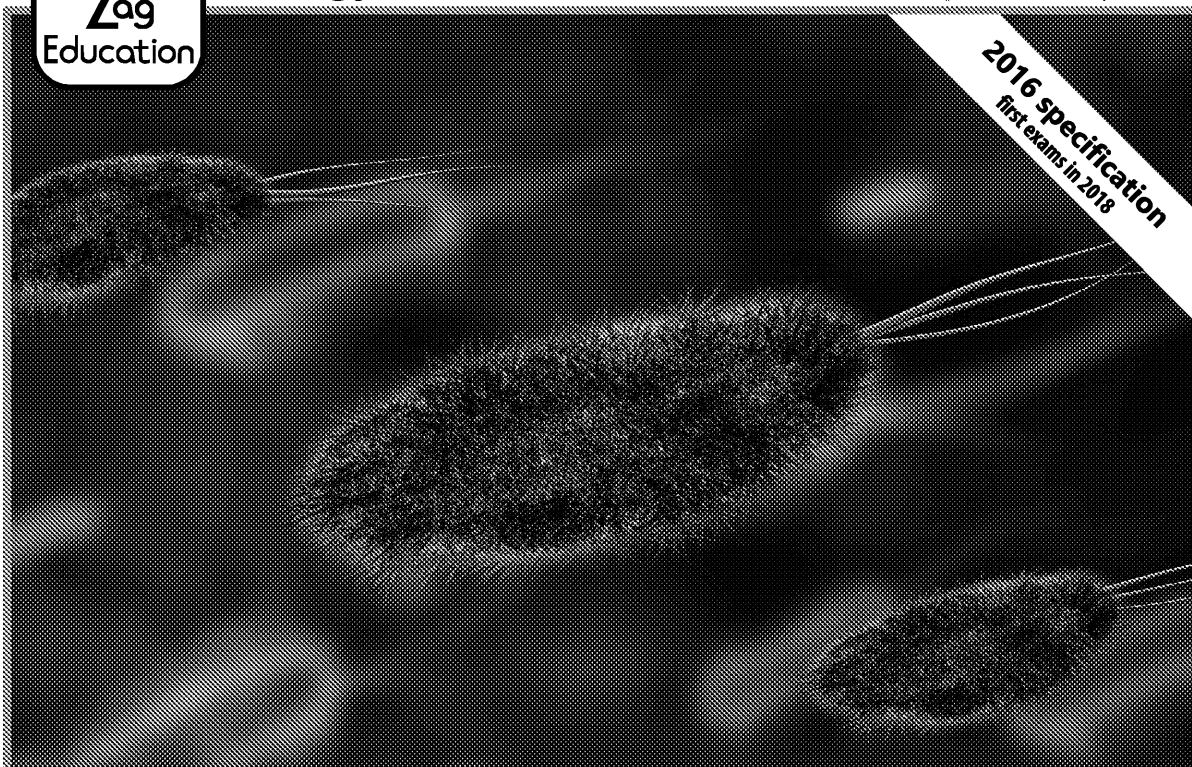




Multiple-Choice Practice Questions

for GCSE (9–1) OCR Combined Science A (Biology) Topics B1–B3

Paper 1: Foundation

Paper 7: Higher

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Teacher's Introduction

The OCR Gateway Combined Science A specification (J250) remains a popular choice for many schools and, in common with the assessment model chosen for all of OCR's Gateway subjects, has multiple-choice questions at the beginning of each exam paper.

Remember!

Always check the exam board website for new information, including changes to the specification and sample assessment material.

While multiple-choice questions may be easy to mark for both teachers and examiners, students may find answering multiple-choice questions difficult if they (a) have not learnt and understood the topic, (b) do not fully read all answer stems, and (c) have not had sufficient opportunity to practise due to the limited number of suitable questions to use from past papers. Exam candidates may also think that they may be able to guess the correct answer or narrow it down to a couple of suitable answers, and this can lead to poor exam technique and preparation. The intention of this resource is to bridge the gap between the lack of sufficient multiple-choice questions currently available and the need to provide useful examples to prepare and train candidates and help them to gain marks in their GCSE exams.

OCR Gateway 9–1 Combined Science A (J250) has multiple-choice questions in both of its Biology exams: Papers 1 and 2 (Foundation tier) and Papers 7 and 8 (Higher tier). Papers 1 and 7 cover topics B1–3 and CS7 (practical skills), while Papers 2 and 8 cover topics B4–6 and CS7, with assumed knowledge of topics B1–3. The questions in this resource provide examples to allow learners to not only practise answering multiple-choice questions and check their answers, but also to understand why their answers may be correct or incorrect. This can correct misconceptions, identify gaps in students' knowledge and understanding, and highlight where their answer may just have been a lucky guess! **The questions in this pack are from topics B1, B2 and B3 – with related practical topics from CS7 – making it suitable preparation for Papers 1 and 7. Higher Tier questions are clearly marked.**

The format of the resource is two banks of multiple-choice questions covering the specification content. In Bank A, solutions include commentary explaining why each answer is either correct or incorrect. A bank of additional questions (without commentary) is provided in Bank B for further student practice.

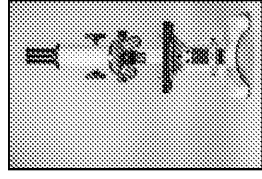
How to use this resource

In addition to the traditional use of multiple-choice questions in summative assessment, students could be given the questions in topic order to complete after revision, either simply to answer or to write a reason/justification for their final answer and why each answer stem is either correct or incorrect. The commentary for Bank A can help students to check their answers and reasoning, while the additional questions in Bank B could be used to check for progress and improvement after revision and practice. This will maximise the learning opportunities provided by this resource which is suitable for all candidates. It will stretch and challenge higher tier candidates and is easy to use by foundation tier candidates.

May 2023

Topic 1: B1 Cell-level sy

B1.1 Cell structures



1. Which is the correct pathway taken by light rays that allows an image to be seen using a light microscope?

A Eyepiece lens → objective lens → specimen → light source

B Specimen → light source → eyepiece lens → objective lens

C Light source → specimen → objective lens → eyepiece lens

D Specimen → light source → objective lens → eyepiece lens

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2. When using a light microscope, why is a coverslip used?

A To trap air bubbles on top of the specimen.

B To prevent the objective lens from touching the specimen.

C To prevent the eyepiece lens from touching the specimen.

D To keep air off the specimen.

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3. When using a light microscope, why is a stain used when examining a specimen?

A To prevent the light from damaging the cells.

B To keep the cells alive.

C It is impossible to see anything unless a stain is used.

D To make parts of the cell easier to see.

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4. What is the formula used to calculate total magnification?

A Total magnification = eyepiece lens magnification × objective lens magnification

B Total magnification = eyepiece lens magnification ÷ objective lens magnification

C Total magnification = eyepiece lens magnification + objective lens magnification

D Total magnification = objective lens magnification ÷ eyepiece lens magnification

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5. HT only
A scientist is using a light microscope to examine a specimen. If the eyepiece lens has a magnification of 10× and the objective lens has a magnification of 40×, what is the total magnification of the specimen?

A 4 × 10

B 4 × 100

C 1 × 10

D 3 × 10

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6. Which statement is correct?

A They are all correct.

B They are all incorrect.

C They are all correct.

D They are all incorrect.

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7. Which statement is correct?

A Eukaryotic cells have a nucleus.

B Prokaryotic cells have a nucleus.

C Plant cells have a cell wall.

D Bacterial cells have a cell wall.

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8. Which statement is correct?

A Some cells are eukaryotic.

B Bacteria are prokaryotic.

C A plant cell is eukaryotic.

D Bacteria are eukaryotic.

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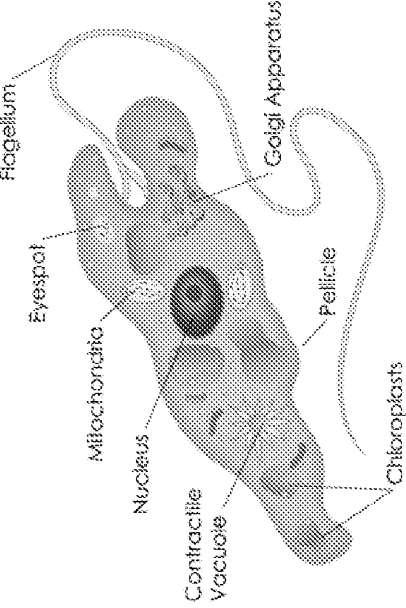
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9.



This image shows the a single-celled organism called *Euglena*.
Using only information shown in the diagram, what is the reason why *Euglena* is not a bacterium?

- A A bacterium does not have a flagellum. ☐
- B A bacterium does not have a nucleus, mitochondria and chloroplasts. ☐
- C It is too big to be a bacterium. ☐
- D It is a plant cell because it has chloroplasts. ☐

10. Which row in the table correctly shows what a student could expect to see with a light microscope when examining an onion epidermis cell?

Row	Organelles/structures visible
A	Mitochondria, cell wall, nucleus, cytoplasm
B	Nucleus, cell wall, cell membrane, cytoplasm
C	DNA, cell wall, cell membrane, cytoplasm
D	Flagellum, plasmid, nucleus, cell wall

- A ☐
- B ☐
- C ☐
- D ☐

11. Which statement is correct?
- 1. Electron microscopes use light rays.
 - 2. Light microscopes detect details smaller than the wavelength of light.
 - 3. Electron microscopes have a higher magnification than light microscopes.
 - 4. The brightness of a light microscope can be adjusted by changing the focus.
- A 2, 3 and 4
B 1 and 2
C 1 and 3
D 1, 3 and 4

12. The resolution of a light microscope is 200 nm. The resolution of an electron microscope is 0.001 nm. How many times greater is the resolution of a light microscope than an electron microscope?
- A 2 times
B 200 times
C 2000 times
D 20000 times

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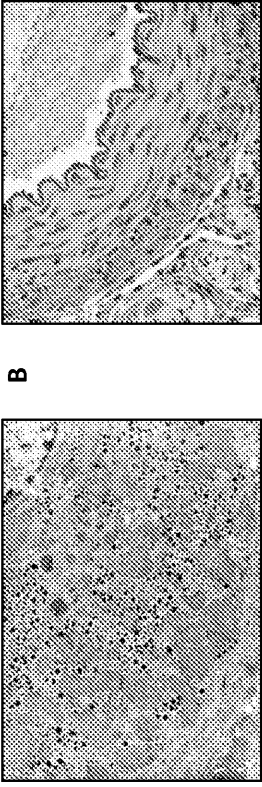


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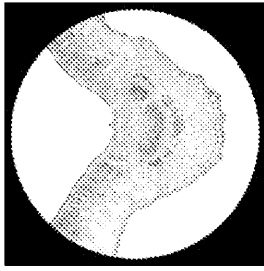
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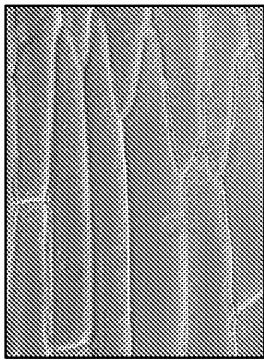
13. Which of these images was produced by an electron microscope?



B



D

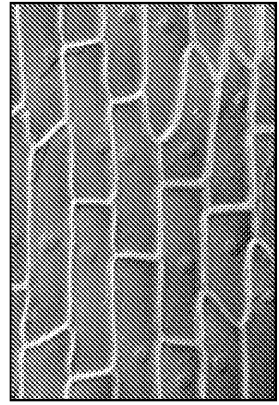


- A** ☐
- B** ☐
- C** ☐
- D** ☐

15. Place the

- 1. An
- 2. An
- 3. A p
- 4. An

- A** 1, 2
- B** 3, 2
- C** 2, 4
- D** 2, 4



14.

A scientist printed this image onto a large sheet of paper. He measured the diameter of a nucleus and found it to be 10 mm; however, he knew the diameter of a nucleus to be 6 μm in real life. What was the magnification of the final image on the sheet of paper?

- A** x60 ☐
- B** x600 ☐
- C** x1667 ☐
- D** x1.67 ☐

B1.2 What happens in cells (and what do)

16. Why is DNA described as a polymer?

- A It is made up of complementary base pairs. ☐
- B It is a double helix. ☐
- C It is made up of sections of DNA called genes. ☐
- D It is made up of many nucleotides which are similar small units joined together. ☐

17.



The picture illustrates a DNA molecule.

Which statement is correct?

- A DNA is made up of two circles of DNA molecules. ☐
- B DNA is a double helix formed by two strands of nucleotides. ☐
- C DNA is a double helix formed by two strands of proteins. ☐
- D DNA is a double helix formed by two strands of amino acids. ☐

18. Sausage skins are generally made out of collagen or cellulose. Since an enzyme is specific for its substrate, which enzyme would be needed to break down sausage skins made of collagen?

- A Amylase ☐
- B Collagenase ☐
- C Cellulase ☐
- D Carbohydrase ☐

19.

Which statement is correct?
and key hypothesis
A The scientists
B The scientists
C The scientists
D The scientists

20. Scientists used
an enzyme to break
down sausage skins
made of collagen.

30
25
20
15
10
5
0

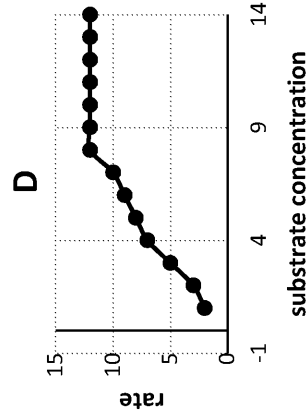
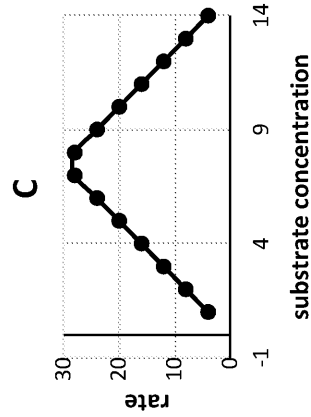
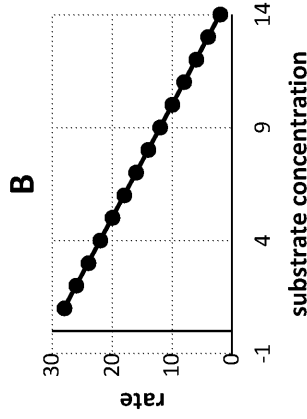
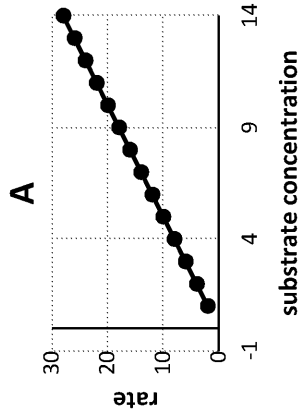
Why did the scientists
use this enzyme?
A 37 °C
B The temperature
C The pH
D The time used

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21. Which graph shows the relationship between the rate of an enzyme-controlled reaction and changes in substrate concentration?



A B C D

☐ ☐ ☐ ☐

22. This graph is controlled

rate of reaction (arbitrary units)

14
12
10
8
6
4
2
0

What is the enzyme concentration?

- A The enzyme concentration is constant
B All of the above
C Enzyme concentration is constant
D The enzyme concentration is constant

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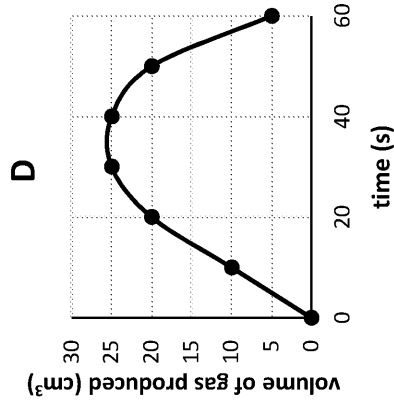
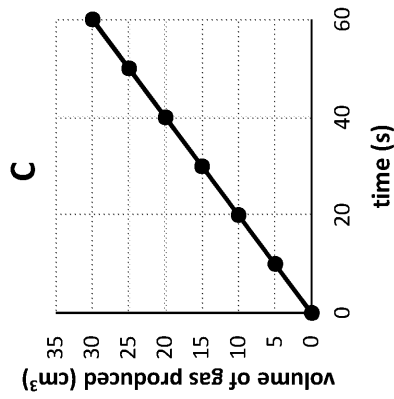
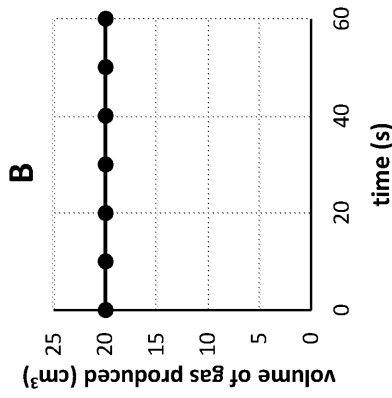
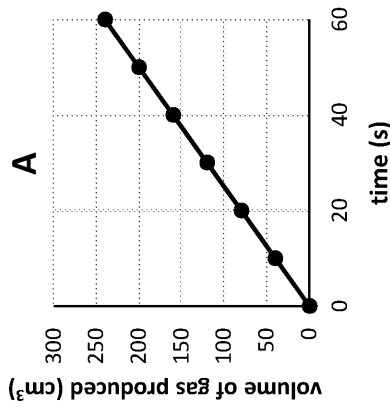


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23. In which graph is the rate of reaction $4.17 \text{ cm}^3/\text{s}$?



A B C D

☐ ☐ ☐ ☐

24. Which of the following words will work?

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

25. Identify the reaction.

26. What is the rate of reaction?

- A 7
B 7.5
C 8
D 7.2

B1.3 Respiration

27. Identify the word equation for aerobic respiration.

- A

Carbon dioxide + water → glucose + oxygen

☐
- B

Glucose → lactic acid

☐
- C

Glucose + oxygen → carbon dioxide + water

☐
- D

Glucose → ethanol + carbon dioxide

☐

28. Which statements are true?

1. Plants photosynthesise during the day and respire only at night.
2. All living cells respire.
3. ATP is a source of energy produced during respiration.
4. Respiration can only happen in the presence of oxygen.

- A

2 and 3.

☐
- B

1, 2, 3 and 4.

☐
- C

3 and 4.

☐
- D

1, 3 and 4.

☐

29. Which word correctly describes the type of chemical reaction that cellular respiration is?

- A

Endothermic

☐
- B

Exothermic

☐
- C

Ectothermic

☐
- D

Anabolic

☐

30. Which row in the table correctly describes anaerobic respiration in yeast?

Row	Reactant(s)	Products
A	Glucose	Carbon dioxide + lactic acid
B	Glucose + oxygen	Carbon dioxide + water
C	Glucose	Carbon dioxide + ethanol
D	Glucose + oxygen	Carbon dioxide + ethanol

- A

☐
- B

☐
- C

☐
- D

☐

31. Which statement describes aerobic respiration?

- A

Aerobic

☐
- B

Anaerobic

☐
- C

ATP is not produced

☐
- D

Aerobic and anaerobic

☐

32. Carbohydrates are produced by living organisms.

- A

They release energy

☐
- B

They store energy

☐
- C

They release energy

☐
- D

They store energy

☐

33. Lipids are

- A

They store energy

☐
- B

They release energy

☐
- C

They store energy

☐
- D

They release energy

☐

34. Which row correctly describes the products of anaerobic respiration in yeast?

- A

1, 2, and 3

☐
- B

1, 2 and 4

☐
- C

1, 3 and 4

☐
- D

1 and 4

☐

B1.4 Photosynthesis

35. Plants and algae are photosynthetic organisms. Why are they important for animal life on Earth?
- A** They release carbon dioxide into the atmosphere from respiration. ☐
 - B** They capture energy from sunlight and convert it to biomass for animals to eat. ☐
 - C** They absorb soil through their roots, recycling minerals in this way. ☐
 - D** They produce energy through photosynthesis. ☐

36. Photosynthesis occurs in two stages. Which two statements correctly describe these stages?
1. Light energy is used to split water into oxygen gas, hydrogen ions and electrons. ☐
 2. Glucose is made from carbon dioxide gas, hydrogen ions and electrons. ☐
 3. Light energy is used to split carbon dioxide into oxygen gas. ☐
 4. Glucose is made from water and carbon dioxide. ☐

37. What is the equation for photosynthesis?
- A** $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ ☐
 - B** $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$ ☐
 - C** $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_3\text{H}_6\text{O}_3$ ☐
 - D** $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2$ ☐

38. Where in a plant cell does photosynthesis take place?
- A** In the mitochondria. ☐
 - B** In the cytoplasm. ☐
 - C** In the nucleus. ☐
 - D** In the chloroplasts. ☐

39. Photosynthesis is an endothermic reaction. What does this mean?
- A** Energy is released. ☐
 - B** Energy is absorbed. ☐
 - C** Enzymes are used. ☐
 - D** Useful work is done. ☐

40. For what purpose do plants use chlorophyll?
- A** To produce glucose. ☐
 - B** To produce light. ☐
 - C** To produce heat. ☐
 - D** To produce oxygen. ☐

41. Which of the following is not a product of photosynthesis?
- A** Glucose ☐
 - B** Oxygen ☐
 - C** Water ☐
 - D** Carbon dioxide ☐

42. Which of the following is not a reactant of photosynthesis?
- A** Glucose ☐
 - B** Oxygen ☐
 - C** Water ☐
 - D** Carbon dioxide ☐

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42. Which three factors affect the rate of photosynthesis?
- A Temperature, light intensity, availability of carbon dioxide ☐
 - B Temperature, light intensity, availability of oxygen ☐
 - C Light intensity, availability of carbon dioxide, availability of oxygen ☐
 - D Temperature, availability of carbon dioxide, availability of oxygen ☐

43. HT only

The reactions involved in photosynthesis require enzymes. Which of these statements are correct?

1. As the temperature increases, the rate of photosynthesis will increase, but if it increases too much the enzymes may become denatured and photosynthesis will stop.
2. Carbon dioxide is a substrate required for glucose production and as carbon dioxide concentration increases, the rate of photosynthesis will increase.
3. Light provides the activation energy for the enzyme-controlled reactions to proceed.
4. Oxygen is a product of photosynthesis and enzymes are needed for it to be produced.

- A 1, 2, 3 and 4. ☐
- B 1 and 2. ☐
- C 3 and 4. ☐
- D 1 and 3. ☐

44. HT only

The inverse square law relates light intensity reaching a photosynthesising plant with the distance a light source is from the plant. It is shown by this equation:

$$\text{Light intensity} \propto 1 \div (\text{distance from the light source})^2$$

Which of these statements is correct?

- A As the light intensity increases, the distance increases. ☐
- B As the light intensity increases by four, the distance decreases by two. ☐
- C As the distance doubles, the light intensity halves. ☐
- D As the distance doubles, light intensity decreases by a factor of four. ☐

45. HT only
What does

rate of photosynthesis (a.u.)

180
160
140
120
100
80
60
40
20
0

- A Temperature ☐
- B As light intensity increases ☐
- C The rate of photosynthesis ☐
- D Light intensity ☐

Topic 2: B2 Scaling u

B2.1 Supplying the cell

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46. Which factors increase the rate of diffusion?
- A ☐ A decrease in surface area, a decrease in concentration gradient, a decrease in diffusion distance
- B ☐ An increase in surface area, an increase in concentration gradient, an increase in diffusion distance
- C ☐ An increase in surface area, an increase in concentration gradient, a decrease in diffusion distance
- D ☐ An increase in surface area, a decrease in concentration gradient, a decrease in diffusion distance
-
47. What is the definition of diffusion?
- A ☐ The net movement of particles from an area of high concentration to an area of low concentration down a concentration gradient.
- B ☐ The net movement of particles from an area of high concentration, to an area of low concentration down a concentration gradient, across a partially permeable membrane.
- C ☐ The movement of water from an area of high water potential to an area of low water potential across a partially permeable membrane.
- D ☐ The movement of particles from an area of low concentration to an area of high concentration, against a concentration gradient.
-
48. Which statement about osmosis is correct?
- A ☐ Osmosis requires energy in the form of ATP.
- B ☐ During osmosis, water moves from an area of low water potential to an area of high water potential.
- C ☐ Oxygen moves by osmosis into a cell so aerobic respiration can occur.
- D ☐ Only water can move by osmosis.
-
49. During experiments to study the effects of osmosis, cylinders of potatoes are often placed in salt solutions of different concentrations. If a potato cylinder had an initial mass of 3.0 g and gained 0.8 g, what was the percentage change in mass?
- A ☐ +3.8 %
- B ☐ +26.7 %
- C ☐ +21.1 %
- D ☐ -26.7 %

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sexu
B To all
C So ba
D To m

50. Which row

Row
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B
C
D

A
B
C
D

51. Which sta

A The
B How
C The
D The

52.

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56. Which row

Row
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B
C
D

- A
B
C
D

57. What is the

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B To div
C To allo
D To allo

58. Which state

- A Embry
B Adult
C Adult
D Plants

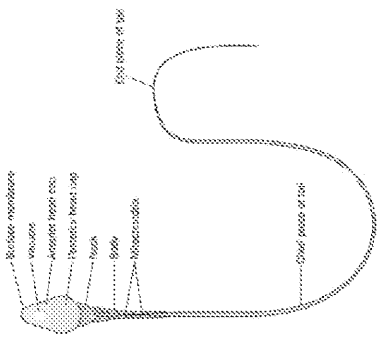
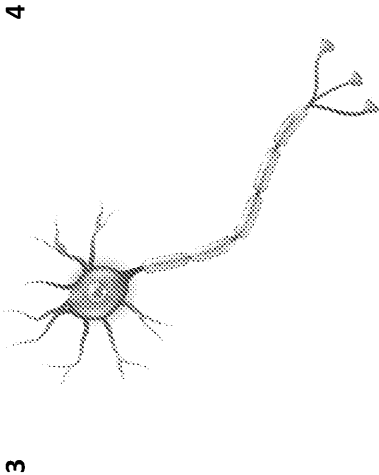
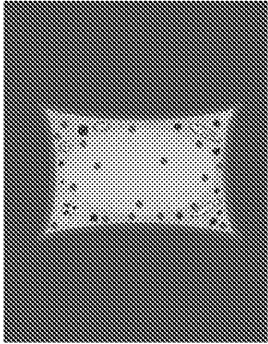
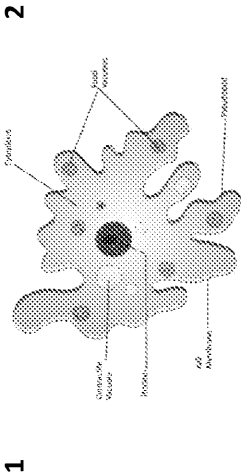
53. The cell cycle occurs in stages. Which stages are given in the correct sequence?

- A DNA replication, movement of chromosomes, growth of the cell
B Movement of chromosomes, DNA replication, growth of the cell
C Growth of the cell, DNA replication, movement of chromosomes
D DNA replication, movement of chromosomes, DNA replication, growth of the cell

54. A cell that has differentiated can be said to be what?

- A Repaired.
B Replaced.
C Specialised.
D A stem cell.

55. Which images show cells that are clearly specialised to perform a particular, unique function?

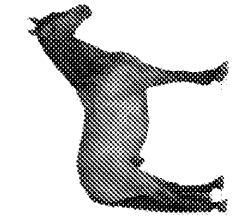
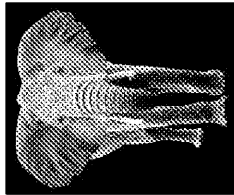


- A 1 and 2.
B 1 and 3.
C 2 and 4.
D 3 and 4.

☐ ☐ ☐ ☐

B2.2 The challenges of size

59.



61.

Place these organisms in order of surface-area-to-volume ratio from smallest to largest.

- A Elephant, ant, baby, horse
- B Ant, baby, horse, elephant
- C Elephant, horse, baby, ant
- D Horse, baby, ant, elephant

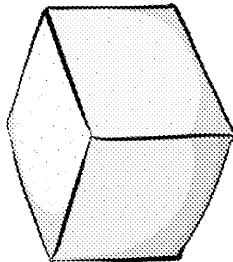
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60.



What is the surface-area-to-volume ratio of a cube with sides that are 3 cm long?

- A 9 : 6
- B 3 : 2
- C 1 : 2
- D 2 : 1

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Why do large animals have a smaller surface-area-to-volume ratio than small animals?

- A Their surface area is smaller.
- B Their volume is smaller.
- C Their surface area is larger.
- D Their volume is larger.

62. Which row shows the correct order of the animals into and out of the water during a breakdown of the water cycle?

Row	Order
A	1. Fish, 2. Frog, 3. Toad, 4. Salamander
B	1. Frog, 2. Toad, 3. Salamander, 4. Fish
C	1. Salamander, 2. Toad, 3. Frog, 4. Fish
D	1. Toad, 2. Salamander, 3. Frog, 4. Fish

- A
- B
- C
- D

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63. Which of the following have a large surface area for exchange of substances in a mammal? 66.

1. Alveoli in the lungs
2. Villi in the small intestine
3. Blood capillaries
4. Root hair cells

- A** 1, 2, 3 and 4 ☐
- B** 1, 2 and 3 ☐
- C** 1 and 2 ☐
- D** 1 and 4 ☐

64. The circulatory system in humans is described as a double circulatory system. Why is this?

- A** Because it is larger than the circulatory system in fish. ☐
- B** Because blood passes through the heart once during each circuit of the body. ☐
- C** Because blood passes through the heart twice during each circuit of the body. ☐
- D** Because blood is under high pressure in the arteries and low pressure in the veins. ☐

65. The lungs, heart and blood vessels work together to ensure that respiring cells receive the oxygen they need. Which row in the table is correct?

Row	Explanation regarding gas exchange
A	Gas exchange between blood and cells occurs in the arteries.
B	Gas exchange between blood and cells occurs in the veins.
C	Gas exchange between blood and cells occurs in the capillaries.
D	Gas exchange between blood and cells occurs in all blood vessels.

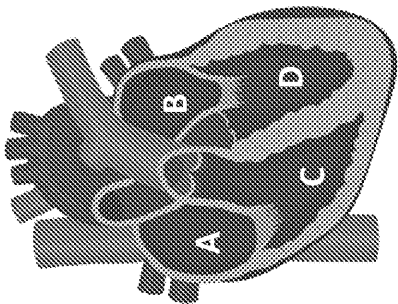
- A** ☐
- B** ☐
- C** ☐
- D** ☐

- Which state is the blood in?
- A** Arteries ☐
- B** Arteries ☐
- C** Veins ☐
- D** Veins ☐

67. Valves are found in the heart to prevent backflow of blood. Which row in the table is correct?

- A** To maintain high pressure ☐
- B** To allow blood to flow in one direction ☐
- C** To allow blood to flow in two directions ☐
- D** To allow blood to flow in one direction ☐

68.



Which letter shows the location of the left ventricle?

- A
- B
- C
- D

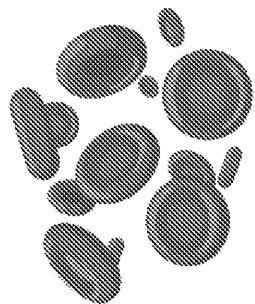
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69.



Which statements are correct regarding adaptations of red blood cells for the transport of oxygen?

- 1. They have no nucleus to allow more room for haemoglobin.
- 2. They have haemoglobin which picks up and carries oxygen.
- 3. They are biconcave discs and so have a large surface area.
- 4. They carry hydrogen to the lungs so it can be breathed out.

- A 1 and 2
- B 3 and 4
- C 1, 2 and 3
- D 1, 2, 3 and 4

☐

☐

☐

☐

70. Plasma contains
Why are
A The
B The
C The
D The

71. Water at
Which s
A Wat
hair
B Wat
by t
C Wat
mo
D Wat
in t

72. Which r
and fun

Row
A
B
C
D

- A
- B
- C
- D

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- 73.** What is translocation?
- A** The movement of water through xylem tubes.
 - B** The movement of water from the roots, through the phloem, around the plant.
 - C** The movement of sugars produced by photosynthesis through the phloem, around the plant.
 - D** The movement of water and mineral ions through the xylem, around the plant.
-
- 74.** Which of the following environmental factors will increase the rate of transpiration?
- A** Low light intensity, low air movement, low temperature
 - B** High light intensity, high air movement, high temperature
 - C** Low light intensity, low air movement, high temperature
 - D** Low light intensity, high air movement, low temperature
-
- 75.** What is the name of the apparatus that may be used to study transpiration?
- A** Hygrometer
 - B** Photosynthometer
 - C** Hydrometer
 - D** Potometer
-
- 76.** A student studying transpiration measured the time taken for a bubble of air to travel a set distance through some glass tubing to which a potometer was connected. Which calculation did they use to measure the rate of transpiration?
- A** Distance moved $\times$ time taken
 - B** Distance moved $\div$ time taken
 - C** Time taken $\div$ distance moved
 - D** $1 \div$ time taken

Topic 3: B3 Organism-level

B3.1 and 3.2 Coordination and control – the nervous system

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77. Which of the following comprise the nervous system?
- | | | |
|----------|--|--------------------------|
| A | Central nervous system, sensory neurons, sensory receptors and motor neurons | ☐ |
| B | The brain and spinal cord | ☐ |
| C | Receptors and effectors | ☐ |
| D | Sensory neurons and motor neurons | ☐ |
-
78. The brain produces a coordinated response to stimuli. How does it do so?
- | | | |
|----------|---|--------------------------|
| A | The brain assesses the information it receives and selects a suitable sensory neuron so it can respond. | ☐ |
| B | Nerve impulses travel around the body through nerves until they finally reach the brain. | ☐ |
| C | The brain processes information from receptors around the body and selects an appropriate response. | ☐ |
| D | Relay neurons form connections between sensory neurons and motor neurons. | ☐ |
-
79. Which of these statements is true about reflex responses?
- Reflex responses are automatic.
 - Reflex responses are protective.
 - Reflex responses are fast.
 - Reflex responses require the involvement of the brain.
- | | | |
|----------|----------------|--------------------------|
| A | 1, 2, 3 and 4. | ☐ |
| B | 1, 2 and 3. | ☐ |
| C | 1 and 4. | ☐ |
| D | 2 and 3. | ☐ |
-
80. Which row shows the correct sequence for a reflex arc?
- | | | |
|----------|---|--------------------------|
| A | Sensory neuron → receptor → stimulus → motor neuron → relay neuron → effector → response. | ☐ |
| B | Receptor → sensory neuron → stimulus → relay neuron → motor neuron → effector → response. | ☐ |
| C | Stimulus → receptor → sensory neuron → brain → motor neuron → effector → response. | ☐ |
| D | Stimulus → receptor → sensory neuron → relay neuron → motor neuron → effector → response. | ☐ |
-
81. What is the central nervous system?
- | | |
|----------|----------------------|
| A | A chemical messenger |
| B | A chemical target |
| C | A chemical messenger |
| D | A chemical target |
-
82. On which part of the cell does the nucleus sit?
- | | |
|----------|---------------|
| A | Cell wall |
| B | Cell membrane |
| C | Nucleus |
| D | Mitochondrion |
-
83. HT only
What is the role of the nucleus?
- | | |
|----------|---------------------|
| A | To release energy |
| B | To produce proteins |
| C | To make DNA |
| D | To store DNA |
-
84. HT only
Which of the following is not a function of the nucleus?
- | | |
|----------|--|
| A | Stimulus |
| B | Increases the rate of cell division |
| C | Stimulus |
| D | An increase in the rate of cell division |
-
85. HT only
What does the nucleus do?
- | | |
|----------|--|
| A | As an organelle |
| B | As an organelle |
| C | A low level of energy |
| D | An increase in the rate of cell division |

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86. Which statement is true?
- ☐ **A** Oestrogen causes the lining of the uterus to build up during the menstrual cycle.
 - ☐ **B** Progesterone causes the lining of the uterus to build up during the menstrual cycle.
 - ☐ **C** Follicle-stimulating hormone (FSH) causes the lining of the uterus to build up during the menstrual cycle.
 - ☐ **D** Testosterone causes the lining of the uterus to build up during the menstrual cycle.

87. HT only

This question is about the interaction of hormones in the control of the menstrual cycle.

Which statement/s is/are true?

1. Follicle-stimulating hormone (FSH) stimulates the ovaries to produce oestrogen.
2. An increase in oestrogen levels can inhibit the production of FSH.
3. Luteinising hormone (LH) can be used as a contraceptive.
4. Progesterone can inhibit LH production.

- ☐ **A** 1, 2, 3 and 4
- ☐ **B** 1, 2 and 3
- ☐ **C** 1, 3 and 4
- ☐ **D** 1, 2 and 4

88. One form of the contraceptive pill contains progesterone. Why?

- ☐ **A** Progesterone maintains the lining of the uterus and stops it from breaking down.
- ☐ **B** Progesterone inhibits the production of FSH and LH.
- ☐ **C** Progesterone stimulates the production of FSH and LH.
- ☐ **D** Progesterone stimulates ovulation.

89. The table became p

Contra
Intrau
C
Fe

Which m

- A** Mos
- B** Mos
- C** Mos
- D** Mos

90. HT only

Hormone infertility

- A** Adre
- B** Prog
- C** Test
- D** FSH

B3.3 Maintaining internal environment

91. Which of the following statements correctly explain why it is important for living things to maintain a constant internal environment?

1. So that metabolic reactions can proceed at the correct rate.
2. So that enzyme-catalysed reactions occur at their optimum temperature.
3. So that water levels in blood plasma prevent cells from shrinking or bursting.
4. So that blood sugar levels ensure that cells can produce enough ATP.

- A** 1 and 2. ☐
- B** 3 and 4. ☐
- C** 1, 2, 3 and 4. ☐
- D** 1, 2 and 3. ☐

92. Insulin controls blood sugar levels in the body. How does it do so?

- A** If blood sugar levels are too high, insulin converts glycogen to glucose. ☐
- B** If blood sugar levels are too high, insulin converts glucose to glycogen. ☐
- C** If blood sugar levels are too low, insulin converts glucose to glycogen which is stored. ☐
- D** If blood sugar levels are too low, insulin converts glycogen to glucose. ☐

93. HT only

Glucagon interacts with insulin to control blood sugar levels in the body. Which statement is correct?

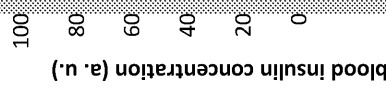
- A** Insulin converts excess glucose to glycogen; glucagon does the same. ☐
- B** Insulin converts excess glycogen to glucose; glucagon does the same. ☐
- C** Glucagon converts glycogen to glucose; insulin converts excess glucose to glycogen. ☐
- D** Glucagon converts excess glucose to glycogen; insulin converts glycogen to glucose. ☐

94. Which of these statements about type 1 and type 2 diabetes are true?

1. People with type 1 diabetes cannot make insulin.
2. People with type 1 diabetes need insulin injections to control their diabetes.
3. People with type 2 diabetes need insulin injections to control their diabetes.
4. People with type 2 diabetes do not produce enough insulin, or their cells do not respond to it.

- A** 1 and 3 ☐
- B** 2 and 4 ☐
- C** 1, 2, 3 and 4 ☐
- D** 1, 2 and 4 ☐

95. The graph shows blood insulin concentration (a.u.) without and after therapy.



Which statement is correct?

- A** The patient has type 1 diabetes. ☐
- B** The patient has type 2 diabetes. ☐
- C** The patient has type 1 diabetes and is taking insulin. ☐
- D** The patient has type 2 diabetes and is taking insulin. ☐

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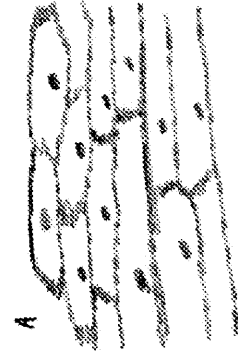
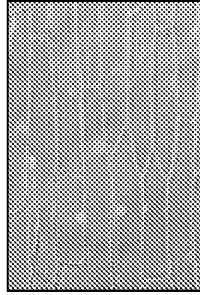
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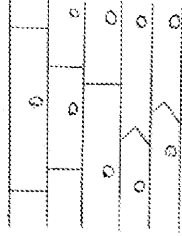
CS7 Practical skills

Practical activity group B1 – Micro

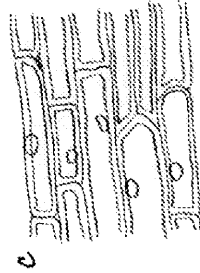
96. A student looked at some onion cells using a microscope and saw the image, right. Which of these is the best representation of what the student saw, and is a good biological drawing?



B



D



- A
B
C
D

☐ ☐ ☐ ☐

97. The student was interested to know the length of the onion cells in real life. Her teacher told her that the diameter of the low power field is 4.5 mm. She could see three cells across the diameter of that field. What was her estimate of the length of an onion cell?

- A 4.5 mm
B 13.5 mm
C 1.5 cm
D 1.5 mm

☐ ☐ ☐ ☐

Which of the following is the correct order of steps when using a microscope?

1. Use the coarse focus.
2. Add the specimen.
3. Place the slide on the stage.
4. Turn the stage.
5. Select the low power objective.
6. Adjust the light.
7. Select the high power objective.

- A 1, 2, 3, 4, 5, 6, 7
B 1, 4, 3, 2, 5, 6, 7
C 1, 4, 3, 2, 5, 6, 7
D 1, 5, 3, 2, 4, 6, 7

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Practical activity group B2 – Sampling techniques - qualitative

- 100.** A plant had to be kept in a dark cupboard for a week. When its leaves were tested for the presence of starch, which results would you expect?
- A** There was no starch present so the leaves were orange in colour. ☐
 - B** There was no starch present so the leaves were green in colour. ☐
 - C** There was no starch present so the leaves were blue-black in colour. ☐
 - D** There was starch present so the leaves were blue-black in colour. ☐

- 101.** To test for the presence of proteins, Biuret reagent may be used. It is made up of copper(II) sulfate (harmful) in sodium hydroxide solution (irritant). What would be a sensible safety precaution to take that is relevant to the hazards linked to the use of Biuret reagent?
- A** Turn off Bunsen burners. ☐
 - B** Wear a lab coat. ☐
 - C** Wear safety goggles. ☐
 - D** Tie back long hair. ☐

- 102.** Question 101 states that Biuret reagent can be used to test for the presence of proteins. It is blue in colour and turns purple/lilac in the presence of proteins. What colour would it be in each of these solutions:
- glucose, protein, lipids (fats and oils), enzyme?
- A** Red, purple, white, purple ☐
 - B** Blue, purple, blue, purple ☐
 - C** Blue, purple, blue, blue ☐
 - D** Blue-black, blue, purple, blue ☐

- 103.** Benedict's reducing starch is A student to break the maltose What colour reagents

Row	
A	
B	
C	
D	

- A**
- B**
- C**
- D**

- 104.** In the experiment, separate Which reagent? There is a problem. There is a problem. There is a problem.
- A** There is a problem.
 - B** There is a problem.
 - C** There is a problem.
 - D** There is a problem.

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Practical activity group B3 – Rates of enzyme-controlled reactions

105. A student measured the volume of gas produced every 30 s in an enzyme-catalysed reaction. How should they plot a graph of their results?
- A** As a line graph with volume of gas produced on the **x**-axis and time on the **y**-axis. ☐
- B** As a bar graph with volume of gas produced on the **x**-axis and time on the **y**-axis. ☐
- C** As a line graph with volume of gas produced on the **y**-axis and time on the **x**-axis. ☐
- D** As a bar graph with volume of gas produced on the **y**-axis and time on the **x**-axis. ☐

106. To calculate the rate of reaction of an enzyme-catalysed reaction involving the time taken for a colour change to happen, how should rate be calculated?

- A** Using the formula: $\text{rate} = 1/\text{time taken}$ ☐
- B** Using the formula: $\text{rate} = \text{time taken}/60 \text{ s}$ ☐
- C** Using the formula: $\text{volume of gas produced} \div \text{time taken}$ ☐
- D** Using the formula: $\text{time taken} \div \text{volume of gas produced}$ ☐

107. The experiment described in question 106 involved a colour change as an end point to a reaction. Which of the following would improve the ability of a scientist to determine the end point of such a reaction?

- A** Repeat the experiment on different days to see whether the time taken is the same. ☐
- B** Use a colour chart to match the colour of the end point. ☐
- C** Use a thermostatically controlled water bath to maintain constant temperature. ☐
- D** Turn off the lights in the lab so that light intensity is not a confounding variable. ☐

Practical

108. Calculate the rate of reaction that is 0.25 g of product per second.
- A** 0.04 ☐
- B** 0.004 ☐
- C** 0.25 ☐
- D** 4 ☐

109. A scientist is studying the growth of pondweed. Which of the following is the most appropriate reason for using a control?

Variety
<i>E. helvola</i>
<i>C. elodea</i>

- A** *Cabomba* ☐
- B** *Cabomba* ☐
- C** *Elodea* ☐
- D** *Elodea* ☐

110. This diagram shows a student's experiment. What is the purpose of the control?

- A** A student's control ☐
- B** To be used to compare the results of the experiment with the results of the control ☐
- C** To be used to compare the results of the experiment with the results of the control ☐
- D** To be used to compare the results of the experiment with the results of the control ☐

- A** The bulb ☐
- B** Light intensity ☐
- C** The plant ☐
- D** That the results are the same ☐

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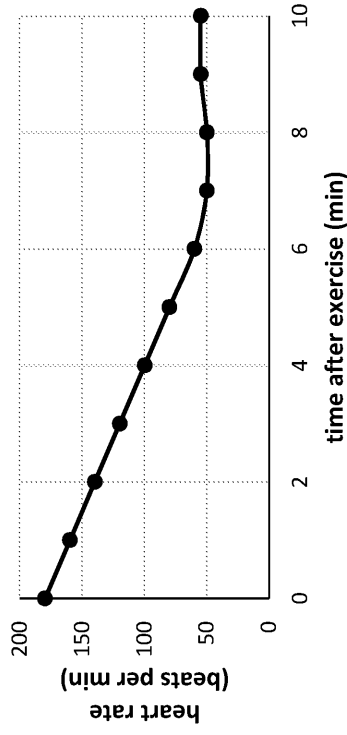


Practical investigations of respiration (B1.3)

111. A sports scientist measured the heart rate of an athlete at rest and immediately after strenuous exercise. The athlete's heart rate at rest was 50 beats per minute and immediately after exercise it was 180 beats per minute. What was the percentage increase in the athlete's heart rate?

- A** 72.2 % ☐
- B** 260 % ☐
- C** 130 % ☐
- D** 100 % ☐

112. The graph shows how quickly an athlete's heart rate returned to resting values after completing exercise. What was the rate of recovery?



- A** 20.0 beats per minute/minute.
B 12.0 beats per minute/minute.
C 120.0 beats per minute/minute.
D 18.6 beats per minute/minute.

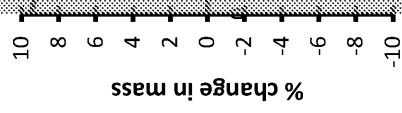
113. When an experiment involves the use of human beings, which of the following are ethical considerations that must be taken into account?

1. Ensure a large enough sample size to make results valid.
2. Seek informed consent so that the subjects know what the study involves.
3. Keep information about the subjects and the results confidential.
4. Ensure that the participants are not harmed by the experiment.

- A** 1 and 2
B 3 and 4
C 2, 3 and 4
D 1, 2, 3 and 4

Practical i

114.



The graph of cylinders of What is the

- A** 9.50 n
- B** 0.26 n
- C** 0.10 n
- D** 0.50 n

115. A potato cy

- A** 42.5 m
B 7.5 m
C 17.6 m
D 35 m

116. When the mentioned to dry them the method

- A** To square
B To store
C To remove
D To remove

Answers to Multiple-choice Questions

Topic 1: B1 Cell-level systems

B1.1 Cell structures

Question 1

A	✗	This pathway is the wrong way round and should begin with the light
B	✗	The specimen and light source are in the wrong order and so are the lenses
C	✓	Correct.
D	✗	The specimen and light source are in the wrong order.

Question 2

A	✗	The formation of air bubbles should be avoided when placing a coverslip
B	✓	Correct.
C	✗	The eyepiece lens is nowhere near the specimen.
D	✗	Specimens can be viewed in contact with the air under low and medium magnification, but should exclude air.

Question 3

A	✗	Light is needed to be able to see the cells.
B	✗	Cells do not need to be alive to be seen.
C	✗	It is possible to see cells without staining them, but details may not be visible
D	✓	Correct.

Question 4

A	✓	Correct.
B	✗	The magnifications of the lenses should be multiplied, not divided.
C	✗	The magnifications of the lenses should be multiplied, not added.
D	✗	The magnifications of the lenses should be multiplied, not divided.

Question 5

A	✗	This would be $\times 400$, which is the same as the total magnification given. If the objective lens magnification is $\times 10$, that would make the total $\times 4000$ ($400 \times 10 = 4000$).
B	✓	Correct. (Total magnification = $4 \times 10^2 = 400$, so objective lens magnification $\div$ eyepiece lens magnification (10); $400 \div 10 = 40 = 4 \times 10^1$).
C	✗	This would be $\times 10$, and, if the eyepiece magnification is $\times 10$, that would be $(10 \times 10 = 100, \text{ not } \times 400 \text{ as stated})$.
D	✗	This would be $\times 300$, and, if the eyepiece magnification is $\times 10$, that would be $(300 \times 10 = 3000, \text{ not } \times 400 \text{ as stated})$.

Question 6

A	✗	Cellular respiration takes place in mitochondria, not chloroplasts.
B	✗	This answer relates to the cell membrane rather than chloroplasts.
C	✓	Correct.
D	✗	This answer relates to the cell wall rather than chloroplasts.

Question 7

A	✓	Correct.
B	✗	Bacterial (prokaryotic) cells do not have nuclei.
C	✗	Plant and animal cells are eukaryotic cells.
D	✗	Bacterial cells do not have mitochondria.

Question 8

A	✗	This statement is true.
B	✗	This statement is true.
C	✗	This statement is true.
D	✓	Correct as this statement is false. Bacterial cells have cell walls and the

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Question 9		
A	✗	Some bacteria do have flagella.
B	✓	Correct.
C	✗	Although a bacterium would be smaller than <i>Euglena</i> there is no scale answer relating to information shown in the diagram.
D	✗	It does have chloroplasts, but it lacks a cell wall so it cannot be a plant.
Question 10		
A	✗	Mitochondria are not visible with a light microscope.
B	✓	Correct. All of these would be visible.
C	✗	DNA is not visible with a light microscope.
D	✗	Onion cells do not have flagella or plasmids. These would only be found in bacteria.
Question 11		
A	✗	Electron microscopes produce images with higher magnification so statement 4 is incorrect as the electron beam can be focussed using a magnet.
B	✓	Correct.
C	✗	Electron microscopes produce images with higher magnification so statement 4 is incorrect as the electron beam can be focussed using a magnet.
D	✗	Electron microscopes produce images with higher magnification so statement 4 is incorrect as the electron beam can be focussed using a magnet.
Question 12		
A	✗	$0.2 \mu\text{m} = 2 \times 10^{-7} \text{ m}$ and $0.1 \text{ nm} = 1 \times 10^{-10} \text{ m}$ so the resolution of a light microscope is less than 0.1 nm .
B	✗	Although the resolution of a light microscope is less, the answer is incorrect. $0.1 \text{ nm} = 1 \times 10^{-10} \text{ m}$, so $2 \times 10^{-7} \text{ m} \div 1 \times 10^{-10} \text{ m} = 2 \times 10^{-7 - (-10)} \text{ m} = 2 \times 10^3 \text{ m}$, less, not greater.
C	✓	Correct.
D	✗	$0.2 \mu\text{m} = 2 \times 10^{-7} \text{ m}$ and $0.1 \text{ nm} = 1 \times 10^{-10} \text{ m}$ so the resolution of a light microscope is less than 0.1 nm . An electron microscope because the EM can resolve objects as small as $0.1 \text{ nm} = 1 \times 10^{-10} \text{ m}$ with a light microscope.
Question 13		
A	✓	Correct. Mitochondria and other organelles would only be visible with an electron microscope.
B	✗	The size of an artery means that this has to have been produced using a light microscope.
C	✗	The size of the leaf and the magnification of its image mean that this image was produced using a light microscope.
D	✗	This image is similar to one that would be obtained using a school light microscope. It would be seen with an electronmicrograph.
Question 14		
A	✗	This answer has ignored the difference in units: $10 \text{ mm} = 10 \times 10^{-3} \text{ m}$ has been obtained by multiplication rather than division.
B	✗	This answer is just a guess, knowing that a large value for magnification has been obtained by multiplication rather than division.
C	✓	Correct: image size = $10 \text{ mm} = 10 \times 10^{-3} \text{ m}$ Actual size = $6 \mu\text{m} = 6 \times 10^{-6} \text{ m}$ Magnification = image size $\div$ actual size = $10 \times 10^{-3} \text{ m} \div 6 \times 10^{-6} \text{ m}$
D	✗	This answer has ignored the difference in units: $10 \text{ mm} = 10 \times 10^{-3} \text{ m}$ has been obtained by division.
Question 15		
A	✗	$1 \mu\text{m}$ is less than $50 \mu\text{m}$.
B	✗	0.5 mm is larger than $1 \mu\text{m}$.
C	✓	Correct.
D	✗	$50 \mu\text{m}$ is less than 0.5 mm .

B1.2 What happens in cells (and what do cells need)?

Question 16

A	✗	Although this is true, it is not a valid reason why DNA is a polymer.
B	✗	Although this is true, it is not a valid reason why DNA is a polymer.
C	✗	Although this is true, it is not a valid reason why DNA is a polymer.
D	✓	Correct: polymers are made of similar, smaller units that are joined to

Question 17

A	✗	DNA's double helix is not circular.
B	✓	Correct.
C	✗	DNA is not made of proteins but it does carry the code to make them.
D	✗	DNA is not made of amino acids. The nucleotide base sequence in DNA that are then assembled to make proteins.

Question 18

A	✗	Amylase only breaks down starch.
B	✓	Correct.
C	✗	Cellulase would only break down cellulose.
D	✗	Carbohydrase is any enzyme from a general family of enzymes which Collagen is, in fact, a protein.

Question 19

A	✗	The active site is the lock.
B	✗	The active site is the lock.
C	✓	Correct.
D	✗	The active site is the lock.

Question 20

A	✗	This statement is correct but there is no information to confirm that the
B	✗	The rate of reaction did increase as temperature increased, but then it d
C	✓	Correct.
D	✗	There is evidence that denaturation was happening but enzymes are n

Question 21

A	✗	This graph ignores the limiting effect of availability of active sites even concentration increases.
B	✗	This graph confuses the limiting effect of availability of active sites even increases, so rate would not decrease but rather remain constant. Also substrate concentrations due to the availability of unoccupied active s
C	✗	This graph confuses the limiting effect of availability of active sites even increases, so rate would not decrease but rather remain constant.
D	✓	Correct. The limiting effect of the number of available active sites is sh The rate becomes constant regardless of how much more substrate is

Question 22

A	✗	Enzymes are not used up in reactions.
B	✗	As enzyme concentration increases, the number of available active site
C	✓	Correct.
D	✗	This would be unlikely as there is no mention of extremes of pH or tem

Question 23

A	✓	Correct. $(250 \text{ cm}^3 \div 60 \text{ s} = 4.17 \text{ cm}^3/\text{s})$
B	✗	The rate of reaction is $20 \text{ cm}^3 \div 60 \text{ s} = 0.33 \text{ cm}^3/\text{s}$
C	✗	The rate of reaction is $30 \text{ cm}^3 \div 60 \text{ s} = 0.5 \text{ cm}^3/\text{s}$
D	✗	The rate of gas production has increased and then decreased with tim specify the time points, e.g. the rate for the first $30 \text{ s} = 25 \text{ cm}^3 \div 30 \text{ s} =$

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A	✓	Correct.
B	✗	Both statements are incorrect.
C	✗	Statement 3 is incorrect.
D	✗	Statement 4 is incorrect.

Question 25

A	✗	This is only true for organisms, such as humans, with a core body temperature.
B	✓	Correct.
C	✗	The optimum temperature of an enzyme would have a fixed value.
D	✗	Some enzymes are used to build larger molecules (anabolic reactions).

Question 26

A	✗	The peak of the curve does not coincide with pH 7.
B	✓	Correct.
C	✗	The peak of the curve does not coincide with pH 8.
D	✗	The peak of the curve does not coincide with pH 7.25.

B1.3 Respiration

Question 27

A	✗	This is photosynthesis, not respiration.
B	✗	This is anaerobic respiration in animals, not aerobic respiration.
C	✓	Correct.
D	✗	This is anaerobic respiration (fermentation) in plants and yeast.

Question 28

A	✓	Correct.
B	✗	Statements 1 and 4 are incorrect because plants always respire and in the absence of oxygen.
C	✗	Statements 1 and 4 are incorrect.
D	✗	Statements 1 and 4 are incorrect.

Question 29

A	✗	Energy is released rather than required.
B	✓	Correct.
C	✗	This word means 'cold-blooded'.
D	✗	This word describes metabolic reactions in which molecules are built.

Question 30

A	✗	Lactic acid is produced by animals rather than by yeast.
B	✗	Oxygen is not needed for anaerobic respiration.
C	✓	Correct.
D	✗	Oxygen is not needed for anaerobic respiration.

Question 31

A	✓	Correct.
B	✗	Anaerobic respiration produces less ATP.
C	✗	ATP is produced and energy cannot be made or destroyed.
D	✗	Aerobic respiration produces more ATP.

Question 32

A	✗	Carbohydrates are not made of amino acids, proteins are.
B	✗	Glycerol is one of the components of lipids (fats and oils) and not carbohydrates.
C	✗	Fatty acids are one of the components of lipids (fats and oils) and not carbohydrates.
D	✓	Correct.

Question 33

A	✗	Carbohydrates are made from glucose monomers.
B	✗	Proteins are made from amino acids.
C	✓	Correct.
D	✗	Although this statement is true, it does not answer the question.

Question 34

A	✗	Row 2 is incorrect.
B	✗	Row 2 is incorrect and row 4 is correct.
C	✓	Correct.
D	✗	Row 4 is also correct.

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B1.4 Photosynthesis

Question 35

A	✗	Although this is true, it does not address their importance to animal life
B	✓	Correct.
C	✗	Plants do not absorb soil.
D	✗	Energy cannot be made.

Question 36

A	✗	Water is not used to make glucose.
B	✗	Light energy is used to split water to make oxygen gas.
C	✓	Correct.
D	✗	Both statements are incorrect.

Question 37

A	✓	Correct.
B	✗	This is aerobic respiration.
C	✗	This is anaerobic respiration in animals.
D	✗	This is anaerobic respiration in plants and yeast.

Question 38

A	✗	Respiration occurs in mitochondria.
B	✗	Many chemical reactions take place in the cytoplasm but photosynthesis occurs in chloroplasts which are found in the cytoplasm, along with other organelles.
C	✗	Photosynthesis does not take place in the nucleus.
D	✓	Correct.

Question 39

A	✗	Light energy is needed for photosynthesis to happen.
B	✓	Correct.
C	✗	Although this is true, the answer does not address the question.
D	✗	Although this is true, the answer does not address the question.

Question 40

A	✗	The experiment described would not prove that oxygen is produced as it is in the atmosphere.
B	✗	The experiment described would not prove that chlorophyll is needed as it would compare the effects of removal of chlorophyll from the leaves.
C	✗	The experiment described would not prove that carbon dioxide is needed as it would compare the effects of removal of carbon dioxide from the leaves.
D	✓	Correct.

Question 41

A	✗	The two variables should be divided not multiplied.
B	✗	The two variables should be divided not multiplied.
C	✓	Correct.
D	✗	The numerator and denominator are the wrong way round.

Question 42

A	✓	Correct.
B	✗	Oxygen is a product of photosynthesis, rather than a reactant.
C	✗	Oxygen is a product of photosynthesis, rather than a reactant.
D	✗	Oxygen is a product of photosynthesis, rather than a reactant.

Question 43

A	✗	Statement 3 is incorrect because light energy is used to split water into hydrogen and oxygen. Statement 4 is incorrect because enzymes are not required.
B	✓	Correct.
C	✗	Statement 3 is incorrect because light energy is used to split water into hydrogen and oxygen. Statement 4 is incorrect because enzymes are not required.
D	✗	Statement 3 is incorrect because light energy is used to split water into hydrogen and oxygen. Statement 4 is incorrect because enzymes are not required.

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A	✗	This ignores the reciprocal ($1 \div$) nature of the equation.
B	✗	This ignores the reciprocal ($1 \div$) nature of the equation. If distance in would decrease by four.
C	✗	As distance doubles, light intensity would decrease to a quarter.
D	✓	Correct.

Question 45

A	✓	Correct.
B	✗	The rate of photosynthesis increases up to a maximum point as light
C	✗	The curves do not show any data for 0 °C so this statement cannot be
D	✗	Light intensity determines the rate of photosynthesis up to a maximum

Topic 2: B2 Scaling up

B2.1 Supplying the cell

Question 46

A	✗	A decrease in surface area will slow down the rate of diffusion.
B	✗	An increase in diffusion distance will slow down the rate of diffusion.
C	✓	Correct.
D	✗	A decrease in concentration gradient will slow down the rate of diffusion.

Question 47

A	✓	Correct.
B	✗	Diffusion does not only happen across cell membranes.
C	✗	This is osmosis.
D	✗	This is active transport.

Question 48

A	✗	Additional energy is not required for osmosis to occur.
B	✗	The direction is incorrect: water moves from an area of high water potential to an area of low water potential.
C	✗	Only water moves by osmosis.
D	✓	Correct.

Question 49

A	✗	Incorrect. This is simply the sum of the two masses (3.0 g + 0.8 g) and not a percentage.
B	✓	Correct percentage <u>gain</u> of mass. $[(3.8 \text{ g} - 3.0 \text{ g}) \div 3.0 \text{ g}] \times 100 = 0.8 \div 3.0 = 0.267 \times 100 = 26.7\%$
C	✗	Incorrect. The denominator should be the original mass (3.0 g) and not the final mass (3.8 g).
D	✗	Incorrect. This is the correct value but the minus sign shows a <u>loss</u> of mass.

Question 50

A	✗	Diffusion does not require energy from ATP.
B	✓	Correct.
C	✗	Osmosis does not require energy from ATP.
D	✗	Active transport requires energy from ATP.

Question 51

A	✗	Water potential refers to the concentration of water but the presence of solutes also affects it.
B	✗	Differences in water potential will result in osmosis but the term does not refer to the rate of osmosis to occur.
C	✓	Correct.
D	✗	The only solvent that is relevant is water and the term does not relate to the presence of any solutes.

Question 52

A	✗	Gametes are produced by meiosis, not mitosis.
B	✓	Correct.
C	✗	Bacteria multiply by binary fission which is not the same as mitosis as there is no nucleus.
D	✗	DNA must have been replicated before mitosis can happen.

Question 53

A	✓	Correct.
B	✗	DNA replication needs to occur before chromosome movement.
C	✗	Growth of the cell would be the last stage of the cycle before cell division.
D	✗	DNA replication occurs once at the start of the cell cycle.

Question 54

A	✗	Not all differentiated cells become damaged and need to be repaired.
B	✗	Not all differentiated cells need to be replaced.
C	✓	Correct.
D	✗	Stem cells are cells that have not yet differentiated to become specialised.

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Question 55

A	✗	Cell 1 is a single-celled organism called an amoeba and cell 2 is just a
B	✗	Cell 3 is a highly specialised neuron (nerve cell) but cell 1 is a single
C	✗	Cell 4 is a highly specialised sperm cell but cell 2 is just a general pla
D	✓	Correct.

Question 56

A	✗	Stem cells may also be found in adults.
B	✓	Correct.
C	✗	Stem cells may also be found in animals.
D	✗	Stem cells may also be found in animal embryos.

Question 57

A	✗	Stem cells can divide to become specialised to perform specific func
B	✓	Correct.
C	✗	Cells in the tips of the plant shoot/stem can respond to light through
D	✗	Stem cells can divide to become specialised to perform specific func (only one example).

Question 58

A	✓	Correct.
B	✗	Only embryonic stem cells can do this.
C	✗	Stem cells could be used for repair.
D	✗	Plants have stem cells in their meristems.

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B2.2 The challenges of size

Question 59

A	✗	As an ant is the smallest organism in the list, it would have the largest ratio and should, therefore, be placed last.
B	✗	These organisms have been placed in increasing order of size, rather than decreasing.
C	✓	Correct.
D	✗	As an elephant is the largest organism in the list, it would have the smallest ratio and should, therefore, be placed first.

Question 60

A	✗	These numbers are from the calculation of surface area ($9 \text{ cm}^2 \times 6 \text{ faces}$).
B	✗	These numbers are from the calculation of surface area ($9 \text{ cm}^2 \times 6 \text{ faces}$) divided by 3 as a common denominator giving 3 and 2.
C	✗	These numbers are the wrong way round.
D	✓	Correct. The surface area is $9 \text{ cm}^2 \times 6 \text{ faces of the cube} = 54 \text{ cm}^2$. The volume is $3 \text{ cm} \times 3 \text{ cm} \times 3 \text{ cm} = 27 \text{ cm}^3$, so the surface-area-to-volume ratio is $54 : 27$ which reduces to $2 : 1$.

Question 61

A	✗	Their diffusion distances are too big.
B	✓	Correct.
C	✗	Their surface-area-to-volume ratio is too small.
D	✗	The cells need to receive sufficient oxygen for respiration. Carbon dioxide is a waste product.

Question 62

A	✗	Urea is a waste product of mammals, not plants, and needs to be removed from the dog.
B	✗	Urea needs to be removed from the dog and not transported in.
C	✗	Bacteria do not produce urea and it would need to be removed and not transported in.
D	✓	Correct.

Question 63

A	✗	Root hair cells are found in plants, not mammals, but they do provide a large surface area for the uptake of substances in plant roots.
B	✓	Correct.
C	✗	Blood capillaries have a large surface area and are found in mammals.
D	✗	Villi in the small intestine of mammals have a large surface area.

Question 64

A	✗	This may be true but size is not the reason.
B	✗	Blood passes through the heart twice during each circuit of the body.
C	✓	Correct.
D	✗	This may be true but pressure differences are not the reason.

Question 65

A	✗	The arterial wall is too thick to allow gas exchange to occur.
B	✗	The wall of the vein is too thick to allow gas exchange to occur.
C	✓	Correct.
D	✗	Only the capillaries have walls that are thin enough to allow gas exchange to occur.

Question 66

A	✗	Gas exchange cannot happen if the walls are thick.
B	✓	Correct.
C	✗	Veins have thinner walls than arteries because the pressure inside the veins is lower.
D	✗	Gas exchange cannot happen if the walls are thick.

Question 67

A	✓	Correct.
B	✗	The pulse is a consequence of contraction of the left ventricle.
C	✗	Contraction of the cells forming the ventricular walls allows blood to be pumped out of the heart.
D	✗	If this were true, blood would never leave the heart.

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Question 68		
A	✗	This is the right atrium.
B	✗	This is the left atrium.
C	✗	This is the right ventricle.
D	✓	Correct.
Question 69		
A	✗	Statement 3 is also correct.
B	✗	Statements 1 and 2 are also correct but statement 4 is incorrect.
C	✓	Correct.
D	✗	Statement 4 is incorrect.
Question 70		
A	✓	Correct.
B	✗	Red blood cells do not absorb these substances but they do absorb oxygen and are bound to the haemoglobin.
C	✗	Those substances are soluble and do dissolve in plasma.
D	✗	Carbon dioxide is not needed by cells. It is dissolved in plasma and transported.
Question 71		
A	✗	Water moves into the xylem, not the phloem.
B	✗	Water moves into the xylem, not the phloem.
C	✗	Water moves into the xylem, not the phloem. Only water can move by osmosis. Water cannot move by active transport.
D	✓	Correct.
Question 72		
A	✗	Xylem tubes are dead.
B	✗	Phloem tubes are made of living cells.
C	✗	Root hair cells are living cells.
D	✓	Correct.
Question 73		
A	✗	This is transpiration.
B	✗	This is transpiration.
C	✓	Correct.
D	✗	Water and mineral ions are transported in the xylem, not the phloem.
Question 74		
A	✗	All of these factors will decrease the rate of transpiration.
B	✓	Correct.
C	✗	High temperature will increase the rate of transpiration but the other factors will decrease it.
D	✗	Low light intensity and low temperature will both decrease the rate of transpiration.
Question 75		
A	✗	This measures the humidity of the air.
B	✗	This measures the rate of photosynthesis.
C	✗	This measures the density of a liquid.
D	✓	Correct.
Question 76		
A	✗	The distance should be divided by the time taken, not multiplied by it.
B	✓	Correct.
C	✗	The equation is the wrong way round.
D	✗	This could be used to calculate a rate, but it would not be correct for comparing rates produced in different volumes which reflect the overall rate of photosynthesis.

Topic 3: B3 Organism-level systems

B3.1 and 3.2 Coordination and control – the nervous and endocrine systems

Question 77

A	✓	Correct.
B	✗	This is only the central nervous system.
C	✗	These are the beginning and end components of the reflex pathway.
D	✗	These are two types of neuron that make up the peripheral nervous system.

Question 78

A	✗	Sensory neurons send information to the brain, not away from it.
B	✗	If this were true, nervous responses would be slow due to indirect pathways to reach the brain.
C	✓	Correct.
D	✗	This statement is true but it relates to reflexes which do not need to involve the brain.

Question 79

A	✗	Statement 4 is incorrect.
B	✓	Correct.
C	✗	Statements 1 and 2 are correct but statement 4 is incorrect.
D	✗	Statement 1 is correct.

Question 80

A	✗	Stimulus, receptor, sensory neuron, relay neuron and motor neuron are in the wrong positions.
B	✗	Stimulus, receptor and sensory neuron are in the wrong positions.
C	✗	The brain is not involved in a reflex pathway.
D	✓	Correct.

Question 81

A	✗	Hormones are not made in the blood, rather they are transported in the blood.
B	✗	Hormones only affect target organs that have receptor molecules on their surface.
C	✓	Correct.
D	✗	Hormones are produced by endocrine glands but do not affect them.

Question 82

A	✗	Human cells do not have a cell wall.
B	✓	Correct.
C	✗	The nucleus is not involved.
D	✗	The mitochondria are not involved.

Question 83

A	✓	Correct.
B	✗	This is the role of adrenaline.
C	✗	This is the role of progesterone.
D	✗	This is the role of luteinising hormone.

Question 84

A	✗	This is a response to follicle-stimulating hormone.
B	✗	This is the opposite to what adrenaline does; it <u>reduces</u> blood flow to the muscles.
C	✗	This is a response to luteinising hormone.
D	✓	Correct.

Question 85

A	✗	This would be positive feedback.
B	✓	Correct.
C	✗	This would only happen in situations where the body temperature is too high.
D	✗	This would only happen in situations where the body temperature is too low.

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Question 86		
A	✓	Correct.
B	✗	Progesterone maintains the lining of the uterus during pregnancy.
C	✗	Follicle-stimulating hormone causes an egg to mature.
D	✗	Testosterone is not involved in regulating the menstrual cycle.
Question 87		
A	✗	Statement 3 is incorrect.
B	✗	Statement 3 is incorrect.
C	✗	Statement 3 is incorrect.
D	✓	Correct.
Question 88		
A	✗	This would maintain pregnancy, rather than prevent it.
B	✓	Correct.
C	✗	Progesterone inhibits the production of these hormones.
D	✗	This would make pregnancy more likely, rather than prevent it.
Question 89		
A	✓	Correct.
B	✗	The diaphragm was the least effective, not the most effective.
C	✗	The IUS was the most effective, not the least effective.
D	✗	The diaphragm was the least effective, not the most effective.
Question 90		
A	✗	Adrenaline cannot be used to treat infertility. It is a hormone that pr
B	✗	These would work as contraceptives rather than treating infertility.
C	✗	Testosterone has no role in regulating female fertility.
D	✓	Correct.

B3.3 Maintaining internal environments

Question 91

A	✗	Statements 3 and 4 are also correct.
B	✗	Statements 1 and 2 are also correct.
C	✓	Correct.
D	✗	Statement 4 is also correct.

Question 92

A	✗	The opposite happens: glucose is converted to glycogen.
B	✓	Correct.
C	✗	This happens if blood sugar levels are too high, not too low.
D	✗	Glucagon, rather than insulin, allows this to happen.

Question 93

A	✗	Glucagon converts glycogen to glucose.
B	✗	Insulin converts glucose to glycogen.
C	✓	Correct.
D	✗	Glucagon converts glycogen to glucose, and insulin converts glucose to

Question 94

A	✗	Statement 3 is incorrect.
B	✗	Statement 1 is also correct.
C	✗	Statement 3 is incorrect.
D	✓	Correct.

Question 95

A	✗	Incorrect. The graph does not give any information about the levels of
B	✗	Incorrect. There is no information in the graph about glucagon levels, converts glycogen into glucose when blood glucose levels are low whi
C	✓	Correct.
D	✗	Incorrect. There is no information in the graph about glucagon levels,

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CS7 Practical skills

Practical activity group B1 – microscopy

Question 96

A	✗	This diagram is sketched and shaded.
B	✗	This diagram has been drawn with a ruler and does not depict the cell
C	✓	Correct.
D	✗	This diagram lacks the visible detail, e.g. nuclei and cell membranes.

Question 97

A	✗	This is the diameter of the low power field rather than the length of one
B	✗	This is three times the diameter of the low power field (3×4.5).
C	✗	This answer has been given in cm rather than mm, so the incorrect unit
D	✓	Correct ($4.5 \text{ mm} \div 3 \text{ cells} = 1.5 \text{ mm}$).

Question 98

A	✗	This magnification is too high for low power.
B	✗	This magnification could not be obtained with a light microscope. A po
C	✗	This is the eyepiece magnification only.
D	✓	Correct. If the eyepiece magnification is $\times 10$, low power objective lens

Question 99

A	✗	The cells need to be transferred to the slide before being stained.
B	✓	Correct.
C	✗	Cells should be looked at under low power first so that an area of inter
D	✗	The cells need to be transferred to a slide before they can be seen.

Practical activity group B2 – sampling techniques – qualitative testing

Question 100

A	✓	Correct.
B	✗	A negative result for the presence of starch is orange, not green. Also w
C	✗	A blue-black colouration indicated the presence of starch.
D	✗	After one week in the dark, there should be no starch left in the leaves

Question 101

A	✗	Neither chemical is flammable.
B	✗	It is not necessary to wear a lab coat; an apron would suffice.
C	✓	Correct.
D	✗	This is desirable but not essential as the practical does not involve the

Question 102

A	✗	Biuret reagent would remain blue in the presence of glucose and lipid
B	✓	Correct.
C	✗	As enzymes are proteins, Biuret reagent would be purple in the presen
D	✗	Biuret reagent would not be blue-black in the presence of glucose.

Question 103

A	✗	As starch was present at the beginning, the student would see a blue-b
B	✗	There should be no starch left at the end but rather glucose, which wo
C	✓	Correct.
D	✗	As starch was present at the beginning, the student would see a blue-b

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Question 104

A	✗	Starch is not a protein; it is a carbohydrate.
B	✗	As enzymes are proteins and they do not get used up, there was protein in the experiment.
C	✗	As enzymes are proteins and they do not get used up, there was protein in the experiment.
D	✓	Correct. As enzymes are proteins and they do not get used up, there was protein in the experiment.

Practical activity group B3 – rates of enzyme-controlled reactions**Question 105**

A	✗	The axes are the wrong way round.
B	✗	As both variables are continuous, a line graph should be used and the y-axis should be rate.
C	✓	Correct.
D	✗	As both variables are continuous, a line graph should be used.

Question 106

A	✓	Correct.
B	✗	The equation is the wrong way round to calculate rate.
C	✗	This could be used if the volume of gas produced was being measured and the time taken for a colour change to happen so this is incorrect.
D	✗	Since the volume of gas produced was not being measured, this is incorrect.

Question 107

A	✗	This could lead to more variation if any other variables had changed, such as temperature, pH, or enzyme freshness.
B	✓	Correct as this would allow the colour of the end point to be standardised.
C	✗	This would only be important if temperature changes were difficult to control or pH changes had a huge impact on the rate of reaction. It could also be difficult to see a colour change had happened underwater.
D	✗	This would make it very hard to judge when the end point had been reached as the colours were not clear.

Practical activity group B4 – photosynthesis**Question 108**

A	✗	The denominator is wrong as it has been changed from 0.25 m to 25 m.
B	✗	The denominator is wrong as it has been changed from 0.25 m to 250 m.
C	✗	This ignores the calculation $1 \div \text{distance}$.
D	✓	Correct.

Question 109

A	✗	It produced 60 bubbles per minute, not 20.
B	✓	Correct: $30 \text{ bubbles in } 30 \text{ s} = 60 \text{ in } 60 \text{ s (1 minute)}$.
C	✗	<i>Elodea</i> only produced 20 bubbles per minute but <i>Cabomba</i> produced a faster rate.
D	✗	<i>Elodea</i> produced 20 bubbles per minute not 60.

Question 110

A	✗	This could easily be checked by measuring its rate of movement and the rate of transpiration rather than photosynthesis.
B	✗	Light intensity does affect the rate of photosynthesis so it may have been in a position where light intensity was constant.
C	✗	The plant should survive; however, if it did die, the rates of transpiration would be zero.
D	✓	Correct.

Practical investigations of respiration (B1.3)

Question 111

A	✗	This calculation was $(180 - 50) \div 180 \times 100$. The denominator should be heart rate at rest and the question asks about the percentage <u>increase</u> .
B	✓	Correct $(180 - 50) \div 50 \times 100$.
C	✗	This is simply the numerical increase in heart rate (from 50 to 180 beats per minute).
D	✗	This is just a guess!

Question 112

A	✗	This is the rate up until 6 minutes but ignores the further decrease to 7 minutes.
B	✗	This ignores the fact that heart rate was steady at 50 beats per minute.
C	✓	Correct. $(180 - 50) \text{ beats per minute} \div 7 \text{ minutes}$.
D	✗	This is just the difference in heart rate between 0 and 6 minutes.

Question 113

A	✗	Statement 1 is generally important but is not an ethical consideration.
B	✗	Statement 2 is also an important ethical consideration.
C	✓	Correct.
D	✗	Statement 1 is generally important but is not an ethical consideration.

Practical investigations of osmosis (B2.1 Supplying the cell)

Question 114

A	✗	Incorrect: 9.50 was the maximum percentage increase in mass.
B	✓	Correct. There was no net movement of water (no osmosis) because the water potentials were equal between the solution and the inside of the potato cells.
C	✗	The water potentials were not equal so water was moving into the cells.
D	✗	The water potentials were not equal so water was moving out of the cells.

Question 115

A	✓	Correct: $0.15 = (50 - \text{final length}) \div 50$
B	✗	This is just 15 % of 50.
C	✗	This uses the correct final length in a calculation (42.5 mm) but ignores the initial length: $(50 - 42.5) \div 42.5$. This in fact gives the wrong value for percentage change when it should be 15 % calculated as $(50 - 42.5) \div 50 = 0.15 \times 100 \%$.
D	✗	This is just the difference between 50 and 15 ($50 - 15 = 35$).

Question 116

A	✗	Squeezing water out of the potato cylinder could mean that any water squeezed out, making the measurement invalid.
B	✗	The water would not be 'reacting' rather moving passively by osmosis.
C	✗	The presence of excess water would not affect the measurement of length or mass.
D	✓	Correct.

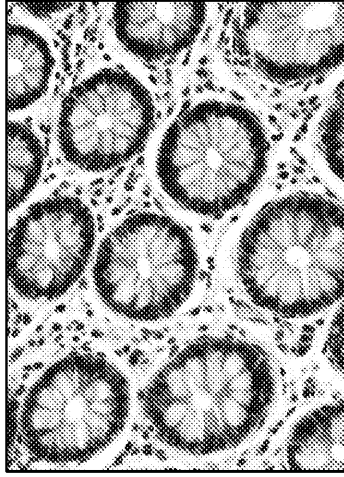
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Topic 1: B1 Cell-level sy

B1.1 Cell structures

1.



When using a light microscope to view a specimen on a slide, why is a thin section used?

- A To reflect light better. ☐
- B To show up the colours better. ☐
- C So that a coverslip will stick easily. ☐
- D To let light pass through easily. ☐

2.

A student looked at some human cheek cells and was careful to avoid trapping air bubbles underneath the coverslip when she lowered it onto the slide. Which instrument would be most useful to her to do this?

- A A mounted needle. ☐
- B Fine dissection scissors. ☐
- C A scalpel. ☐
- D A hand lens. ☐

3.

H&E is a commonly used stain. The H component stains nuclei a blue-violet colour, while the E component stains cytoplasmic material and cell membranes red. Why is this stain useful to doctors looking at human tissue?

- A It makes the slide easier to photograph. ☐
- B It means that the magnification need not be as high. ☐
- C It allows different parts of cells to be easily visible and clear to see. ☐
- D It increases the resolution of the microscope. ☐

4. Which camera lens is best for a light microscope?

- A Eyepiece lens
- B Objective lens
- C Total lens
- D Total lens

5. What is the magnification of the object shown in the micrograph?

- A $\times 600$
- B $\times 2.6$
- C $\times 25$
- D $\times 55$

6. HT only

Electron microscope magnification is $\times 250\,000$.

- A $25 \times$
- B $2.5 \times$
- C $2.5 \times$
- D $2.5 \times$

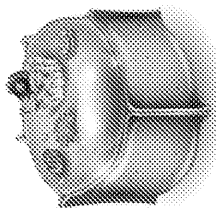
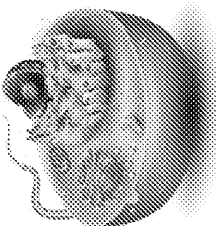
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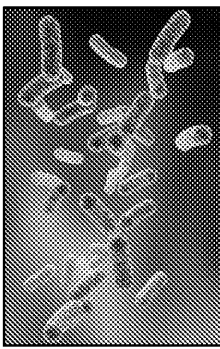
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7. Which statement is correct?
- ☐ A Eukaryotic cells contain a nucleus.
 - ☐ B Eukaryotic cells do not contain cytoplasm.
 - ☐ C Prokaryotic cells contain a nucleus.
 - ☐ D Plant cells are prokaryotic cells.

8. Select the true statement.
- ☐ A Eukaryotic cells do not have a cell wall.
 - ☐ B Prokaryotic cells do not have a cell wall.
 - ☐ C Mitochondria in eukaryotic cells are bigger than those in prokaryotic cells.
 - ☐ D Eukaryotic cells have a nucleus, cytoplasm, cell membrane and mitochondria.

- 9.
- 
- How are plant cells different from animal cells?
- ☐ A Plant cells have a vacuole instead of cytoplasm.
 - ☐ B Plant cells do not have a cell membrane but have a cell wall instead.
 - ☐ C Plant cells may contain chloroplasts, a vacuole and a cell wall.
 - ☐ D Plant cells have chloroplasts instead of mitochondria.

- 10.
- 
- Which of these structures might be found in bacterial cells?
- ☐ A Plasmids, flagella, cell wall and nucleus.
 - ☐ B Cytoplasm, cell wall, flagella and plasmids.
 - ☐ C Plasmids, flagella, cell wall and mitochondria.
 - ☐ D Mitochondria to release energy so the flagella can help the bacteria to move.

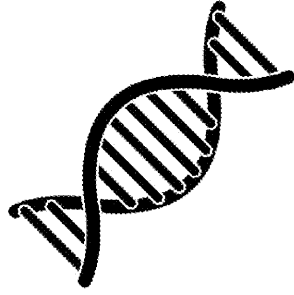
11. Which of the following is not a microscope?
- ☐ A Nuclear
 - ☐ B Micro
 - ☐ C Chlor
 - ☐ D Vacu

12. Which of the following is not a type of microscope?
- ☐ A Two and
 - ☐ B On
 - ☐ C Elec
 - ☐ D Ob

13. Select the correct answer for each question.
- | No. | Question | Answer |
|-----|----------|--------|
| 1 | Electron | A 1 a |
| 2 | Light | B 2 a |
| 3 | Electron | C 3 a |
| 4 | Light | D 1 a |

B1.2 What happens in cells?

14.



DNA is a polymer made up of nucleotides. What is a DNA nucleotide made of?

- A** A phosphate, a ribose sugar and an organic base. ☐
- B** A phosphate, a deoxyribose sugar and an organic base. ☐
- C** Amino acids and organic bases. ☐
- D** Organic bases called adenine, cytosine, guanine and uracil. ☐

15. Which of these statements are true?

No.	Statement
1	Enzymes are not used up in a reaction.
2	Enzymes are proteins.
3	Enzymes are catalysts.
4	Enzymes are killed by high temperatures.

- A** 1 and 4. ☐
- B** 1, 2, 3 and 4. ☐
- C** 1, 2 and 4. ☐
- D** 1, 2 and 3. ☐

16. Which statement is correct?

- A** High temperatures denature the substrate so it no longer fits into an enzyme's active site. ☐
- B** High temperatures denature the enzyme's active site so it no longer fits the substrate. ☐
- C** The substrate acts like the lock. ☐
- D** Enzymes are specific because they can only be used once. ☐

17. Which row

Row	1	2	3	4
1				
2				
3				
4				

- A** 1 and 2
- B** 1 and 3
- C** 2 and 4
- D** 3 and 4

18. What are

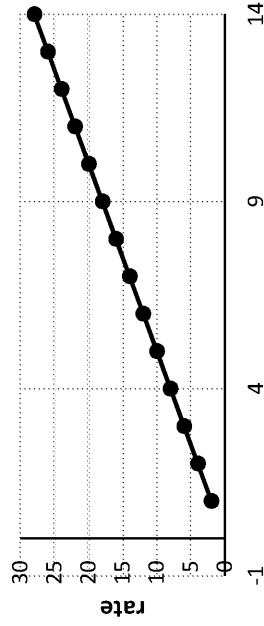
- A** Lipase
- B** Lipid
- C** Plasma
- D** Amylase

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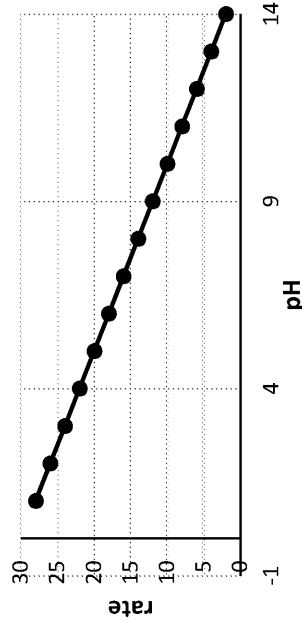
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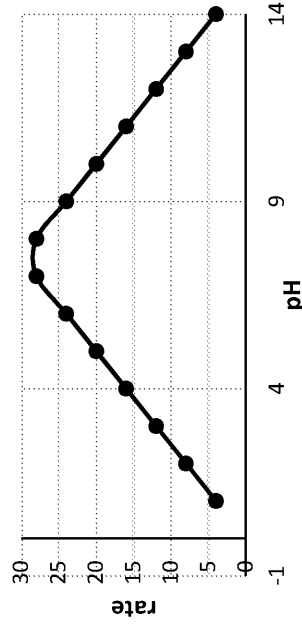
19. Which graph shows the relationship between the rate of an enzyme-controlled reaction and changes in pH?



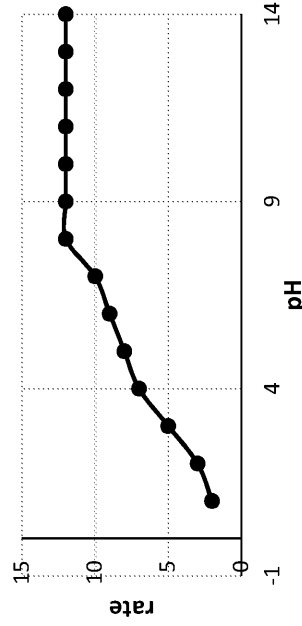
A



B



C



D

20. This graph of an enzyme-controlled reaction shows the relationship between the rate of the reaction and changes in pH.

☐

☐

☐

☐

Which statement is correct?

A As the pH increases, the rate of the reaction increases.

B As the pH increases, the rate of the reaction decreases.

C As the pH increases, the rate of the reaction remains constant.

D As the pH increases, the rate of the reaction decreases.

21. Which of the following is denatured by high pH?

A The enzyme amylase.

B The enzyme pepsin.

C The enzyme trypsin.

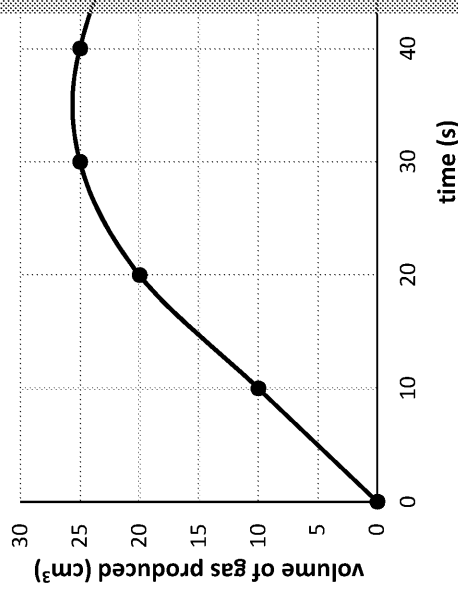
D It is not denatured by high pH.

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22. When a graph such as this is used to calculate the rate of reaction, which statement is true?



- A The gradient is zero when the reaction is fastest.
- B The gradient is zero when the reaction is just starting.
- C The gradient is steepest when the reaction is fastest.
- D The gradient drops to zero when the enzyme has been used up.

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B1.3 Respiration

23. What is the symbol equation for aerobic respiration?

- A** $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{CO}_2 \rightarrow 6\text{H}_2\text{O} + 6\text{O}_2$
B $6\text{H}_2\text{O} + 6\text{O}_2 \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{CO}_2$
C $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$
D $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_3\text{H}_6\text{O}_3$

☐
☐
☐
☐

26.

24.



Why do muscle cells contain lots of mitochondria?

- A** They use a lot of energy for contraction.
B They make up a large proportion of the body.
C They are large.
D The chloroplasts need them to release energy.

☐
☐
☐
☐

25. When respiration happens, some energy is lost as heat. What is the word to describe this type of reaction?

- A** Exothermic.
B Endothermic.
C Aerobic.
D Metabolic.

☐
☐
☐
☐

Fermentation
cells. Which

- A** Glucose
B Glucose
C Glucose
D Glucose

27. Identify the

- A** More anaerobic
B More aerobic
C More anaerobic
D More aerobic

28. Which stage

- A** Glucose are produced
B Fats are produced
C Proteins are produced
D Proteins are produced

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B1.4 Photosynthesis

29. Photosynthetic organisms are the main producers of biomass on Earth.

What does this statement mean?

- A** The mass of all plants is greater than the mass of all animals. ☐
- B** Photosynthetic organisms such as plants are the main producers of food on Earth. ☐
- C** Energy may be released from combustion of biomass as an alternative to using fossil fuels. ☐
- D** Photosynthesis produces more energy than respiration. ☐

30. What is the symbol equation for photosynthesis?

- A** Glucose + oxygen → carbon dioxide + water ☐
- B** Carbon dioxide + water → glucose + oxygen ☐
- C** $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$ ☐
- D** $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ ☐

31. During photosynthesis, what do plants take in?

- A** Carbon dioxide from the air and water from the soil. ☐
- B** Carbon dioxide and water through the leaves' stomata. ☐
- C** Nitrogen from the air. ☐
- D** Carbon dioxide and water through their roots. ☐

32. Which row in the table is correct?

Row	Statement
A	Photosynthesis occurs in two stages in the cytoplasm of plant cells.
B	Photosynthesis occurs in one stage in chloroplasts in the cytoplasm of plant cells.
C	Photosynthesis occurs in two stages in chloroplasts in the cytoplasm of plant cells.
D	Photosynthesis occurs in two stages in mitochondria in the cytoplasm of plant cells.

- A** ☐
- B** ☐
- C** ☐
- D** ☐

33. Photosynthesis

1. Water ☐
2. Carbon dioxide ☐
3. Respiration ☐
4. Chlorophyll ☐

- A** 1 and 2 ☐
- B** 2 and 3 ☐
- C** 3 and 4 ☐
- D** 1 and 4 ☐

34. Why is chlorophyll

- A** It captures light energy ☐
- B** It makes glucose ☐
- C** It is green ☐
- D** It makes oxygen ☐

35. Not all of the energy from respiration

- A** It can be used for other processes ☐
- B** It can be lost as heat ☐
- C** It can be used for growth ☐
- D** It can be used for reproduction ☐

36. Photosynthesis

- A** Light energy ☐
- B** Energy from the soil ☐
- C** Energy from the air ☐
- D** Energy from the roots ☐

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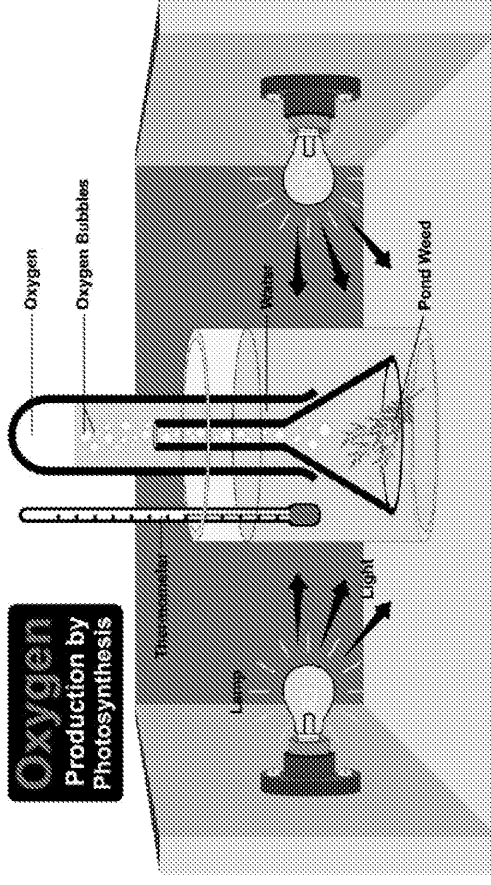


37. If a piece of pondweed produces 50 bubbles of gas in 60 s, what is the rate of photosynthesis?
- A** 50 bubbles/s ☐
- B** 1.2 bubbles/s ☐
- C** 300 bubbles/s ☐
- D** 50 bubbles/minute ☐

38. Why does temperature affect the rate of photosynthesis?

- A** On hot days there is more sunlight. ☐
- B** There is more carbon dioxide in the air on hot days. ☐
- C** Enzymes are affected by temperature. ☐
- D** Plants grow more in summer than in winter. ☐

39. HT only



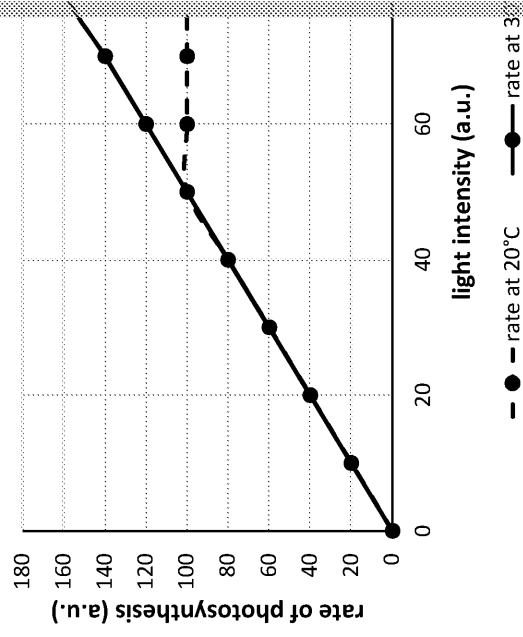
To calculate the light intensity reaching a plant, the distance between the plant and a light source can be measured. What is the calculation?

- A** Relative light intensity = distance from the light source² ☐
- B** Relative light intensity = 1 ÷ distance from the light source² ☐
- C** Relative light intensity = 1 ÷ distance from the light source ☐
- D** Relative light intensity = 100 cm ÷ distance from the light source² ☐

40. HT only
The relationship between light intensity and rate of photosynthesis was only calculated for one distance. What does this mean?
- A** It was only calculated for one distance. ☐
- B** It was only calculated for one distance. ☐
- C** It was only calculated for one distance. ☐
- D** It was only calculated for one distance. ☐

41. HT only
What does the relationship between light intensity and rate of photosynthesis mean?
- A** The rate of photosynthesis is directly proportional to light intensity. ☐
- B** The rate of photosynthesis is directly proportional to light intensity. ☐
- C** The rate of photosynthesis is directly proportional to light intensity. ☐
- D** The rate of photosynthesis is directly proportional to light intensity. ☐

42. HT only



This graph shows that increasing light intensity and temperature of photosynthesis up to a limit. What is the other factor that limits the rate of photosynthesis, and how could the rate be increased?

- A** Carbon dioxide; reduce the amount available to increase the rate of photosynthesis.
- B** Carbon dioxide; increase the amount available to increase the rate of photosynthesis.
- C** Oxygen; increase the amount available to increase the rate of photosynthesis.
- D** Oxygen; reduce the amount available to increase the rate of photosynthesis.

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Topic 2: B2 Scaling u

B2.1 Supplying the cell

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43. What is the definition of diffusion?
- A** The movement of particles from a region of low concentration to a region of high concentration. ☐
- B** The movement of particles from a region of high concentration to a region of low concentration. ☐
- C** The movement of water molecules through a selectively permeable membrane. ☐
- D** The movement of particles along a concentration gradient. ☐
-
44. How might the rate of diffusion be increased?
- A** The concentration gradient could be decreased. ☐
- B** The distance particles have to travel could be increased. ☐
- C** Surface area could be decreased. ☐
- D** Surface area could be increased. ☐
-
45. Which of these statements is correct for a living, respiring cell?
- A** Glucose and oxygen diffuse in, and carbon dioxide diffuses out. ☐
- B** Glucose and oxygen diffuse out, and carbon dioxide diffuses in. ☐
- C** Starch and oxygen diffuse in, and carbon dioxide diffuses out. ☐
- D** Starch and oxygen diffuse out, and carbon dioxide diffuses in. ☐
-
46. Which of these statements describes osmosis?
- A** When glucose moves into cells for respiration. ☐
- B** A transport mechanism that is only possible in plant cells. ☐
- C** Diffusion of water across a partially permeable membrane. ☐
- D** The movement of molecules such as glucose and water across a partially permeable membrane. ☐
-
47. Which statement is correct?
- A** Pure water contains no solute. ☐
- B** Pure water contains a small amount of solute. ☐
- C** Pure water contains a large amount of solute. ☐
- D** Pure water contains no solvent. ☐
-
48. What happens when a cell is placed in a hypotonic solution?
- A** The cell shrinks. ☐
- B** The cell swells. ☐
- C** The cell bursts. ☐
- D** The cell remains the same. ☐
-
49. What happens when a cell is placed in a hypertonic solution?
- A** The cell swells. ☐
- B** The cell shrinks. ☐
- C** The cell bursts. ☐
- D** The cell remains the same. ☐
-
50. What happens when a cell is placed in an isotonic solution?
- A** The cell swells. ☐
- B** The cell shrinks. ☐
- C** The cell bursts. ☐
- D** The cell remains the same. ☐
-
51. Why do plant cells not burst in a hypotonic solution?
- A** The cell wall is rigid. ☐
- B** Osmosis does not occur. ☐
- C** They are surrounded by a thick layer of cellulose. ☐
- D** The cell wall is flexible. ☐

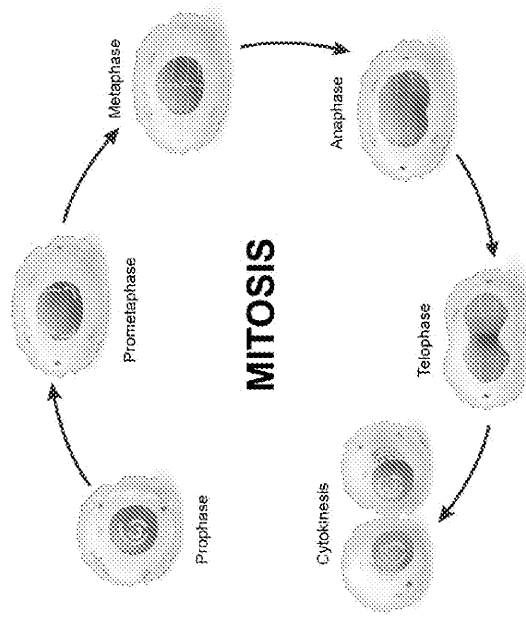
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52. Which statement is correct?
- ☐ A Active transport describes how water moves into plant cells for photosynthesis.
 - ☐ B Active transport requires cells to have large numbers of chloroplasts.
 - ☐ C Active transport requires energy and carrier proteins, and particles are moved down a concentration gradient.
 - ☐ D Active transport requires energy and carrier proteins, and particles are moved against a concentration gradient.

53. Which of these is an example of active transport?
- ☐ A Glucose moving into a cell from a high concentration outside the cell.
 - ☐ B Plants absorbing nitrate ions from a low concentration in the soil.
 - ☐ C Water moving into a cell from a high concentration outside the cell.
 - ☐ D Oxygen moving from a high concentration in the cytoplasm to a low concentration in mitochondria.

54.



What does mitosis produce?

- ☐ A Four genetically different daughter cells.
- ☐ B Two genetically different daughter cells.
- ☐ C Two genetically identical daughter cells.
- ☐ D Four genetically identical daughter cells.

55. Which is not a function of DNA?
- ☐ A Cell division
 - ☐ B DNA replication
 - ☐ C DNA transcription
 - ☐ D Cell differentiation

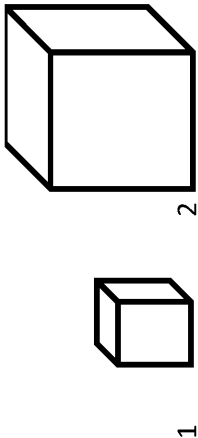
56. When does a cell differentiate?
- ☐ A Stem cells
 - ☐ B Differentiated cells
 - ☐ C Adult cells
 - ☐ D Tissue cells

57. Why is a cell differentiated?
- ☐ A It allows for specialization.
 - ☐ B It allows for the cell to perform a specific function.
 - ☐ C It allows for the cell to perform a specific function.
 - ☐ D It allows for the cell to perform a specific function.

58. Which stage of mitosis is the longest?
- ☐ A Embryonic
 - ☐ B Stem cell
 - ☐ C Embryonic
 - ☐ D Adult

B2.2 The challenges of size

59.



These objects are both cubes but they are different sizes. Which row in the table is correct?

Row	Statement
A	Cube 1 has the larger surface-area-to-volume ratio and larger diffusion distance.
B	Cube 2 has the larger surface-area-to-volume ratio and larger diffusion distance.
C	Cube 1 has the larger surface-area-to-volume ratio and smaller diffusion distance.
D	Cube 2 has the larger surface-area-to-volume ratio and smaller diffusion distance.

- A ☐ B ☐ C ☐ D ☐

61.

Fish gills

explain why

1. Their surface area is large.
2. Their surface area is small.
3. The distance between them is small.
4. The distance between them is large.

- A 1 and 2
B 2 and 3
C 1 and 4
D 2 and 4

62. Which row explains the reason why

Row
A
B
C
D

- A
B
C
D



60. The formula to calculate the surface area of a cylinder is $2\pi rh + 2\pi r^2$.
The formula to calculate the volume of a cylinder is $\pi r^2 h$.
What is the surface-area-to-volume ratio for a cylinder of radius 2 cm and height 4 cm?

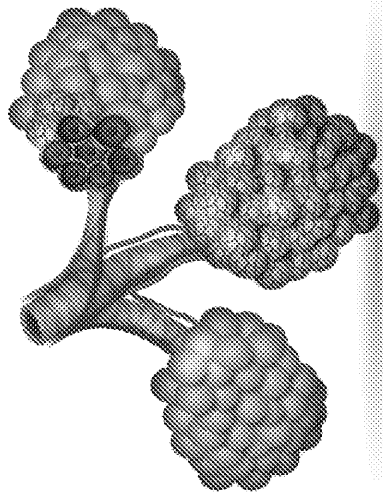
- A 1.5 : 1
B 0.7 : 1
C 3 : 2
D 2 : 1

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63.



Gas exchange in mammals occurs in the alveoli of lungs. Which features below indicate suitable adaptations?

1. Large surface area
2. Moist surfaces
3. Small diffusion distances
4. Good blood supply

- A** 1 and 2. ☐
- B** 1 and 3. ☐
- C** 2 and 4. ☐
- D** 1 and 4. ☐

64. Which row is the correct sequence that blood follows during its passage through the circulatory system of a mammal?

- A** Left ventricle → lungs → right ventricle → body → left ventricle ☐
- B** Right ventricle → lungs → left ventricle → body → right ventricle ☐
- C** Left atrium → lungs → left ventricle → body → left atrium ☐
- D** Right atrium → lungs → right ventricle → body → right atrium ☐

65. What is the correct sequence of blood flow from the heart around the body?

- A** Heart → arteries → veins → capillaries → heart ☐
- B** Heart → arteries → capillaries → veins → heart ☐
- C** Heart → arteries → capillaries → veins → capillaries → heart ☐
- D** Heart → veins → capillaries → veins → arteries → heart ☐

66. Blood flow is correct
- A** Blood to heart ☐
- B** Blood from heart ☐
- C** Blood to capillaries ☐
- D** Blood from capillaries to heart ☐

67. Faulty heart valves will
- A** Stop the heart ☐
- B** Stop the blood ☐
- C** Stop the blood from flowing ☐
- D** Stop the blood from flowing back ☐

68. A student is dissecting a mammal for to identify the large local outflow
- A** 1, 2, 3, 4 ☐
- B** 1, 2, 3 ☐
- C** 1, 3, 4 ☐
- D** 2, 3, 4 ☐

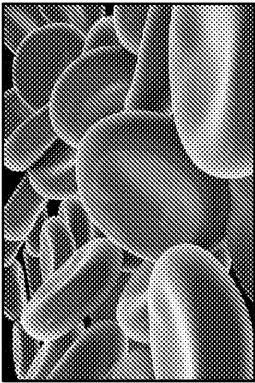
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69. Which row in the table correctly matches the function of red blood cells with their adaptation?

Row	Function	Adaptation
A	Help blood to clot	Presence of haemoglobin
B	Help blood to clot	Flexible, biconcave disc shape
C	Transport oxygen	Presence of haemoglobin
D	Transport oxygen	Thin cell wall



- A ☐
B ☐
C ☐
D ☐

70. What is the function of plasma?

- A To transport blood cells and dissolved substances in the blood around the body. ☐
B To carry haemoglobin so oxygen can be transported in the blood around the body. ☐
C To bathe the cells and supply them with dissolved substances. ☐
D To deliver dissolved oxygen and glucose to mitochondria for respiration. ☐

71. Which statements correctly explain why root hair cells are effective at absorbing water and mineral ions?

1. They have a large surface area.
2. Water is able to easily move by osmosis from the soil through them to the xylem.
3. They contain mitochondria to provide energy for active transport of mineral ions.
4. They are constantly being replaced by new cells as the root grows.
- A 2 and 4 only ☐
B 1 and 2 only ☐
C 1, 2 and 3 only ☐
D 1, 2, 3 and 4 ☐

72. What is the function of stomata?

A Stomata
B Guard cells
C Epidermal cells
D Palisade cells

73. Which structure is found in the epidermis?

A Stomata
B Stomata
C Stomata
D Stomata

74. Which row shows the correct order of the xylem and phloem in a leaf?

Row	Xylem	Phloem
A	Tracheids	Sieve tubes
B	Sieve tubes	Tracheids
C	Tracheids	Sieve plates
D	Sieve plates	Tracheids

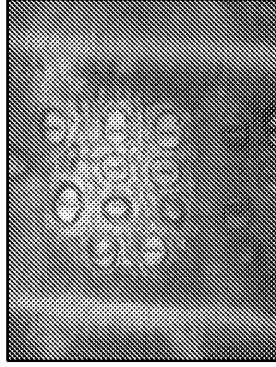
- A ☐
B ☐
C ☐
D ☐

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75.



A student wanted to compare stomatal density between lower surfaces of a leaf. What did they calculate?

- A Number of stomata on the surface $\times$ area of the leaf
- B Area of leaf $\div$ number of stomata on the surface
- C Number of stomata on the surface $\div$ area of the leaf
- D Mass of the leaf $\div$ volume of the leaf

76. What does a potometer measure?

- A The rate of photosynthesis.
- B The rate of translocation.
- C The rate of water uptake by a plant.
- D The rate of respiration of a small organism.

77. A researcher moves a plant into conditions of high light temperature and fast air movement. What effect will this have on the rate of water uptake by the plant?

- A There will be no change in water uptake.
- B Water uptake will decrease.
- C Water uptake will stop completely.
- D Water uptake will increase.

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Topic 3: B3 Organism-level

B3.1 and 3.2 Coordination and control – the nervous system

78. What comprises the central nervous system?

- A The brain and sensory receptors.
- B The brain and spinal cord.
- C The brain, sensory and motor neurons.
- D Sensory receptors, sensory and motor neurons.

☐ ☐ ☐ ☐

80.

79. The components of the nervous system allow a coordinated response to stimuli to be produced. Which of these statements explain how this is achieved?

1. The nervous system reaches all parts of the body.
2. The nervous system has many links and connections.
3. The nervous system has different sensory receptors.
4. The brain is able to coordinate information to produce an appropriate response.

- A 1, 2, 3 and 4.
- B 1, 2 and 3 only.
- C 1 and 2 only.
- D 2 and 3.

☐ ☐ ☐ ☐

Why is a reflex action important?

- A The reflex action is a rapid response.
- B The reflex action is a learned response.
- C The reflex action is a voluntary response.
- D The reflex action is an involuntary response.

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81. Which statements about hormones are true?
- 1. They are chemical messengers.
 - 2. They are transported in the blood.
 - 3. They are produced by endocrine glands.
 - 4. They are detected by receptors on the cell membranes of target organs.
- A** 1, 2 and 3 only ☐
- B** 2, 3 and 4 only ☐
- C** 1, 2 and 4 only ☐
- D** 1, 2, 3 and 4 ☐

82. HT only
- What is the role of adrenaline in the body?
- A** To regulate the body's metabolic rate and how much energy is available to cells. ☐
- B** To prepare the body for 'fight or flight'. ☐
- C** To maintain the lining of the uterus during pregnancy. ☐
- D** To stimulate ovulation. ☐

83. HT only
- Thyroxine is secreted by the thyroid gland. When the concentration of thyroxine in the blood increases, what happens next?
- A** Secretion of thyroid-stimulating hormone from the pituitary gland is increased, so more thyroxine is released. ☐
- B** Secretion of thyroid-stimulating hormone from the pituitary gland is decreased, so less thyroxine is released. ☐
- C** There is no further change in thyroxine concentrations and they remain high. ☐
- D** Insulin is secreted by the pancreas to restore thyroxine concentrations to normal. ☐

84. What is the role of progesterone in controlling the menstrual cycle?
- A** It has no role as it is involved in the male reproductive system. ☐
- B** It causes the lining of the uterus to thicken. ☐
- C** It maintains the lining of the uterus. ☐
- D** It stimulates ovulation (release of an egg). ☐

85. HT only
- The menstrual cycle is controlled by hormones. What does progesterone do?
- A** Inhibits the release of oestrogen. ☐
- B** Stimulates the release of oestrogen. ☐
- C** Stimulates the release of follicle stimulating hormone. ☐
- D** Stimulates the release of luteinising hormone. ☐

86. The combined oral contraceptive pill (COCP) contains oestrogen and progesterone. What is the effect of the progesterone?
- A** Stimulates the release of follicle stimulating hormone. ☐
- B** Reduces the release of follicle stimulating hormone. ☐
- C** Prevents the release of follicle stimulating hormone. ☐
- D** Stimulates the release of luteinising hormone. ☐

- 87.

Barrier method

Method
Male condom
Female condom
Diaphragm

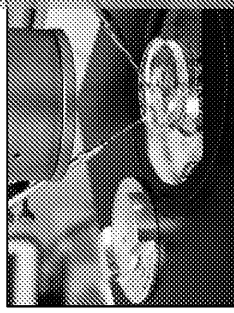
- What is the result of the barrier method?
- A** 92 ☐
- B** 96 ☐
- C** 8 ☐
- D** 80 ☐

88. How do non-hormonal methods of contraception following statements are correct?

1. They use hormones to alter the menstrual cycle.
2. They can prevent egg and sperm from meeting.
3. They can prevent the fertilised egg from implanting.
4. They can prevent an egg from being released.

- A** 1, 2, 3 and 4.
B 1 and 4.
C 2 and 3.
D 3 and 4.

89. HT only



Clomifene is a drug that may be given to women that results in an increase in the levels of follicle-stimulating hormone (FSH) and luteinising hormone (LH). How can this help to make a woman fertile?

- A** LH makes eggs ripen and FSH causes their release.
B FSH makes eggs ripen and LH causes their release.
C LH and FSH maintain the lining of the uterus.
D LH and FSH prevent the production of progesterone and prevent menstruation.

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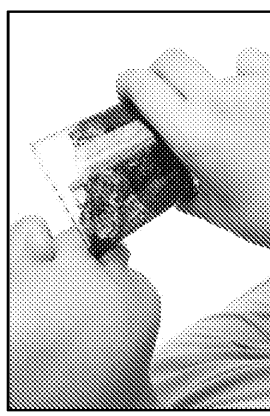
B3.3 Maintaining internal environment

90. Which row in the table correctly explains why it is important that the water potential inside cells is maintained within controlled limits?

Row	Reason
1	To prevent osmosis from happening and cells swelling or shrinking.
2	To allow metabolic reactions to proceed at appropriate rates.
3	To resist changes in temperature as water forms a stable environment.
4	To maintain constant blood water levels.

- A 1, 2, 3 only.☐
- B 1 and 2 only.☐
- C 2 and 3 only.☐
- D 1, 2, 3 and 4.☐

91.



A child enjoys eating sugary sweets and drinks. What will happen to his insulin levels a few hours after eating sugary sweets and drinks?

- A There will be no change.☐
- B Insulin levels will rise and remain high for 24 hours.☐
- C Insulin levels will rise and gradually return to normal.☐
- D Insulin levels will fall and gradually return to normal.☐

92. HT only

Patients are given glucagon

- A The pancreas converts glucose into glycogen
- B The liver converts glycogen into glucose
- C The pancreas makes insulin
- D The liver produces glucose

93. Why does

- A They have their own endocrine glands
- B They have a different type of endocrine glands
- C They have a different type of endocrine glands
- D They have a different type of endocrine glands

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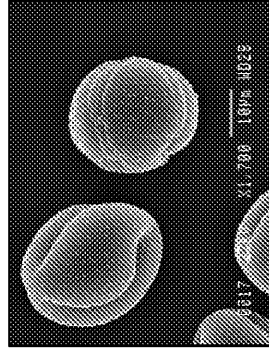


CS7 Practical skills

Practical activity group B1 – micro

94. HT only

An image was produced by a scanning electron microscope at a magnification of $\times 1700$. What is that in standard form?



- A 1.7×10^{-3}
- B 1.7×10^2
- C 1.7×10^3
- D 1.7×10^4

- ☐
- ☐
- ☐
- ☐

- A Chloroplast
- B Mitochondrion
- C Nucleus
- D Ribosome

98. Select the correct answer to the right.

- A Leaf
- B DNA
- C RNA
- D Virus

95. The image in question 94 was produced at a magnification of $\times 1700$. If the actual diameter of one of the pollen grains was 0.01 mm, what was the diameter of the image of the pollen grain?

- A 170 cm
- B 1.7 cm
- C 17 cm
- D 1.7 mm

- ☐
- ☐
- ☐
- ☐

96. A student wanted to look for the effects of osmosis on the cytoplasm of onion cells. Her teacher told her that if she used the epidermis of white onion cells she would need to use a stain such as iodine, but if she used the epidermis of red onions there would be no need to stain the cells. Why would she need to use a stain with the white onion epidermis?

- A To make it easier to see the different parts of the cell.
- B To make the effects of osmosis greater.
- C To make the cells thin enough to let light through.
- D To keep the cells alive for long enough to see the effects of osmosis.

- ☐
- ☐
- ☐
- ☐

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Practical activity group B2 – sampling techniques – qualitative testing of biological molecules

99. A gardener placed a ripe banana in a paper bag with some unripe (green) tomatoes to see whether the gas produced by the ripe banana would speed up the ripening of the tomatoes. Which gas could be produced that would have such an effect?
- A** Oxygen. ☐
- B** Carbon dioxide. ☐
- C** Nitrogen. ☐
- D** Ethene. ☐

100. To test the leaf from a plant for the presence of starch, the leaf needs to be softened in boiling water and then the chlorophyll needs to be removed by using ethanol as a solvent. Why should a Bunsen burner be switched off when the ethanol is used?
- A** To avoid the risk of an explosion. ☐
- B** To avoid the risk of the ethanol igniting / catching fire. ☐
- C** To avoid burning the leaf. ☐
- D** To keep a tidy and clear work space on the bench. ☐

101. Which biological molecule would you expect to find in abundance in the leaves of healthy plants that have been exposed to sufficient sunlight for several days?
- A** Starch ☐
- B** Nucleotides ☐
- C** Carbon dioxide ☐
- D** Water ☐

102. Which component of a DNA nucleotide would give a positive result with Benedict's reagent which is used to test for the presence of reducing sugars?
- A** Deoxyribose ☐
- B** Phosphate group ☐
- C** Organic base ☐
- D** Ribose ☐

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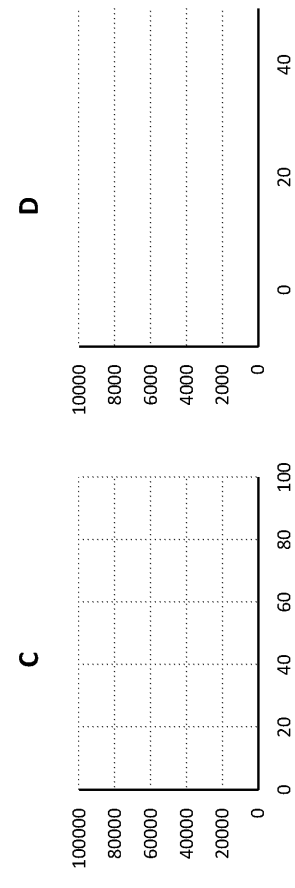
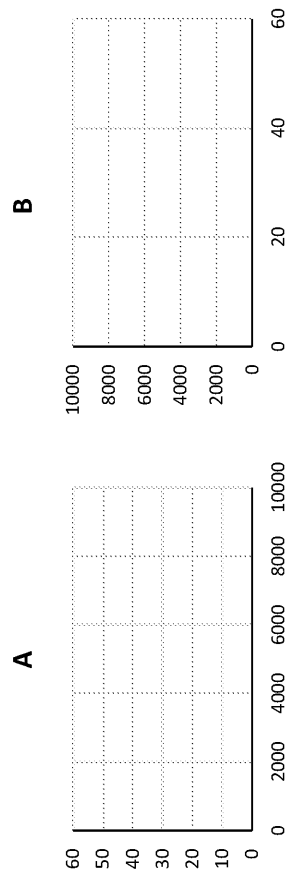
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Practical activity group B3 – rates of enzyme-co

103. Which of the graphs below shows the most appropriate scales for the axes to plot the data shown in the table?

Time (min)	Mass of glucose produced by the action of maltase (mg)
0	0
20	100
40	1000
60	10 000



- A** ☐ **B** ☐ **C** ☐ **D** ☐

104. What is the

- A** 166 g
B 10 g
C 0.00 g
D 6 g/100 g

105. The graph shows the break

Looking at

- A** 25 cm
B 40 cm
C 45 cm
D 55 cm

106. A chemist she deter

- A** Hydrogen
B Oxygen
C Carbon
D Nitrogen

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Practical activity group B4 – photosynthesis

107. A student wanted to measure stomatal density in a leaf. He counted 40 stomata in a field of view of area 5 mm^2 . What is the stomatal density?

- ☐ **A** 8 stomata/ mm^2
☐ **B** 200 stomata/ mm^2
☐ **C** 0.125 stomata/ mm^2
☐ **D** 45 stomata/ mm^2

108. The student wanted to improve the reliability of his method. Which of the following suggestions did he choose?

1. Use a magnification that gave a field with a number of stomata that he could easily see.
2. Only count whole stomata that were in the field of view.
3. Compare results between different plants.
4. Count the number of stomata in at least three fields of view and calculate a mean.

- ☐ **A** 2, 3 and 4.
☐ **B** 1, 2 and 4.
☐ **C** 1, 2 and 3.
☐ **D** 1, 2, 3 and 4.

109. HT only

The relative light intensity for a plant that was 25 cm from a lamp was calculated to be 0.04 units. What was the relative light intensity when the lamp was moved 15 cm closer to the plant?

- ☐ **A** 0.07 units.
☐ **B** 0.10 units.
☐ **C** 10 units.
☐ **D** 4 units.

110. An A Level student produced photosynthetic bubbles in the bubbling apparatus. The accuracy of the results was poor. Which of the following suggestions did he choose?

- ☐ **A** Repeat the experiment.
☐ **B** Measure the volume of the bubbles.
☐ **C** Measure the temperature of the water.
☐ **D** Use a different plant.

111. A Belgian scientist discovered that a tree in a park in Brussels was only 56.7 years old. Which of the following suggestions did he choose?

- ☐ **A** Tree rings.
☐ **B** Tree growth rate.
☐ **C** Tree height.
☐ **D** Tree width.

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Practical investigations of respiration

- 112.** A sports scientist measured an athlete's skin surface temperature immediately after exercise and five minutes after cooling in either air at 20 °C or water at 20 °C and obtained these results:

Skin surface temperature at start: 38.0 °C
 Skin surface temperature after 5 min in air at 20 °C: 37.0 °C
 Skin surface temperature after 5 min in water at 20 °C: 35.5 °C

What was the rate of cooling in water?

- A** 0.2 °C/min ☐
B 3.4 °C/min ☐
C 0.5 °C/min ☐
D 0.02 °C/min ☐

- 113.** In the experiment described in question 112, the athlete was cooled as he sweated in the air. Which process allowed heat energy to be lost from the surface of his skin?

- A** Perspiration. ☐
B Transpiration. ☐
C Evaporation. ☐
D Run-off. ☐

- 114.** A student measured his reaction time by catching a 30 cm ruler which was held above his hand by a friend. He found that his reaction time was faster when he looked at the ruler but slower when he had immersed his hand in water at 5 °C for five minutes. Which statements are true?

1. When he looked at the ruler his reflexes were faster.
2. When he looked at the ruler his brain coordinated his responses.
3. Nerve impulses were slowed down by the cold water.
4. Skin temperature receptors were stimulated by the cold water.

- A** 1, 2, 3 and 4. ☐
B 2, 3 and 4 only. ☐
C 2 and 3 only. ☐
D 1 and 3 only. ☐

- 115.** Cress seeds left near a window were found to be occurring

- A** Negative geotropism ☐
B Negative phototropism ☐
C Positive geotropism ☐
D Positive phototropism ☐

- 116.** This apparatus is used to measure the rate of respiration of a small organism. Which statement is correct?

- A** The volume of gas taken up by the organism is measured. ☐
B The volume of gas given off by the organism is measured. ☐
C The volume of gas taken up by the organism is measured. ☐
D The volume of gas given off by the organism is measured. ☐

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Practical investigations of osmosis (B2.1 Supplying the cell)

117. A student did an experiment using cylinders cut from potatoes. He measured the mass of the potato cylinders at the start and he measured their mass after they had been placed in distilled water for 30 minutes. Why did he conclude that osmosis had happened?
- ☐ A Because the mass had decreased.
- ☐ B Because the mass had increased.
- ☐ C Because the mass had stayed the same.
- ☐ D Because the mass had stayed the same but the potatoes had shrunk.

118. Another student plotted a graph of her results. She calculated percentage change in mass. If a potato cylinder had a mass of 2.5 g at the start and 1.9 g at the end, what was the percentage change in mass?
- ☐ A -31.6 %
- ☐ B +24 %
- ☐ C -24 %
- ☐ D 76 %

119. If a plant cell is placed in a concentrated salt solution, which of the following changes will happen due to osmosis?
- ☐ A The cytoplasm will pull away from the cell wall as water leaves the cell.
- ☐ B Water will move into the cell and the cell will swell.
- ☐ C The cell will shrivel and collapse.
- ☐ D There will be no change because the net movement of water is zero.

120. Cyanide is a metabolic poison that stops mitochondria from producing any ATP. What effect will cyanide have on active transport?
- ☐ A No effect because energy is not required for active transport.
- ☐ B Active transport will be increased.
- ☐ C Active transport will be decreased.
- ☐ D Active transport will be decreased temporarily but then increase.

121. The centrioles contain microtubules. Which row shows the correct structure of the centrioles?

Row
A
B
C
D

- ☐ A
- ☐ B
- ☐ C
- ☐ D

122.

- This image shows a cross-section of a blood vessel. What kind of blood vessel is it?
- ☐ A Artery
- ☐ B Vein
- ☐ C Capillary
- ☐ D Alveolus

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Answers to Multiple-choice Questions

1.	D	26.	C	51.	D
2.	A	27.	A	52.	D
3.	C	28.	D	53.	B
4.	A	29.	B	54.	C
5.	A	30.	D	55.	B
6.	D	31.	A	56.	B
7.	A	32.	C	57.	C
8.	D	33.	D	58.	C
9.	C	34.	A	59.	C
10.	B	35.	A	60.	C
11.	B	36.	B	61.	D
12.	C	37.	D	62.	D
13.	C	38.	C	63.	D
14.	B	39.	B	64.	B
15.	D	40.	C	65.	B
16.	B	41.	A	66.	C
17.	C	42.	B	67.	D
18.	A	43.	B	68.	B
19.	C	44.	D	69.	C
20.	C	45.	A	70.	A
21.	B	46.	C	71.	D
22.	C	47.	D	72.	B
23.	C	48.	C	73.	A
24.	A	49.	A	74.	B
25.	A	50.	B	75.	C

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