UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

**BIOLOGY** **9700/01**

Paper 1 Multiple Choice **May/June 2008**

**1 hour**

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)



**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

This document consists of **19** printed pages and **1** blank page.

**1** What is the order of size of cell components?

| | largest → smallest | | | |
|---|---|---|---|---|
| **A** | centrioles | mitochondria | lysosomes | nucleoli |
| **B** | mitochondria | nucleoli | lysosomes | centrioles |
| **C** | nucleoli | mitochondria | centrioles | lysosomes |
| **D** | nucleoli | centrioles | mitochondria | lysosomes |

**2** When mucus is secreted from a goblet cell in the trachea, these events take place.

1 addition of carbohydrate to protein

2 fusion of the vesicle with the plasma membrane

3 secretion of a glycoprotein

4 separation of a vesicle from the Golgi apparatus

What is the sequence in which these events take place?

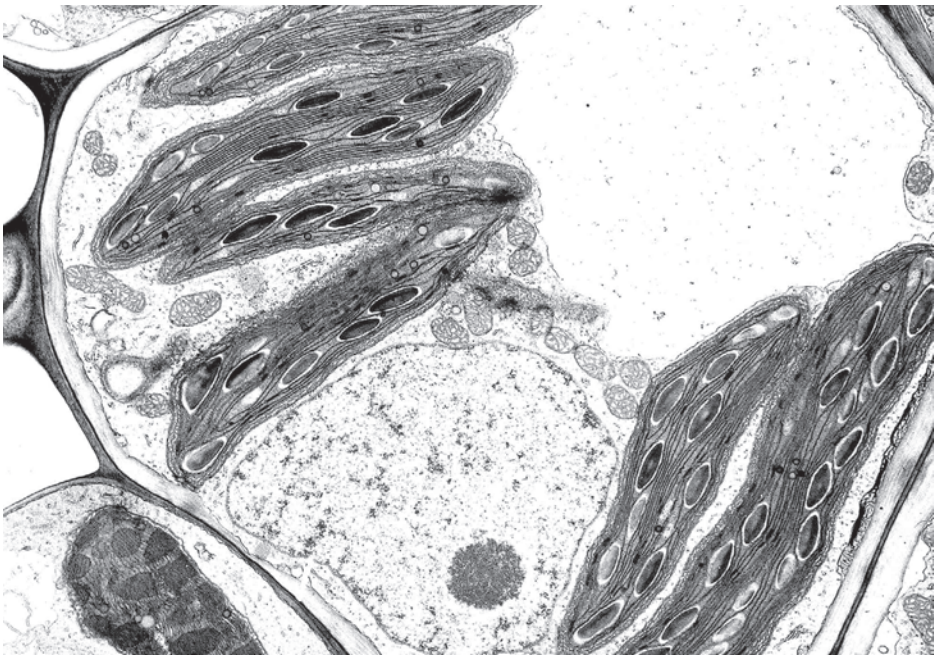
**A** $1 \rightarrow 4 \rightarrow 2 \rightarrow 3$

**B** $1 \rightarrow 4 \rightarrow 3 \rightarrow 2$

**C** $4 \rightarrow 1 \rightarrow 2 \rightarrow 3$

**D** $4 \rightarrow 1 \rightarrow 3 \rightarrow 2$

**3** The magnification of this electron micrograph is $5 \times 10^3$.



What is the actual size of the nucleolus?

**A** 0.2 μm **B** 0.5 μm **C** 2 μm **D** 20 μm

**4** Which structure is present in cells of eukaryotes but not present in cells of prokaryotes?

**A** 70s ribosome

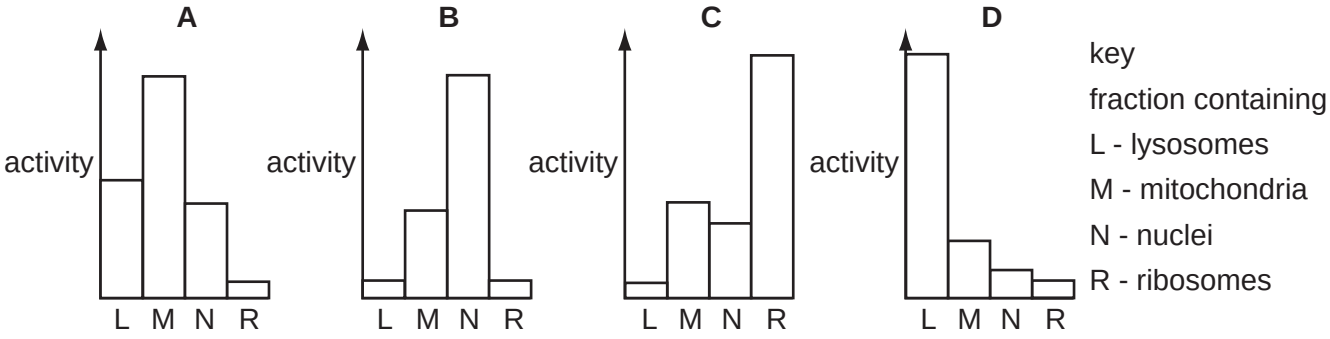
**B** chromatin

**C** mesosome

**D** plasmid

**5** A piece of mammalian tissue was homogenised and subjected to differential centrifugation to yield four subcellular fractions. The activity of four different types of enzyme, **A**, **B**, **C** and **D**, was investigated within each fraction.

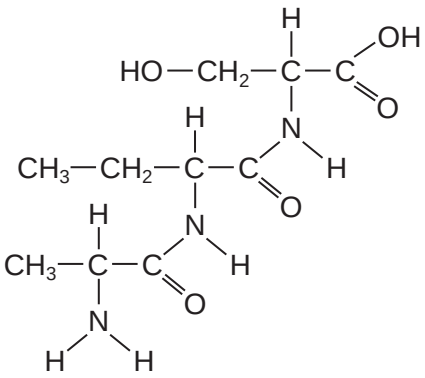
Which bar chart shows the results of investigating hydrolytic enzyme activity?



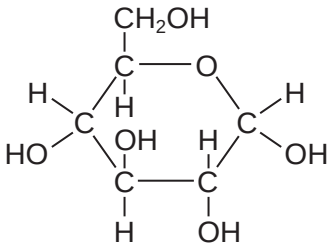
**6** Samples of a food were tested using Benedict's reagent, biuret solution and e[illegible]r testing, the solutions were blue with Benedict's reagent, purple with biuret and c[illegible] ethanol.

Which molecules do the samples contain?

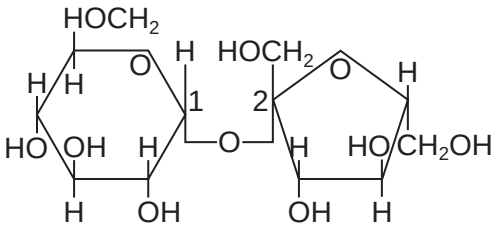
W



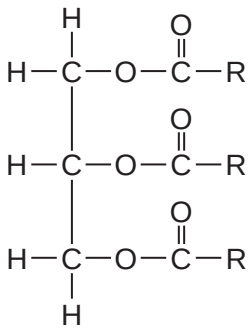
X



Y



Z



**A** W, X and Z

**B** W, Y and Z

**C** W, X and Y

**D** X, Y and Z

**7** How is the shape of a polypeptide chain maintained when it is coiled into an $\alpha$ helix?

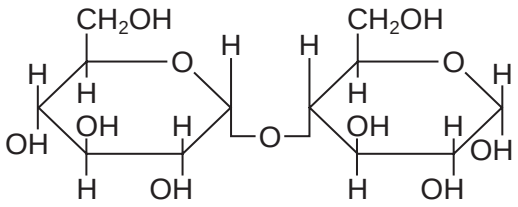
**A** disulphide bonds

**B** hydrogen bonds

**C** hydrophobic interactions

**D** ionic bonds

**8** The diagram shows an α 1:4 glycosidic bond.




Which molecules contain this bond?

**A** amylose and cellulose

**B** amylose but not cellulose

**C** cellulose but not amylose

**D** neither amylose nor cellulose

**9** Which combination describes a triglyceride?

| | hydrophilic | soluble in alcohol |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✗ | ✗ |
| **C** | ✓ | ✗ |
| **D** | ✗ | ✓ |

**10** What will break an ionic bond between amino acids?

**A** condensation

**B** hydrolysis

**C** low temperature

**D** pH change

**11** When hydrolysed, which molecules have products containing a carboxyl group?

1 phospholipids

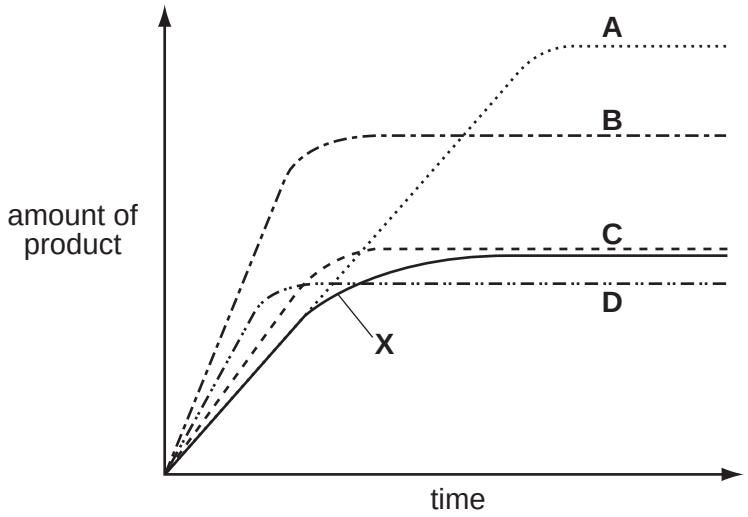
2 polysaccharides

3 proteins

**A** 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 only

**12** The curve **X** shows the activity of an enzyme at 20 °C. Curves **A, B, C** and **D** show the effect of different conditions on the activity of the enzyme.

Which curve shows the effect of increasing the temperature by 10 °C and adding extra substrate?




**13** Following a heart attack, the enzyme lactate dehydrogenase leaks into the blood plasma from damaged heart muscle.

Which steps are required to obtain the best estimate of lactate dehydrogenase activity in a sample of blood plasma?

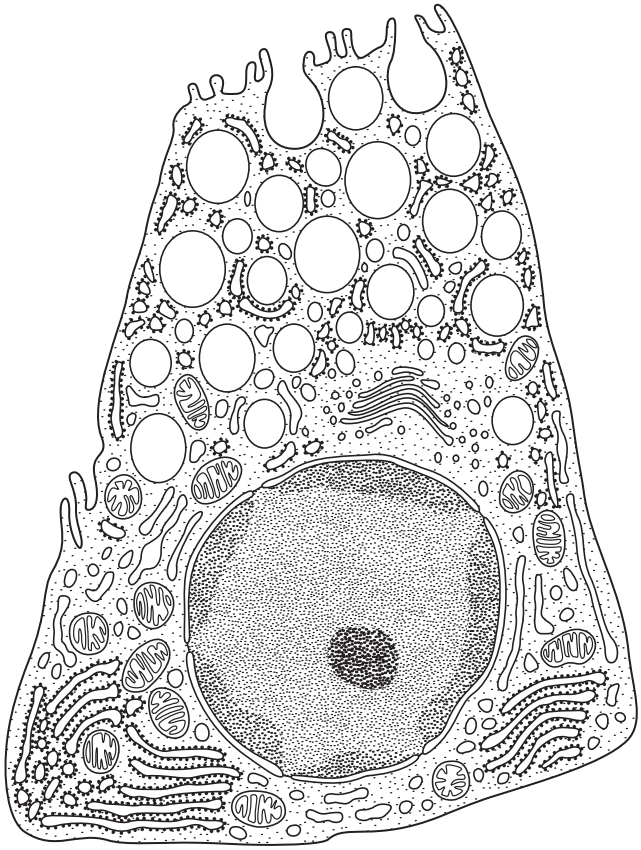
| | sterilise blood plasma by heating | incubate with substrate for lactate dehydrogenase | incubate with lactate dehydrogenase inhibitor |
|---|---|---|---|
| **A** | ✗ | ✓ | ✗ |
| **B** | ✓ | ✗ | ✓ |
| **C** | ✗ | ✓ | ✓ |
| **D** | ✓ | ✓ | ✓ |

key

✓ = step required

✗ = step not required

**14** The diagram shows a cell from the gut. The cell produces protease enzymes.



What is correct?

| | enzymes released by | ATP needed |
|---|---|---|
| **A** | endocytosis | no |
| **B** | endocytosis | yes |
| **C** | exocytosis | no |
| **D** | exocytosis | yes |

**15** Membranes in cells include the following components.

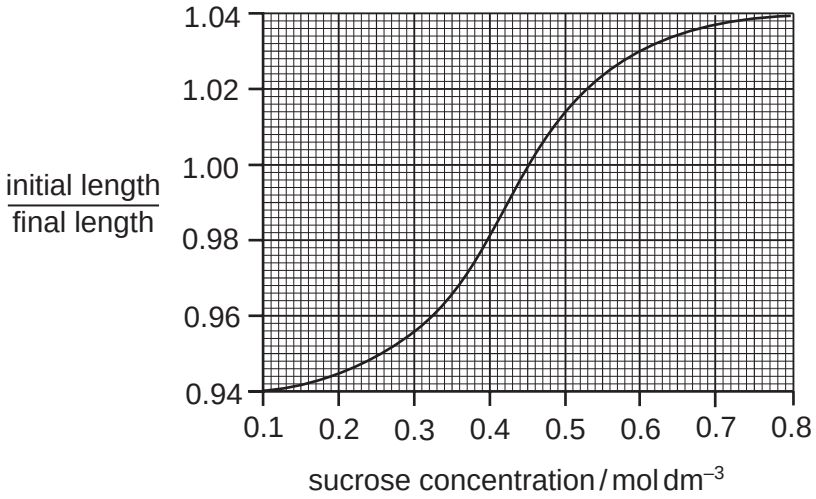
1 cholesterol
2 glycoproteins
3 phospholipids
4 proteins

Which component is the most important for these functions of membranes?

| function | recognising self / non self | separating dissolved ions | stabilising the hydrophobic layer | transporting ions through membranes |
|---|---|---|---|---|
| **A** | 1 | 2 | 3 | 4 |
| **B** | 2 | 3 | 1 | 4 |
| **C** | 3 | 1 | 4 | 2 |
| **D** | 3 | 4 | 1 | 2 |

**16** Strips of plant tissue were immersed in a range of sucrose solutions of different concentrations. Their lengths were measured before immersion and after 30 minutes in the different solutions.

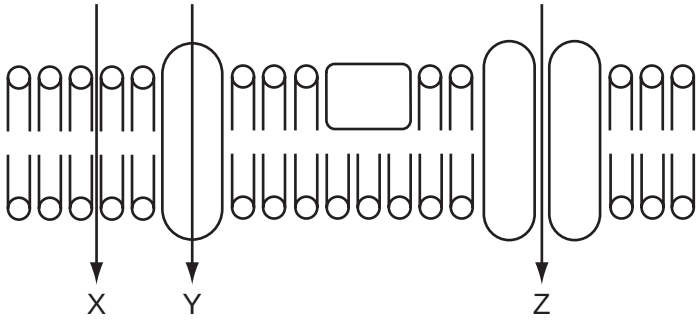
The graph shows the ratio of initial length to final length.




Which concentration of sucrose solution, in mol $dm^{-3}$, has the same water potential as the cell sap before immersion?

**A** 0.1 **B** 0.25 **C** 0.45 **D** 0.8

**17** The diagram shows three routes through which substances can pass across a cell me




Which correctly shows the routes for vitamin D, which is fat soluble, and vitamin C, which is water soluble?

| | vitamin D | vitamin C |
|---|---|---|
| **A** | Y | X |
| **B** | X | Z |
| **C** | X | Y |
| **D** | Z | Y |

**18** Which are features of nuclear division by mitosis?

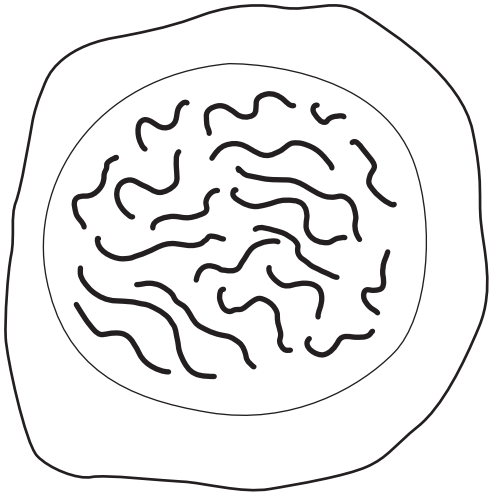
1 forms cells of equal size to the parent cell

2 forms genetically identical cells

3 semi-conservative replication of DNA

**A** 1 and 2 only **B** 2 and 3 only **C** 2 only **D** 1, 2 and 3

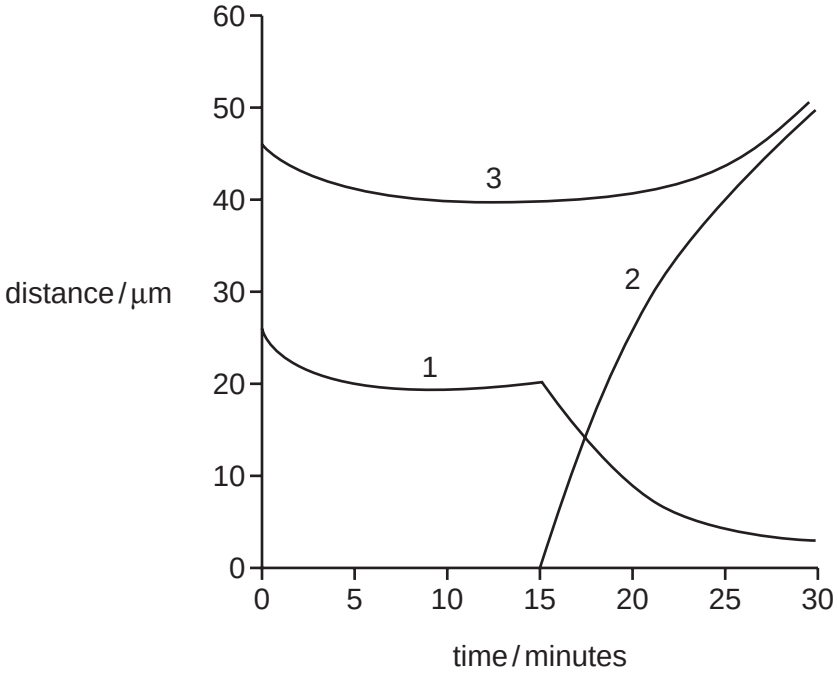
**19** The diagram shows a cell of an organism formed by reduction division.



What is the diploid number for this organism?

**A** 10 **B** 20 **C** 40 **D** 46

**20** The graph shows three measurements obtained following metaphase of mitosis.

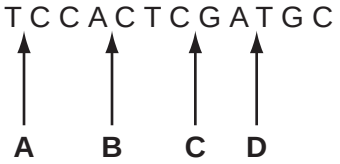



What measurements do the curves represent?

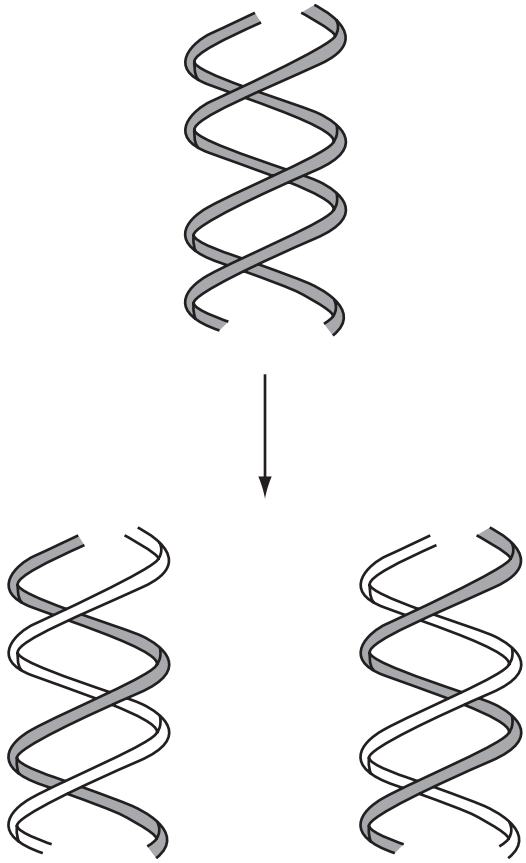
| | distance between centromeres and poles of spindle | distance between centromeres of sister chromatids | distance between poles of spindle |
|---|---|---|---|
| **A** | 1 | 2 | 3 |
| **B** | 1 | 3 | 2 |
| **C** | 3 | 1 | 2 |
| **D** | 3 | 2 | 1 |

**21** The RNA triplet UAG acts as a stop codon terminating the synthesis of a polypeptide. The diagram shows a strand of DNA which codes for four amino acids.

Where would a mutation, introducing a thymine nucleotide, result in the termination of transcription?



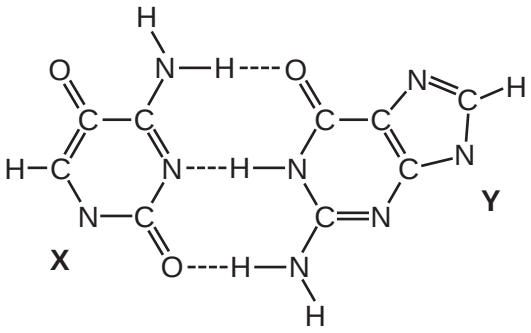
**22** The diagram shows a process involving DNA.



What is the name of the process and the stage in the cell cycle at which it occurs?

| | process | stage |
|---|---|---|
| **A** | replication | interphase |
| **B** | replication | prophase |
| **C** | transcription | interphase |
| **D** | transcription | prophase |

**23** The diagram shows two bases, **X** and **Y**, joined by hydrogen bonds (----) in DNA.




What are the correct bases?

| | X | Y |
|---|---|---|
| **A** | adenine | cytosine |
| **B** | adenine | uracil |
| **C** | cytosine | guanine |
| **D** | cytosine | thymine |

**24** Part of the amino acid sequences in normal and sickle cell haemoglobin are shown.

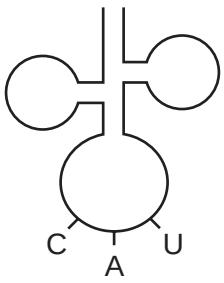
| normal haemoglobin | sickle cell haemoglobin |
|---|---|
| thr-pro-glu-glu | thr-pro-val-glu |

Possible mRNA codons for these amino acids are

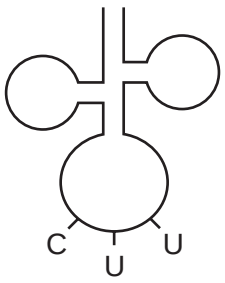
| | |
|---|---|
| glutamine (glu) GAA GAG | proline (pro) CCU CCC |
| threonine (thr) ACU ACC | valine (val) GUA GUG |

Which tRNA molecule is **not** involved in the formation of this part of the sickle cell haemoglobin?

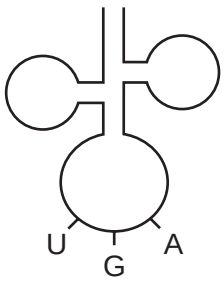
**A**



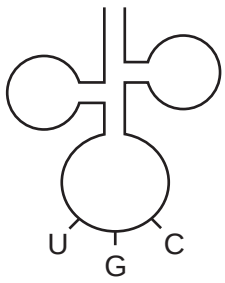

**B**



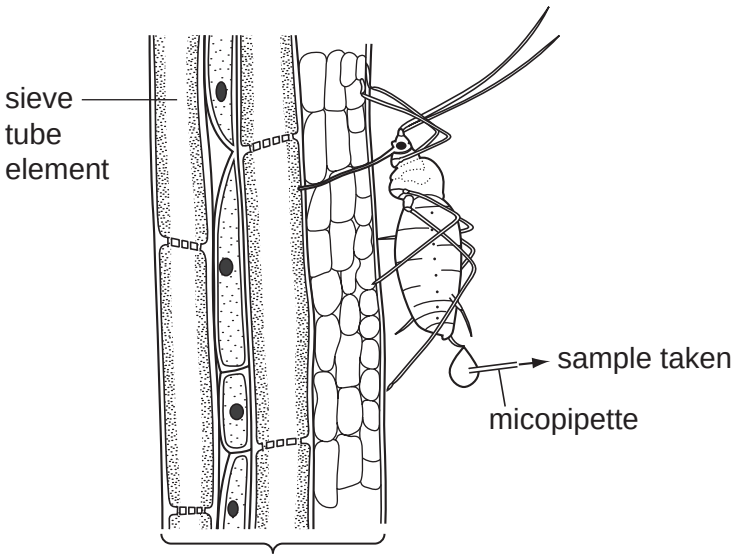

**C**




**D**



**25** A large number of aphids were used to collect samples of the contents of the sieve tubes in a tomato plant.




(aphid and stem are **not** drawn to the same scale)

Different samples of the sieve tube solution were tested.

Which was the correct result?

| | Benedict's test | | iodine in KI |
|---|---|---|---|
| | before hydrolysis | after hydrolysis | |
| **A** | blue | red | brown |
| **B** | blue | blue | blue / black |
| **C** | red | blue | blue / black |
| **D** | red | red | brown |

**26** The diagram shows a dendrograph fixed to a tree. The dendrograph records changes in the diameter of the tree.

Some results are shown on the chart recording.

dendrograph fixed to a tree

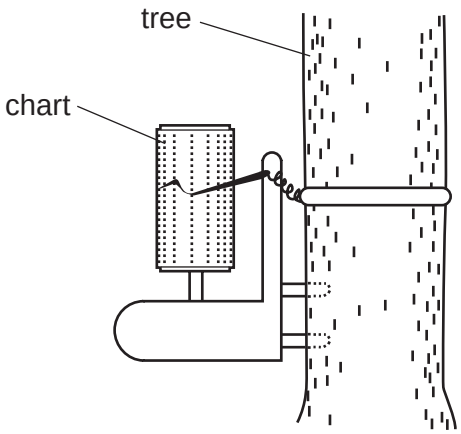
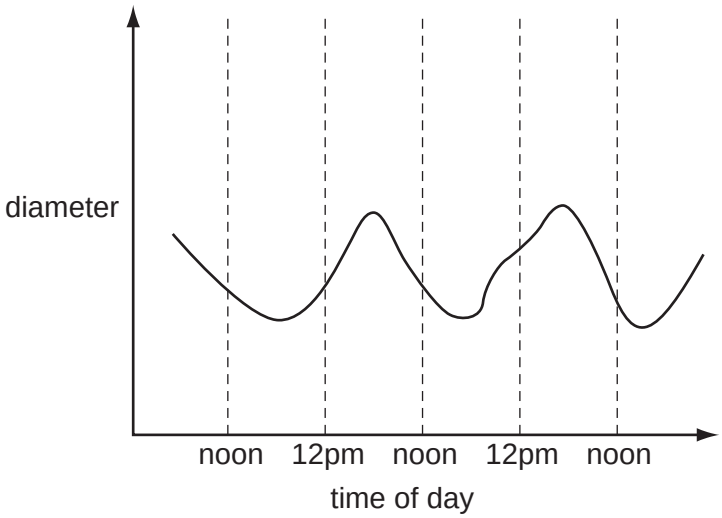



chart recording




What explains the diameter changes recorded during the day and night?

**A** cohesive tension forces increased during the day

**B** mass flow of sucrose increased during the night

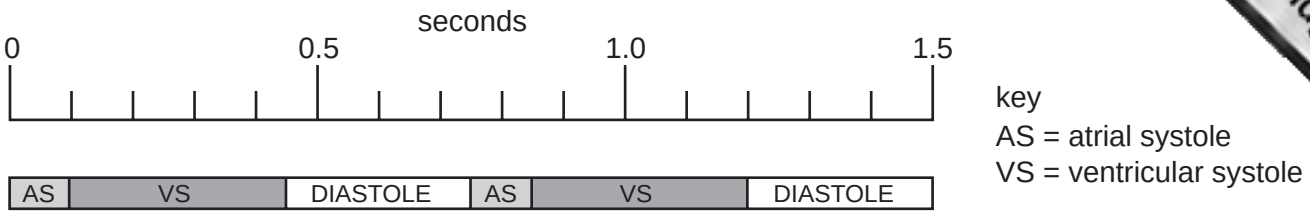
**C** root pressure decreased during the day

**D** thermal expansion and contraction of water in the tree

**27** Which combination of features is characteristic of phloem sieve tubes?

| | solute potential of the cell content | lignification of the cell wall |
|---|---|---|
| **A** | high | absent |
| **B** | high | present |
| **C** | low | absent |
| **D** | low | present |

**28** The diagram shows two cardiac cycles of a student, with the sequence of events s… a time scale.




How many times per minute is the student's heart beating?

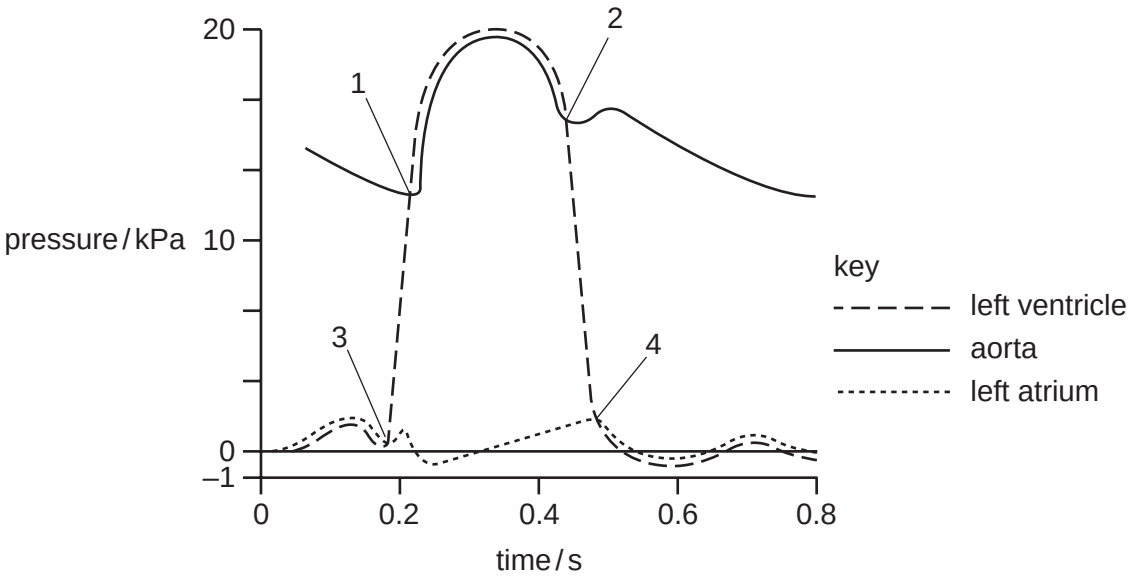
**A** 72

**B** 75

**C** 80

**D** 90

**29** The following graph shows the pressure changes in the left atrium, left ventricle and aorta during a cardiac cycle.




With reference to the semilunar and bicuspid valves, what is happening at points 1, 2, 3 and 4?

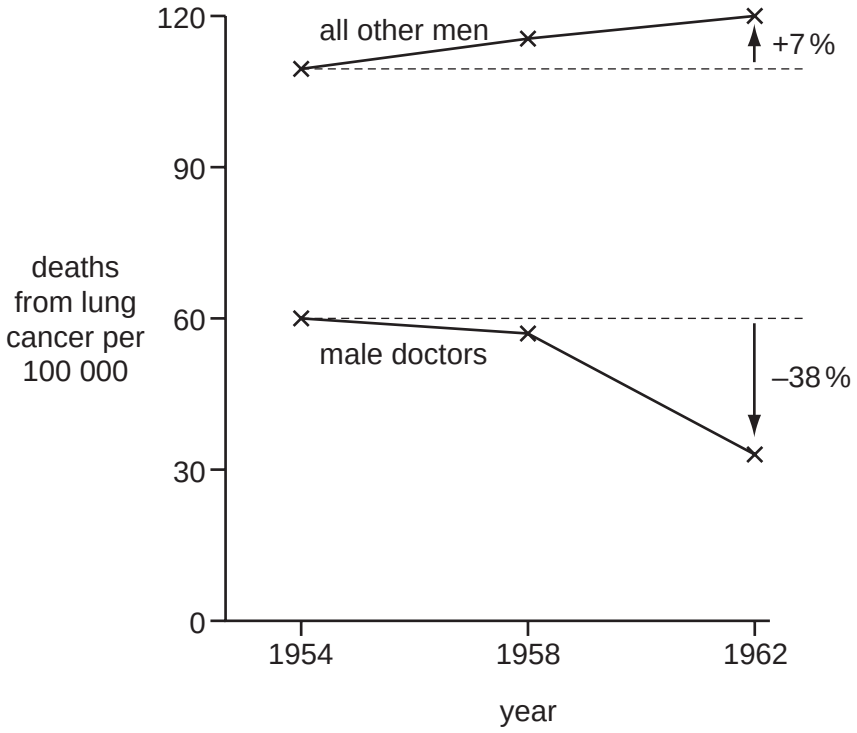
| | semi-lunar valve | | bicuspid valve | |
|---|---|---|---|---|
| | opens | closes | opens | closes |
| **A** | 1 | 2 | 3 | 4 |
| **B** | 1 | 2 | 4 | 3 |
| **C** | 2 | 3 | 1 | 4 |
| **D** | 2 | 3 | 4 | 1 |

**30** Which features of xerophytes reduce water loss by transpiration?

| | rolled leaves | swollen leaves | sunken stomata | thick waxy cuticle |
|---|---|---|---|---|
| **A** | ✓ | ✗ | ✓ | ✓ |
| **B** | ✗ | ✓ | ✓ | ✓ |
| **C** | ✓ | ✓ | ✗ | ✗ |
| **D** | ✓ | ✓ | ✓ | ✓ |

**31** Between 1954 and 1958 many doctors read a report that linked smoking cigarettes to deaths from lung cancer.

The graph shows deaths from lung cancer among male doctors and 'all other men' in England and Wales between 1954 and 1962.




Which statements best explain the changes in deaths from lung cancer between 1954 and 1962?

1 'All other men' are more at risk of dying from lung cancer then male doctors.

2 Male doctors are more at risk of dying from lung cancer than 'all other men'.

3 Proportionally more 'all other men' gave up smoking than male doctors.

4 Proportionally more male doctors gave up smoking cigarettes than 'all other men'.

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

**32** Which component of tobacco smoke affects blood pressure?

**A** carbon dioxide

**B** carbon monoxide

**C** nicotine

**D** tar

**33** Which tissues are present in a bronchus?

| | cartilage | ciliated epithelium | smooth muscle |
|---|---|---|---|
| **A** | ✓ | ✓ | ✓ |
| **B** | ✓ | ✓ | ✗ |
| **C** | ✓ | ✗ | ✓ |
| **D** | ✗ | ✓ | ✓ |

**34** How would health improve if a person suffering from mild emphysema stopped smoking cigarettes?

**A** goblet cells secrete more mucus, allowing a greater number of pathogens to be trapped

**B** increased numbers of phagocytic macrophages arrive in the lungs

**C** less atheroma build-up on the inner lining of arteries, increasing lumen diameter

**D** less carboxyhaemoglobin produced, increasing oxygen transport by haemoglobin

**35** Which disease is treated with drugs that have a similar molecular structure to DNA nucleotides?

**A** cholera

**B** HIV / AIDS

**C** malaria

**D** tuberculosis (TB)

**36** Which factors would help prevent which disease?

1 covering water containers

2 disinfecting and chlorinating water

3 use of antiviral drugs

4 vaccination

| | cholera | malaria | tuberculosis (TB) |
|---|---|---|---|
| **A** | 2 | 1 | 4 |
| **B** | 1 and 2 | 2 | 3 |
| **C** | 4 | 2 | 3 |
| **D** | 3 | 1 and 2 | 4 |

**37** Which future development in vaccine production is most important in the fight to eradicate measles in **developing** countries?

**A** a combined vaccine to combat it and other diseases

**B** a single vaccine, without the need for boosters

**C** a vaccine containing only live measles viruses

**D** a vaccine produced by genetic engineering techniques

**38** The following statements describe some of the stages in phagocytosis.

1 Bacteria become surrounded in a phagocytic vacuole.

2 Bacteria release chemicals that attract neutrophils.

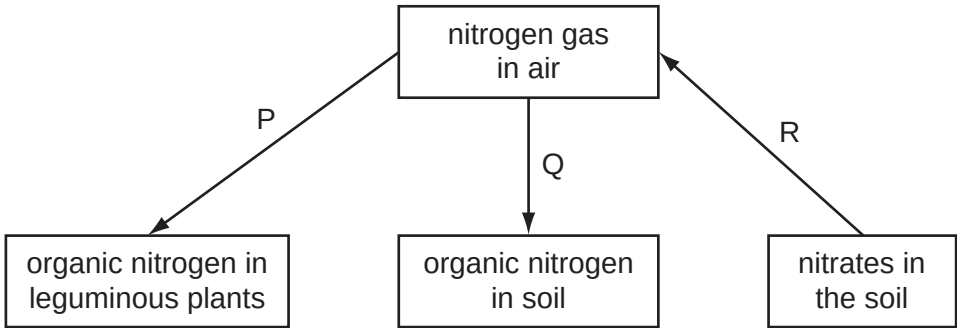
3 Lysosomes fuse with the phagocytic vacuole.

4 Receptor proteins on the neutrophil bind to the bacteria.

Which order defines the correct sequence for phagocytosis?

| | → | | | |
|---|---|---|---|---|
| **A** | 3 | 2 | 4 | 1 |
| **B** | 2 | 4 | 1 | 3 |
| **C** | 4 | 1 | 3 | 2 |
| **D** | 1 | 3 | 2 | 4 |

**39** The diagram shows some chemical conversions during the nitrogen cycle.




Which conversions involve microorganisms?

| stage | P | Q | R |
|---|---|---|---|
| **A** | ✓ | ✗ | ✗ |
| **B** | ✓ | ✓ | ✓ |
| **C** | ✗ | ✓ | ✓ |
| **D** | ✗ | ✗ | ✗ |

key

✓ = involves microorganisms

✗ = does not involve microorganisms

**40** What is the correct match of example to ecological term?

| | community | ecosystem | population | niche |
|---|---|---|---|---|
| **A** | all lake organisms | freshwater lake | freshwater shrimps | pond weed as primary producer |
| **B** | freshwater shrimps | all lake organisms | pond weed as primary producer | freshwater lake |
| **C** | freshwater lake | pond weed as primary producer | freshwater shrimps | all lake organisms |
| **D** | freshwater shrimps | freshwater lake | all lake organisms | pond weed as primary producer |

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