease.

1. high fat diet
2. smoking
3. lack of vitamin A

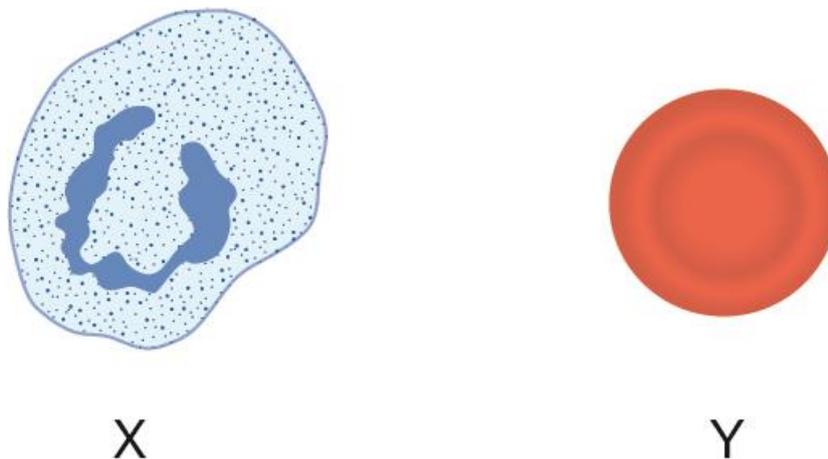
Which of the suggested risk factors for heart disease are correct?

- A 1 and 2
 B 1 and 3
 C 2 and 3
 D 1, 2 and 3

13. Which line correctly states some of the properties of arteries?

	blood pressure	valves
A	high	absent
B	high	present
C	low	absent
D	low	present

14. The diagram shows two blood cells.



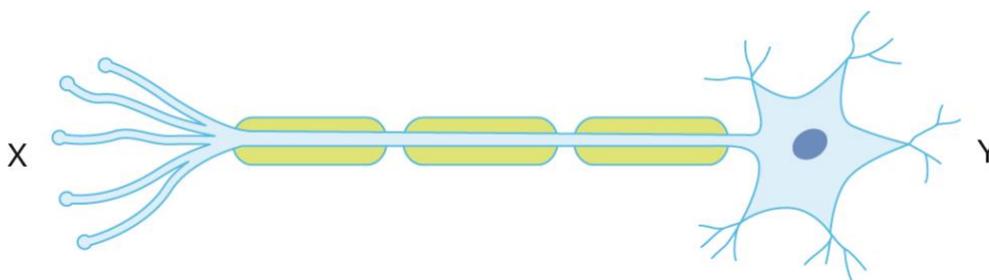
What are the correct names of the cells?

	X	Y
A	lymphocyte	red blood cell
B	lymphocyte	platelet
C	phagocyte	red blood cell
D	phagocyte	platelet

15. Which of the following correctly states the response of white blood cells to infection?

- A lymphocytes release antibodies
- B lymphocytes release antigens
- C phagocytes release antibodies
- D phagocytes release antigens

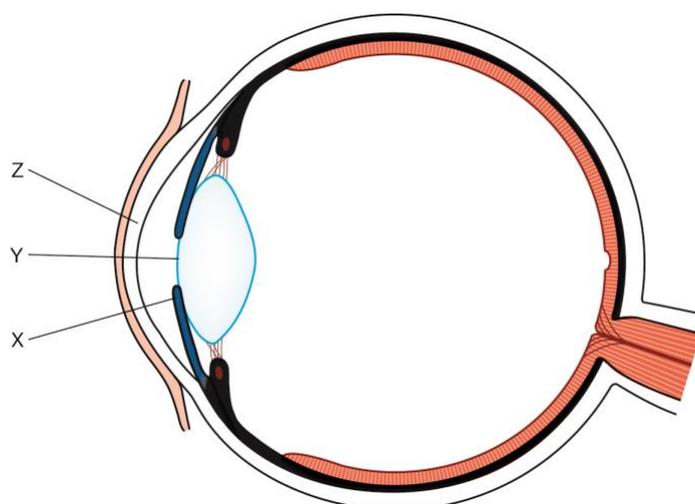
16. The diagram shows a neuron.



Which of the following gives the correct name of the neurone and direction of the impulse?

	name	direction
A	motor neurone	X → Y
B	motor neurone	Y → X
C	sensory neurone	X → Y
D	sensory neurone	y → X

17. The diagram shows the structure of a human eye.



Which of the following gives the correct names for X, Y and Z?

	X	Y	Z
A	cornea	lens	iris
B	iris	cornea	lens
C	iris	lens	cornea

D	lens	cornea	iris
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18. Which of the following correctly gives the state of the ciliary muscle and suspensory ligaments when looking at a close object?

	ciliary muscles	suspensory ligaments
A	contracted	slack
B	contracted	tense
C	relaxed	slack
D	relaxed	tense

19. Below are some statements about synapses.

1. information crosses a synapse by neurotransmitter chemicals and electrical impulses
2. transmission across a synapse involves diffusion
3. synapses only transmit information in one direction

Which of the statements are correct?

- A 1 and 2
- B 1 and 3
- C 2 and 3
- D 1, 2 and 3

20. Which of the following statements about insulin is correct?

- A it is made in the pancreas
- B it is released when blood glucose falls
- C it is released into the duodenum
- D it raises blood glucose concentration

21. Which of the following statements about the endocrine system is correct?

- A most hormones act faster than nerve impulses
- B hormones work only on a few body cells
- C hormones have shorter lasting effects than nerve impulses
- D hormones are transported in the blood

22. A student made the following statements about homeostasis

- it is the maintenance of a constant internal environment
- all organisms maintain a constant body temperature
- in mammals, homeostasis maintains body water balance

How many of the statements are correct?

- A 0
B 1
C 2
D 3

23. Which of the following rows about the body's response to lack of water is correct?

	ADH release	collecting duct permeability
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

24. Which of the following regions of nephron is where glucose is reabsorbed?

- A Bowman's (renal) capsule
B collecting duct
C distal convoluted tubule
D proximal convoluted tubule

25. If the blood becomes too hot, which of the following correctly states the response of the skin?

- A vasoconstriction increasing blood flow to the surface
B vasoconstriction reducing blood flow to the surface
C vasodilation increasing blood flow to the surface
D vasodilation reducing blood flow to the surface

26. By which of the following processes does sweating release heat from the skin?

- A radiation
- B evaporation
- C conduction
- D convection

27. Below are some statements about methods of reproduction.

1. involves two parents
2. involves fusion of gametes
3. results in genetically identical offspring

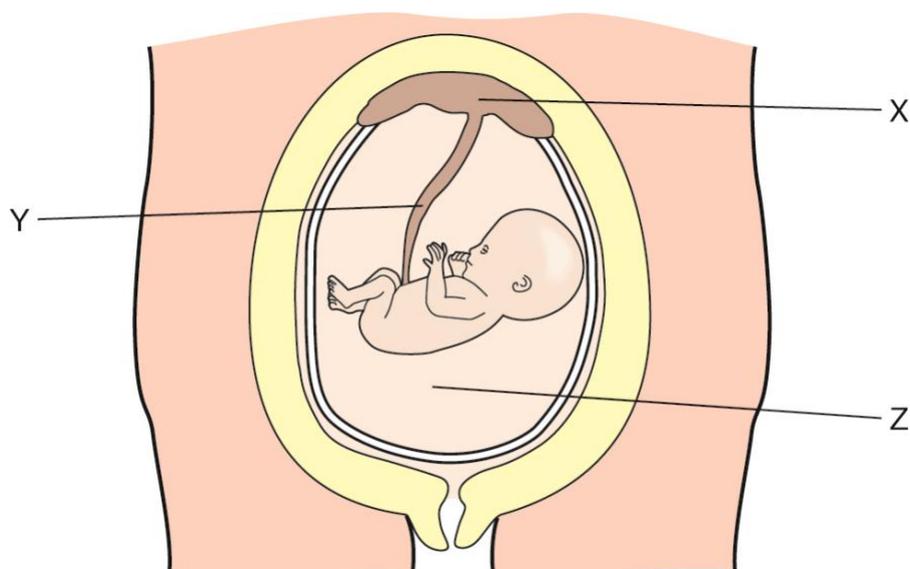
Which of the statements are correct for sexual reproduction?

- A 1 and 2
- B 1 and 3
- C 2 and 3
- D 1, 2 and 3

28. Which of the following rows about oestrogen and progesterone is correct?

	oestrogen	progesterone
A	repairs endometrium	breaks down endometrium
B	blood concentrations peak before ovulation	blood concentrations peak before ovulation
C	blood concentrations are low during menstruation	blood concentrations are high during menstruation
D	stops the menstruation when concentrations rise	falling concentrations lead to menstruation

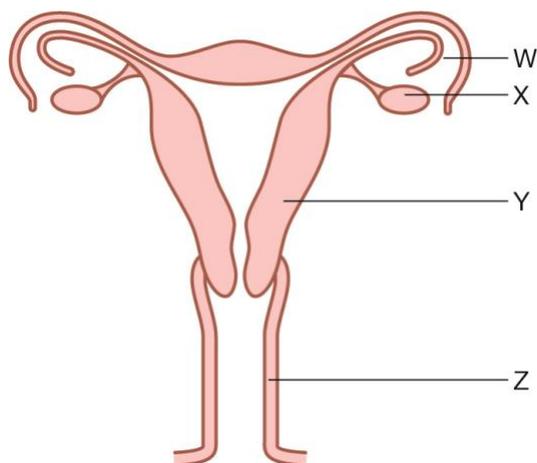
29. The diagram shows a developing fetus in a uterus.



Which row gives the correct names of structures X, Y and Z?

	X	Y	Z
A	amniotic sac	umbilical cord	placenta
B	placenta	umbilical cord	amniotic sac
C	placenta	amniotic sac	umbilical cord
D	umbilical cord	placenta	amniotic sac

30. The following diagram relates to questions 30 and 31. It shows the female reproductive system.



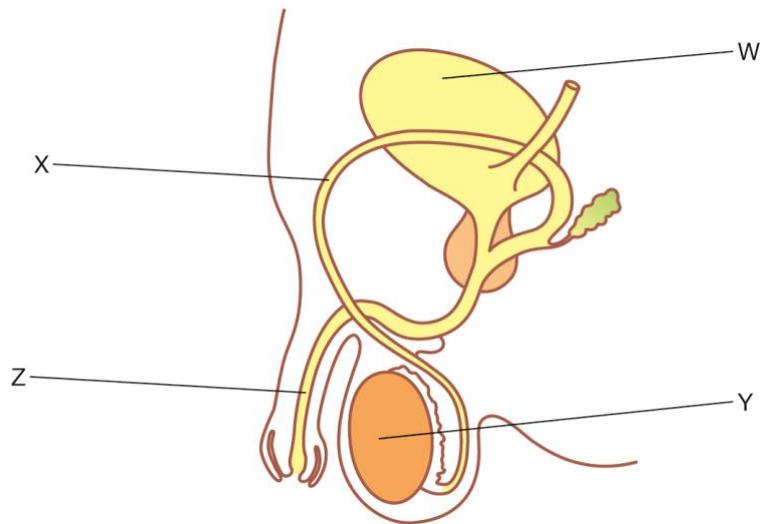
In which of the structures does ovulation occur?

- A W
- B X
- C Y
- D Z

31. In which of the structures does an embryo implant?

- A W
- B X
- C Y
- D Z

32. The following diagram relates to questions 32 and 33. It shows the male reproductive system.



In which of the structures is testosterone produced?

- A W
- B X
- C Y
- D Z

33. In which of the structures is sperm produced?

- A W
- B X
- C Y
- D Z

34. Which of the following statements about FSH is correct?

- A FSH stimulates egg maturation
- B FSH stimulates ovulation
- C FSH levels rise after ovulation
- D FSH is produced by the ovary

35. Which of the following statements about puberty in girls is correct?

- A the shoulders broaden
- B the voice deepens
- C pubic hair growth occurs
- D puberty is stimulated by testosterone

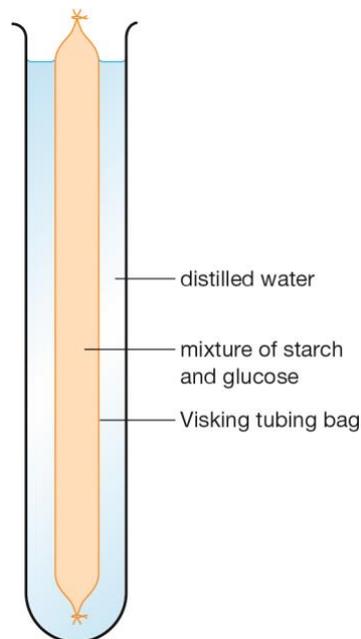
36. Which of the following substances will pass across the placenta from the mother to the baby?

- A amino acids
- B carbon dioxide
- C protein
- D urea

37. When looking at a bright light, which of the following gives the correct states of the circular and radial muscles of the iris?

	circular muscles	radial muscles
A	contracted	contracted
B	contracted	relaxed
C	relaxed	contracted
D	relaxed	relaxed

38. The effect of lipase on fat digestion was investigated using the equipment shown in the diagram.



After one hour of incubation, the pH of the distilled water was tested.

Which of the following is correct about the distilled water?

- A the pH will fall due to the presence of amino acids
- B the pH will fall due to the presence of fatty acids
- C the pH will rise due to the presence of amino acids
- D the pH will rise due to the presence of fatty acids

39. The composition of the blood of a healthy person and a patient admitted to hospital are shown in the table.

	red blood cell count	white blood cell count	platelet count
healthy person	4.32×10^9 per cm^3	3.7×10^6 per cm^3	1.5×10^8 per cm^3
patient	4.52×10^9 per cm^3	9.8×10^6 per cm^3	0.1×10^8 per cm^3

What conditions does the patient have?

- A anaemia
- B poor blood clotting
- C anaemia and poor blood clotting
- D infection and poor blood clotting

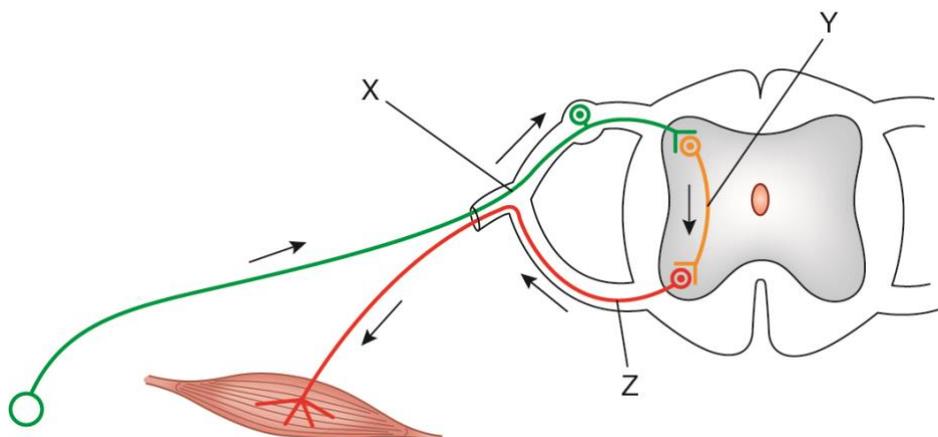
40. Below are the names of some enzymes.

1. amylase
2. lipase
3. protease

Which of the enzymes are made by the pancreas?

- A 1 and 2
- B 1 and 3
- C 2 and 3
- D 1, 2 and 3

41. The diagram shows a reflex arc.



Which of the rows correctly labels cells X, Y and Z?

	X	Y	Z
A	motor neurone	sensory neurone	relay neurone
B	motor neurone	relay neurone	sensory neurone
C	sensory neurone	motor neurone	relay neurone
D	sensory neurone	relay neurone	motor neurone

Answers

1. A - alveolus
2. C - volume increases and pressure decreases
3. C - indicator turns yellow due to increased carbon dioxide gas
4. A - 1 and 2
5. C - protein and starch
6. D - scurvy
7. A - 1 and 2
8. C
9. A - duodenum, ileum, colon, rectum
10. D
11. C - the ventricles are contracting and blood is flowing into the arteries
12. A - 1 and 2
13. A
14. A
15. A - lymphocytes release antibodies
16. B
17. C
18. A
19. C - 2 and 3
20. A - it is made in the pancreas
21. D - hormones are transported in the blood
22. C - 2
23. D
24. D - proximal convoluted tubule
25. C - vasodilation increasing blood flow to the surface
26. B - evaporation
27. A - 1 and 2
28. D
29. B
30. A - W
31. C - Y
32. C - Y
33. C - Y
34. A - FSH stimulates egg maturation
35. C - FSH stimulates egg maturation
36. A - amino acids
37. B
38. B - the pH will fall due to the presence of fatty acids
39. D - infection and poor blood clotting
40. D - 1, 2 and 3
41. D

Biology Paper 2 Exam Question

(c) (i) Describe how a mutation in the DNA of a cell can affect the functioning of an enzyme.

(3)

The Mark Scheme

Question number	Answer	Mark
5(c)(i)	A description that makes reference to three of the following points: <ul style="list-style-type: none">• change in the order of bases/equivalent (1)• leads to different codon (1)• different amino acid in protein (1)• different-shaped enzyme/change to active site/enzyme not made/equivalent (1)	3

Student Response 1

Mutations can be very harmful, sometimes lethal. They are caused by changes to the amino acid sequence of the DNA. This means that different proteins are made and so do not work properly, for example, some enzymes may not be made. Blue eyes may be a mutation of brown eyes genes.

Is this a good answer?

Student Response 1: Verdict

Mutations can be very harmful, sometimes lethal. They are caused by changes to the amino acid sequence of the DNA. This means that different proteins are made and so do not work properly, for example, some enzymes may not be made. Blue eyes may be a mutation of brown eyes genes.

Good

- The candidate correctly states that enzymes may not be made (1 mark).

Could be improved

- This is a very vague answer with significant confusion.
- The candidate has made a common mistake – confusing bases in DNA with amino acids.
- They have tried to give an example of a mutation (eye colour) but the question does not ask for one and there is no explanation.
- They state that different proteins are made but do not link this to active sites of enzymes.

Student Response 1: Improvements

Mutations can be very harmful, sometimes lethal. They are caused by changes to the amino acid sequence of the DNA.

This is not the same as base sequence – a common error.

This means that different proteins are made

This is correct and is an alternative to the fourth point in the mark scheme.

and so do not work properly, for example, some enzymes may not be made.

This lacks detail. It hints at enzymes not functioning but is not precise. No mention of active sites.

Blue eyes may be a mutation of brown eyes genes.

Student Response 2

A mutation is a change in the order of bases of a gene (in the DNA). This leads to transcription of different mRNA which is translated into a protein with a different sequence of amino acids. The active site of the enzyme will have a different shape and so no longer bind the substrate. Some mutations, however, have no effect.

Student Response 2: Commentary

A mutation is a change in the order of bases of a gene (in the DNA).

This is a correct statement about the base sequence change (1 mark).

This leads to transcription of different mRNA

This is a correct but does not mention codons.

which is translated into a protein with a different sequence of amino acids.

This is a correct statement about the change in amino acid sequence (1 mark).

The active site of the enzyme will have a different shape and so no longer bind the substrate.

This is a correct statement about the effect on enzymes (1 mark).

Some mutations, however, have no effect.