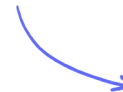


# Practice Paper 1

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Total Marks

/30

- 1 The cell theory describes the idea that all living organisms are made of cells that have a particular set of features, such as being surrounded by a cell membrane.

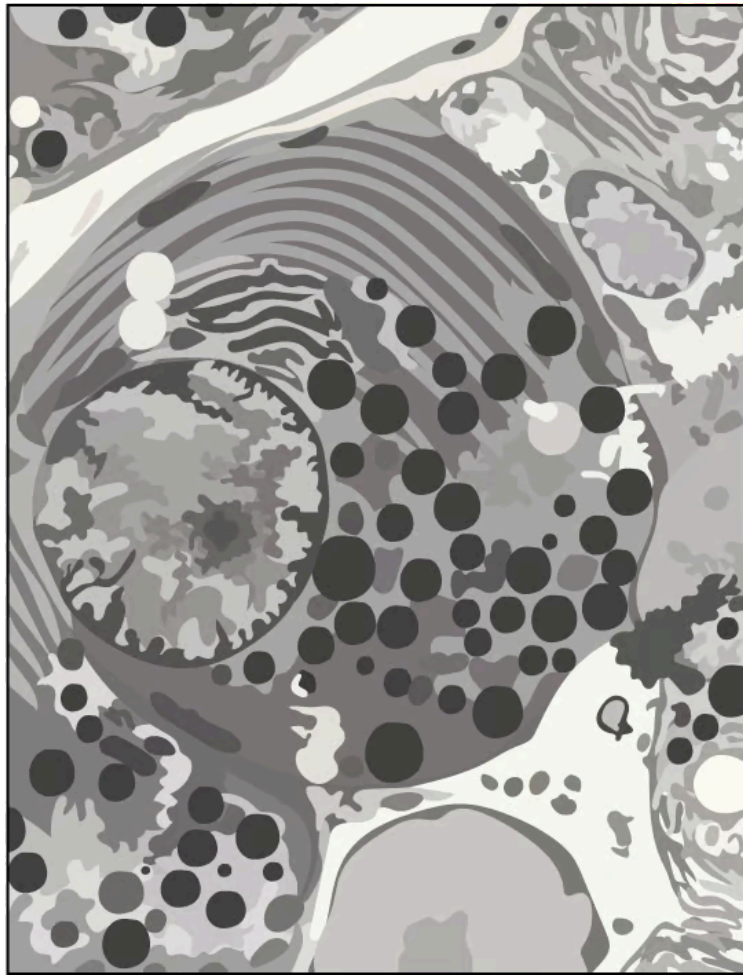
The options below describe some atypical examples that don't possess all the features described by the cell theory.

Which of the examples below does conform to the cell theory?

- A. Striated muscle fibres possess multiple nuclei and can grow up to 300 mm in length.
- B. Skin cells replicate so quickly that our full body of skin cells die and are regenerated every 27 days
- C. Aseptate fungal hyphae do not possess septa (end walls between the cell) meaning that the cells are multinucleated with a shared cytoplasm.
- D. Giant algae (*Acetabularia*) are unicellular but can be up to 100 mm long with just one nucleus and a complex structure.

**(1 mark)**

- 2 The image below shows an electron micrograph of a specialised cell.



Based on the image, which of the following would correctly identify the function of this specialised cell?

- A.** This is a cell found in a gland that secretes enzymes for digestion.
- B.** This is a cell that carries out photosynthesis in the leaf of a plant.
- C.** This is a cell that transports oxygen around the body in the blood.
- D.** This is a cell that absorbs nutrients from digested food and transports them into the food in the small intestine.

**(1 mark)**

- 3** Which row correctly matches the molecules found in the cell surface membrane with their function?

	<b>Influences membrane fluidity</b>	<b>Act as receptor sites for hormones</b>	<b>Bind to antibodies</b>
<b>A</b>	Glycolipids and glycoproteins	Cholesterol	Proteins and glycolipids
<b>B</b>	Glycoproteins	Glycolipids and glycoproteins	Cholesterol
<b>C</b>	Cholesterol	Proteins and glycoproteins	Glycoproteins
<b>D</b>	Phospholipids and cholesterol	Proteins and glycolipids	Phospholipids and cholesterol

(1 mark)

4 The diagram shows the chromosomes of a squashed cell during mitosis.

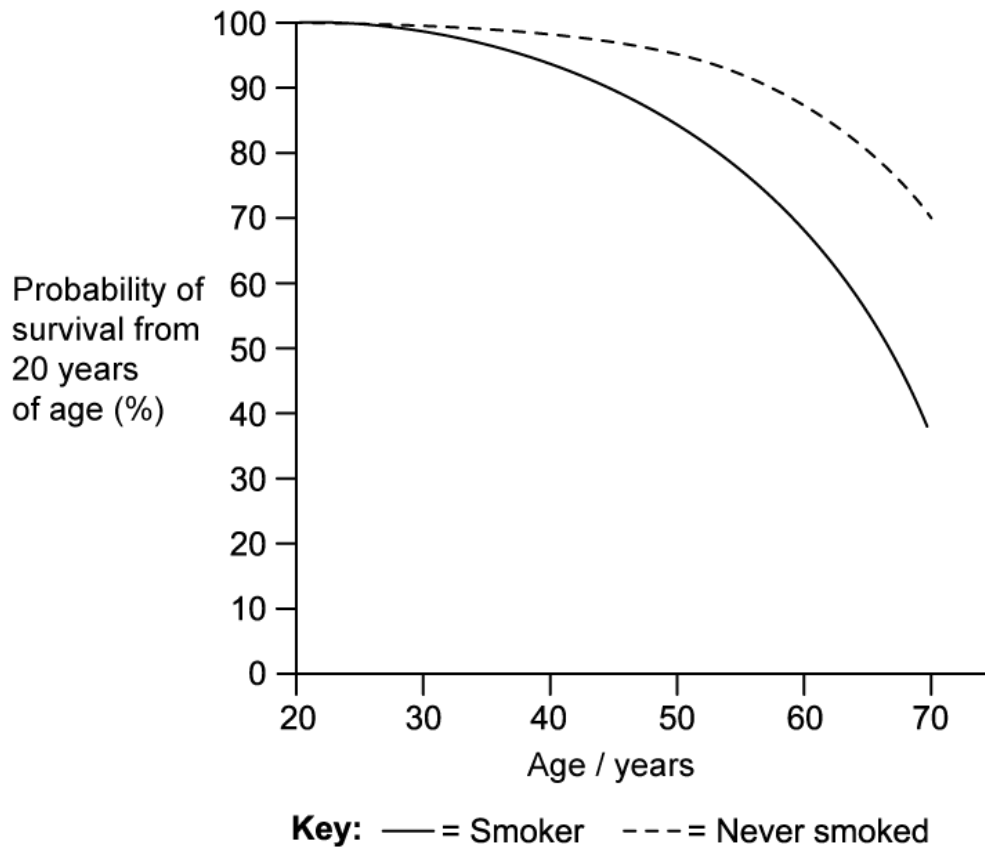


Which stage of mitosis is the cell in and what is the haploid chromosome number of this species?

	<b>Stage of mitosis</b>	<b>Haploid chromosome number</b>
<b>A</b>	Early prophase	5
<b>B</b>	Late prophase	5
<b>C</b>	Metaphase	10
<b>D</b>	Anaphase	10

(1 mark)

- 5 The graph shows the survival probabilities for current smokers and for those who never smoked among men 20 to 70 years of age.

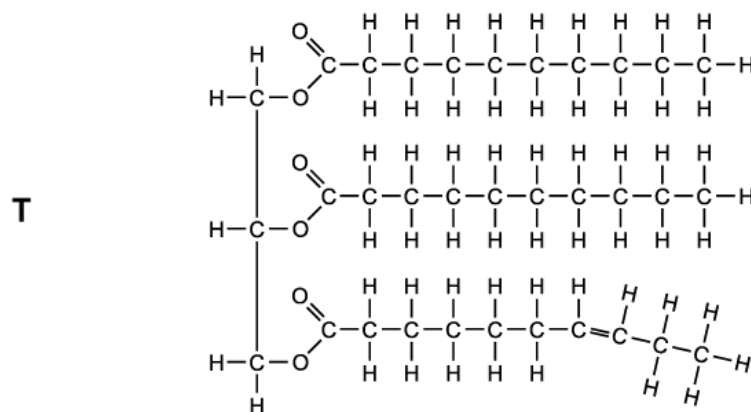
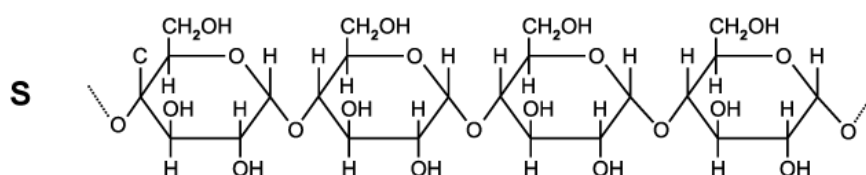
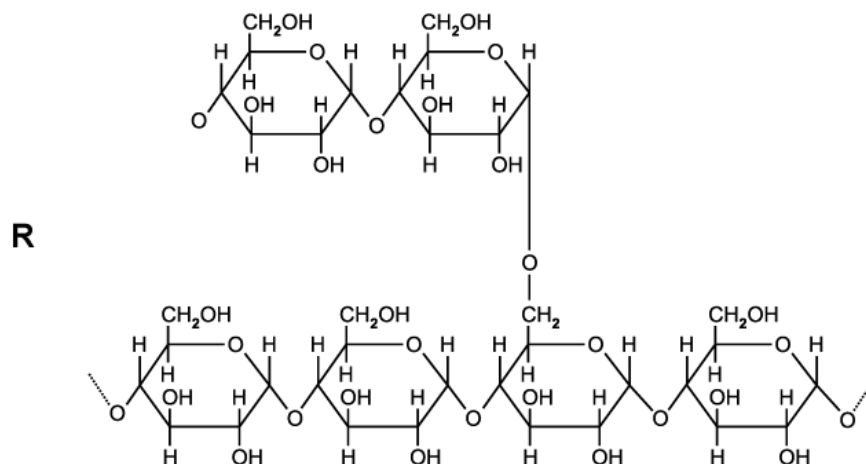
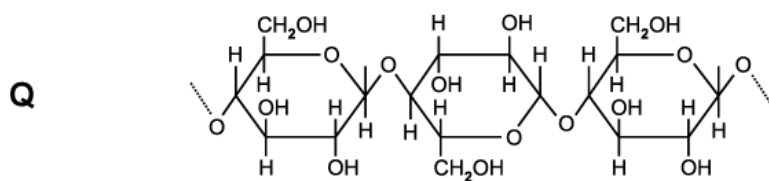


What can be concluded from this graph?

- A. Smoking causes cancer.
- B. There is a correlation between smoking and cancer.
- C. Smoking reduces life expectancy.
- D. People who have never smoked can still die of cancer.

(1 mark)

- 6 The diagram below shows several different biological molecules (**Q**, **R**, **S** and **T**).



Which row of the table below correctly identifies some of the products of hydrolysis of the molecules above?

	<b>Q</b>	<b>R</b>	<b>S</b>	<b>T</b>
<b>A.</b>	$\alpha$ -glucose	$\beta$ -glucose	$\alpha$ -glucose	glycerol
<b>B.</b>	$\alpha$ -glucose	$\beta$ -glucose	$\beta$ -glucose	fatty acids
<b>C.</b>	$\beta$ -glucose	$\alpha$ -glucose	$\beta$ -glucose	glycerol
<b>D.</b>	$\beta$ -glucose	$\alpha$ -glucose	$\alpha$ -glucose	fatty acids

(1 mark)

7 Which of the options below refers to the features of catabolism?

- A. Exergonic, condensation reaction, an example is polypeptide synthesis
- B. Endergonic, hydrolysis reaction, an example is respiration
- C. Endergonic, condensation reaction, an example is photosynthesis
- D. Exergonic, hydrolysis reaction, an example is deamination

(1 mark)

8 Which row of the table below contains two correct statements?

	<b>Cis-fatty acids</b>	<b>Trans-fatty acids</b>
<b>A</b>	Involves a saturated hydrocarbon chain	Involves an unsaturated hydrocarbon chain
<b>B</b>	H-atoms on the same side of a C=C double bond	H-atoms on different sides of a C=C double bond
<b>C</b>	Stack together more closely	Stack together further apart
<b>D</b>	Cause a kinked hydrocarbon chain	Cause a kinked hydrocarbon chain

(1 mark)

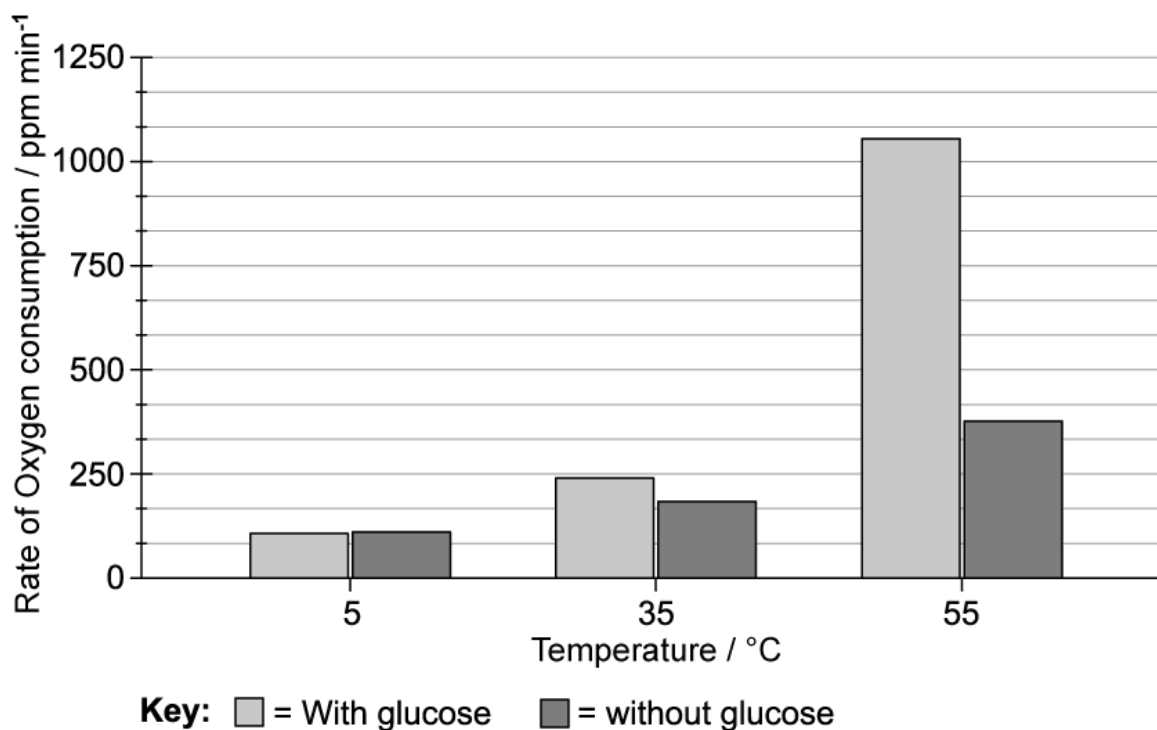
9 Which of the rows in the following table correctly identifies the function of each enzyme listed?

	<b>Helicase</b>	<b>RNA polymerase</b>	<b>DNA polymerase</b>
<b>A.</b>	Breaks the hydrogen bonds between complementary DNA bases	Links thymine to the adjacent nucleotide through covalent bonds	Binds to a template DNA strand and pairs uracil up with adenine
<b>B.</b>	Responsible for the formation of hydrogen bonds between complementary DNA bases	Binds to a template DNA strand and pairs uracil up with adenine	Links thymine to the adjacent nucleotide through covalent bonds
<b>C.</b>	Breaks the hydrogen bonds between complementary DNA bases	Binds to a template DNA strand and pairs uracil up with adenine	Links thymine to the adjacent nucleotide through covalent bonds
<b>D.</b>	Binds to a template DNA strand and pairs uracil up with adenine	Links thymine to the adjacent nucleotide through covalent bonds	Responsible for the formation of hydrogen bonds between complementary DNA bases

**(1 mark)**

- 10** The rate of oxygen consumption was compared in yeast cells incubated with and without glucose at three different temperatures under aerobic conditions. The yeast cells were incubated for a period of 3 minutes during which the rate of O<sub>2</sub> consumption was measured with an O<sub>2</sub> sensor.



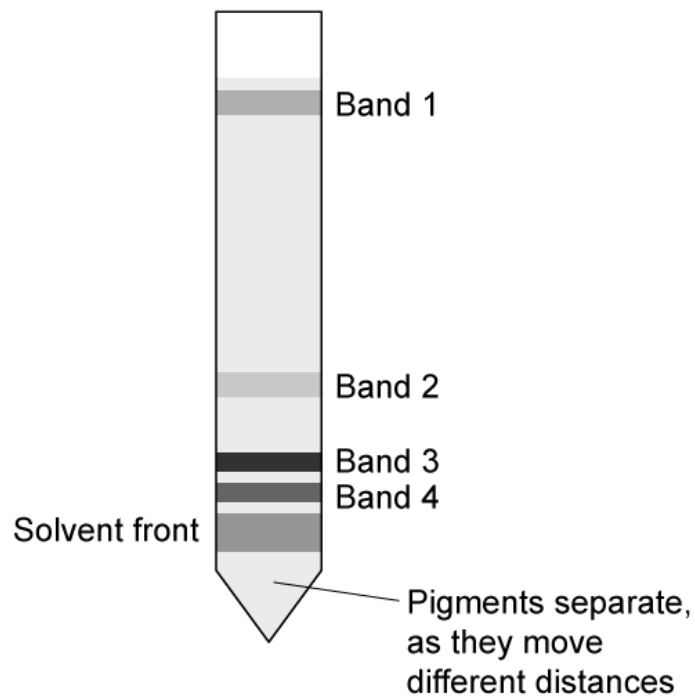


What can be concluded from the results of this experiment?

- A.** Glucose affects the rate of oxygen consumption at higher temperatures less than it does at lower temperatures.
- B.** Rate of cell respiration increases with temperature.
- C.** Glucose is broken down faster at 55°C.
- D.** Yeast does not break down glucose at lower temperatures.

**(1 mark)**

- 11** Paper chromatography can be used to separate photosynthetic pigments obtained from chloroplasts. The chromatography strip shows distinct coloured pigment bands. Which pigments are represented by bands 3 and 4?



- A. Carotenes and Xanthophylls.
- B. Carotenes and Chlorophyll a.
- C. Carotenes.
- D. Chlorophyll a and Chlorophyll b.

(1 mark)

12 The effect of different colours of light on the growth of *Arabidopsis thaliana* (thale cress) seedlings was studied. Three different colours of light were tested and measurements of seedling height, shoot length, and biomass were taken.

Colour of light	Wavelength of light (nm)	Height of seedlings (cm)	Shoot length (cm)	Total biomass (g)
Blue	450	3.5	2.8	2.4
Orange	600	2.3	2.0	2.8
Red	630	7.4	6.1	3.7

What conclusions can be drawn from the data?

- A. White light gives the optimal conditions for photosynthesis.

- B.** There is a linear relationship between wavelength of light and plant growth.
- C.** Red light enhances plant growth.
- D.** There is no correlation between total biomass and plant height.

**(1 mark)**

- 13** Cytochrome C is a protein which is common to all organisms and is therefore a useful gene sequence to study when constructing phylogenetic trees to represent evolutionary relationships.

The table shows the number of nucleotide differences in the cytochrome C genes of several different species.

	<b>Human</b>	<b>Chicken</b>	<b>Mouse</b>	<b>Rat</b>	<b>Yeast</b>	<b>Fruit fly</b>
<b>Human</b>	0	61	32	36	112	89
<b>Chicken</b>	61	0	61	61	119	94
<b>Mouse</b>	32	61	0	10	119	77
<b>Rat</b>	36	61	10	0	115	84
<b>Yeast</b>	112	119	119	115	0	124
<b>Fruit fly</b>	89	94	77	84	124	0

Which of the following shows the correct order of the organisms if arranged from the most closely related to the least closely related compared to humans?

- A.**
  1. Human
  2. Chicken
  3. Fruit fly
  4. Yeast
  5. Mouse

- 6.** Rat
- B.** **1.** Human  
**2.** Rat  
**3.** Mouse  
**4.** Fruit fly  
**5.** Yeast  
**6.** Chicken
- C.** **1.** Human  
**2.** Mouse  
**3.** Rat  
**4.** Chicken  
**5.** Fruit fly  
**6.** Yeast
- D.** **1.** Human  
**2.** Yeast  
**3.** Fruit fly  
**4.** Chicken  
**5.** Rat  
**6.** Mouse

**(1 mark)**

- 14** Which of the following sets of statements correctly describes a process that would now be used for karyotype analysis?

	Stage 1	Stage 2	Stage 3
<b>A</b>	A needle through the abdomen wall samples cells from amniotic fluid	Chromosomes are photographed using a microscope before the image is cut up with scissors and rearranged by size	The resulting karyotype image is analysed to diagnose chromosome abnormalities
<b>B</b>	A tube via the vagina samples cells from amniotic fluid	Chromosomes are photographed using a microscope before the image is digitally rearranged by size	The resulting karyogram image is analysed to diagnose chromosome abnormalities
<b>C</b>	A tube via the vagina samples cells from the chorion	Chromosomes are photographed using a microscope before the image is digitally rearranged by size	The resulting karyotype image is analysed to diagnose chromosome abnormalities
<b>D</b>	A needle through the abdomen wall samples cells from amniotic fluid	Chromosomes are photographed using a microscope before the image is digitally rearranged by size	The resulting karyogram image is analysed to diagnose chromosome abnormalities

**(1 mark)**

- 15** A species of plant can have either blue or white flowers. The colour of the flower is controlled by a single gene where the dominant allele codes for blue flowers.

Two heterozygous plants are crossed; which of the observed outcomes matches up most accurately to the expected ratio of blue to white flowers.

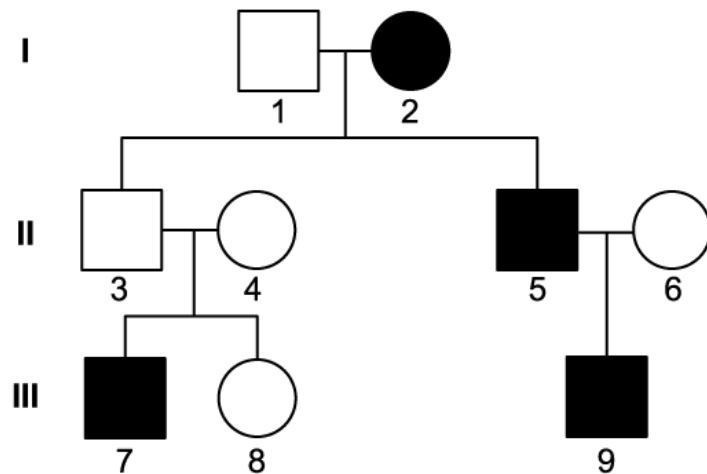
	Blue	White
<b>A</b>	93	46
<b>B</b>	77	203
<b>C</b>	107	33
<b>D</b>	127	42

**(1 mark)**

- 16 The pedigree chart below shows the inheritance of Tay-Sachs disease which is an autosomal recessive trait, characterised by neurological problems caused by the death of nerve cells.

In the pedigree chart a filled in circle or square means the individual is affected and shows the genetic condition.

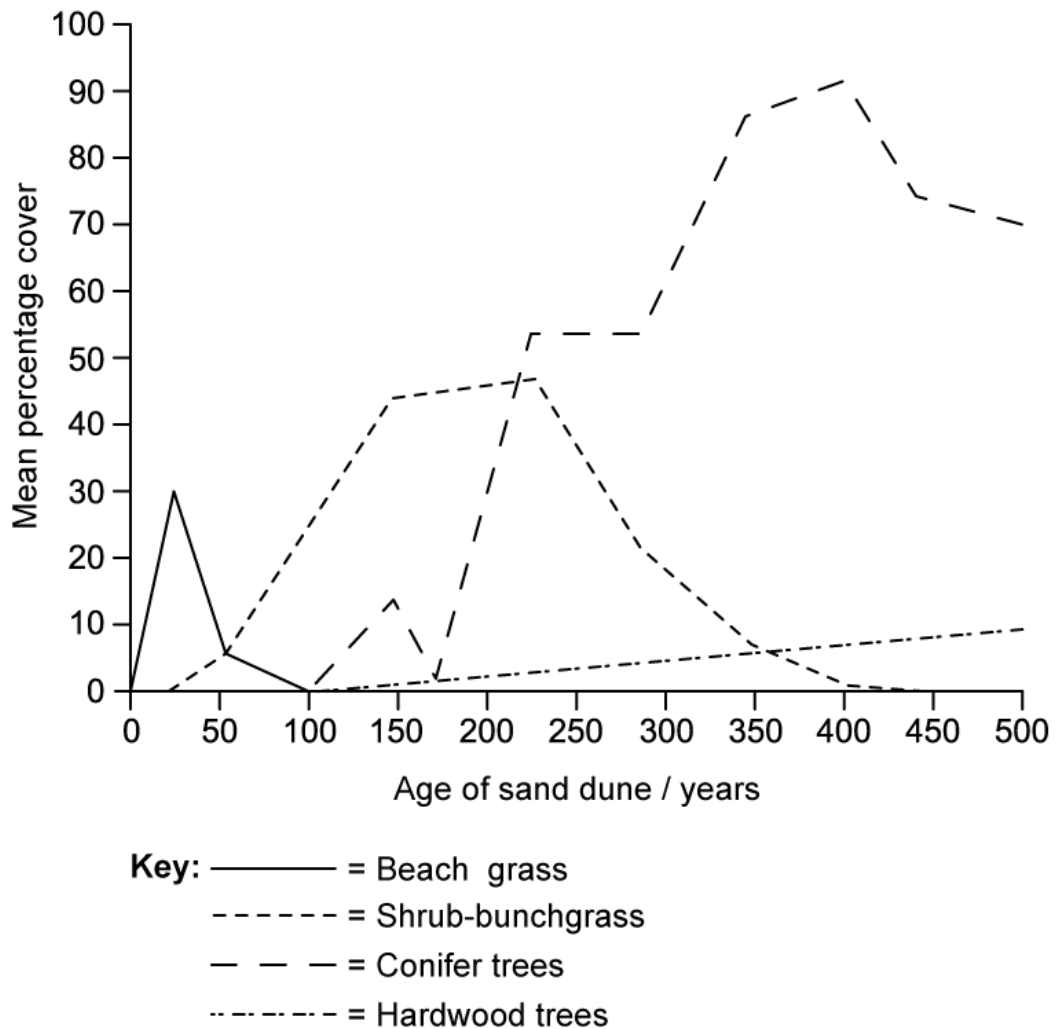
What is the probability that individuals 3 and 4 will have another child with Tay-Sachs disease?



- A. 25%
- B. 50%
- C. 75%
- D. 100%

(1 mark)

- 17 The graph shows changes in percentage cover of four plant species on a sand dune ecosystem over 500 years.

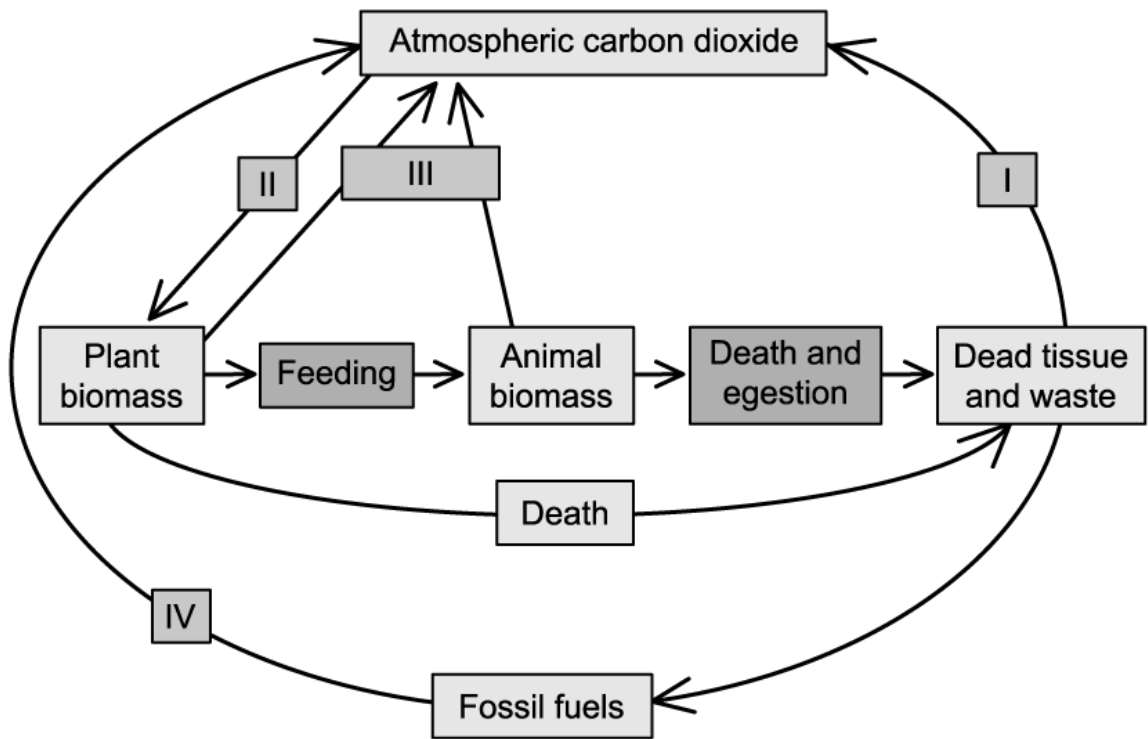


Which of the following explanations cannot be supported using the information in this graph.

- A.** All four species never formed part of the same community
- B.** Beech grass became extinct after 100 years
- C.** Interspecific competition between conifer trees and shrub bunchgrass occurs leading to a decrease in shrub bunchgrass
- D.** Intraspecific competition results in a decrease in conifer trees after around 400 years

**(1 mark)**

**18** The diagram below shows the stages of the carbon cycle.



Which processes are shown in the diagram?

	I	II	III	IV
A	Fossilisation	Photosynthesis	Respiration	Decomposition
B	Decomposition	Absorption	Photosynthesis	Combustion
C	Decomposition	Absorption	Photosynthesis	Decomposition
D	Decomposition	Photosynthesis	Respiration	Combustion

(1 mark)

19 Different greenhouse gases have different global warming potential, or GWP.



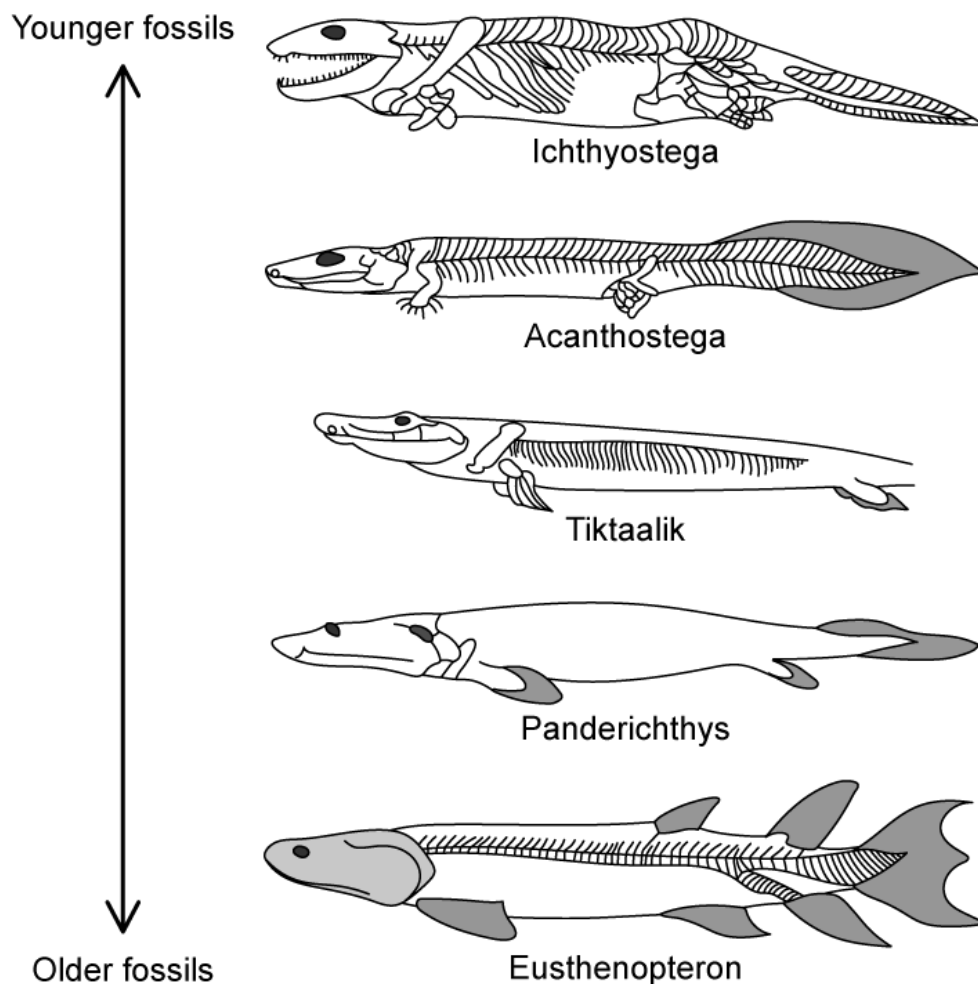
<b>Gas</b>	<b>GWP over 100 years</b>
Carbon dioxide	1
Methane	21
Nitrous oxide	310
Sulfur hexafluoride	23,900

Which factors contribute to the global warming potential of greenhouse gases?

- A.** Atmospheric concentration only.
- B.** Atmospheric concentration and ability to absorb radiation.
- C.** Atmospheric concentration, ability to absorb radiation, and atmospheric lifetime.
- D.** Ability to absorb radiation only.

**(1 mark)**

**20** The image below shows a series of fossils.



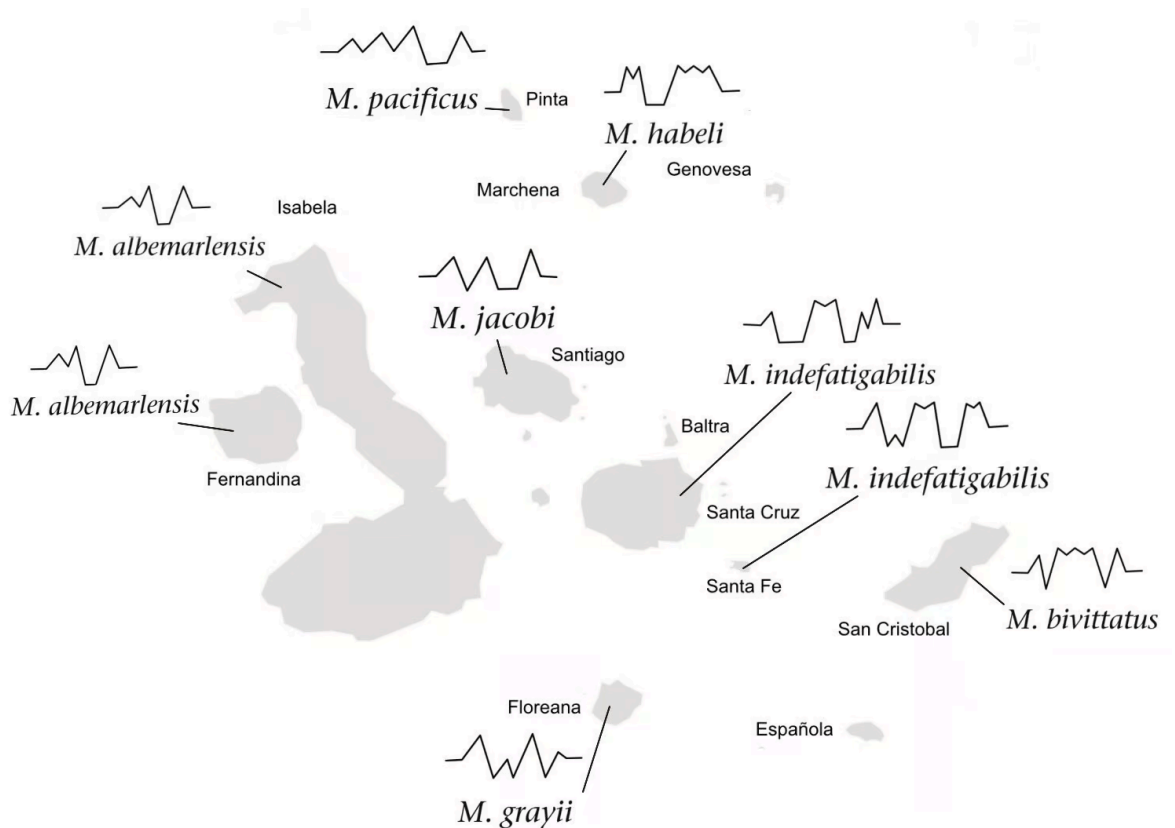
How does this set of fossils provide evidence for evolution?

- A. They show the complete transition between fish and four-legged land animals.
- B. They show that species change to become better adapted to their environment.
- C. They strengthen the evidence for species change over time provided by the rest of the fossil record.
- D. They show that limbs are always advantageous over fins.

(1 mark)

21 Several species of lava lizard of the genus *Microlophus* are found only in the islands of the Galapagos. A group of scientists recorded the mating displays of male lava lizards in

different parts of the Galapagos, using the amplitude of a wave to represent the height and length of head bobbing behaviour. The map shows the mating displays of some male lava lizards currently living on different islands of the Galapagos.



Which of the following statements about mating displays in Galapagos lava lizards are correct?

- I. Mating displays are the same between members of the same species of lava lizard
- II. Mating displays show continuous variation across the geographical range of the Galapagos lava lizards
- III. The mating displays suggest that lava lizards evolved by gradual divergence from a common ancestor
- IV. The mating displays recorded show all the stages of lava lizard divergence

**A.** I, II, and III only

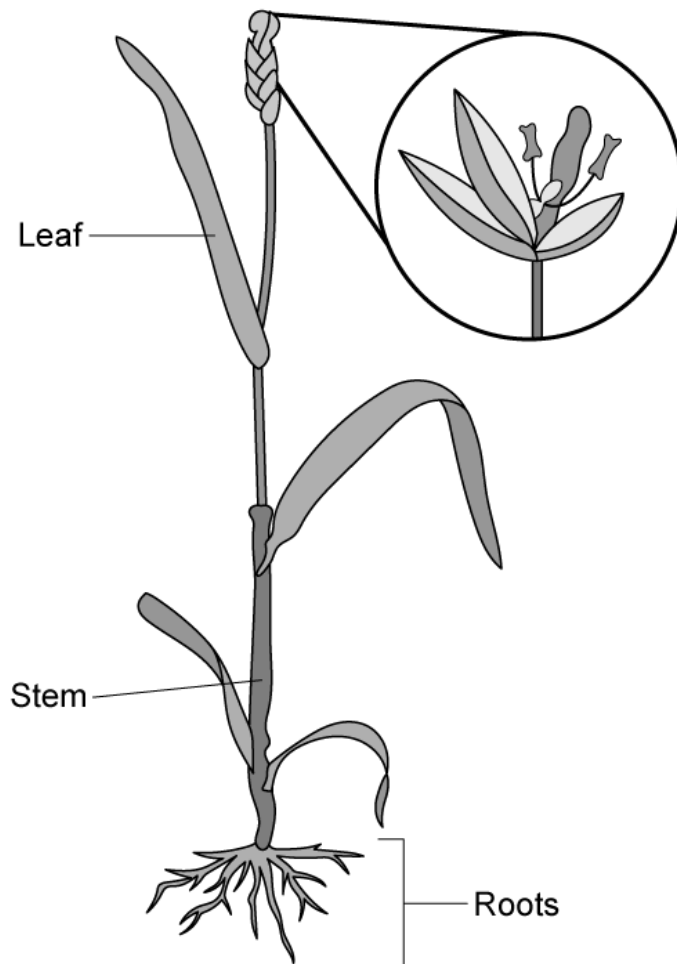
**B.** I, II, III, and IV

C. II and III only

D. II, III, and IV only

(1 mark)

22 To which plant phylum does the plant in the diagram belong, and why?



	Phylum	Reason
<b>A</b>	Coniferophytes	Reproduction takes place via pollen and ovules located in cones
<b>B</b>	Filicinophytes	Leaves are divided structures known as fronds
<b>C</b>	Angiospermophytes	Roots, stems, and leaves are present
<b>D</b>	Angiospermophytes	Reproduction takes place via pollen and ovules located in flowers

(1 mark)

23 Which of the following is **not** an important reason for the binomial system of naming organisms?

- A.** Scientists need to be able to communicate clearly with each other about their work.
- B.** The common names of many species are outdated and should no longer be used.
- C.** Different countries may use the same common name for different species.
- D.** Woodlice are known by more than 50 different common names.

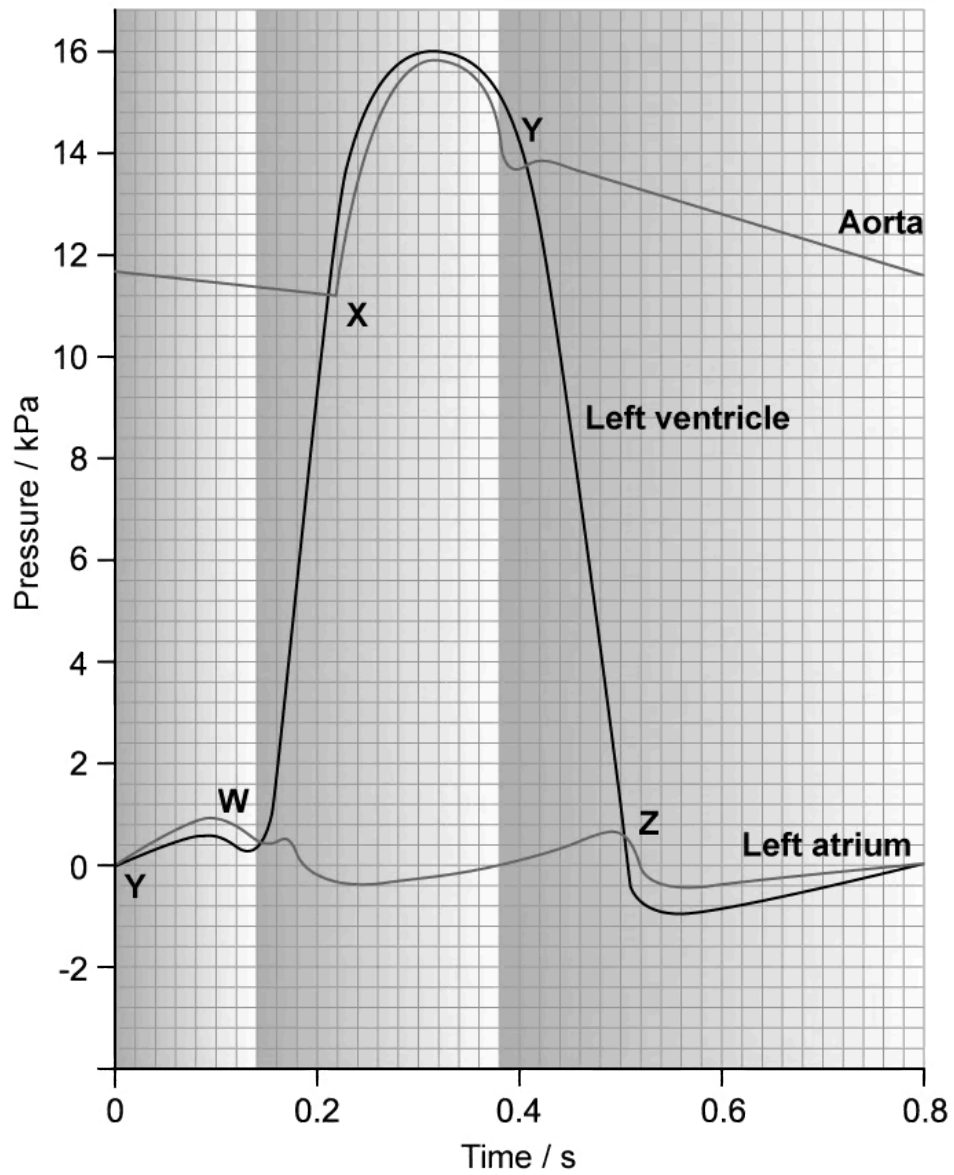
(1 mark)

24 Which row of the table correctly states the monomers which combine to form the disaccharide named?

	Disaccharide	Monomer 1	Monomer 2
<b>A</b>	Galactose	Lactose	$\alpha$ -Glucose
<b>B</b>	Maltose	$\alpha$ -Glucose	Fructose
<b>C</b>	Sucrose	$\alpha$ -Glucose	Fructose
<b>D</b>	Sucrose	$\beta$ -Glucose	Fructose

(1 mark)

25 The graph shows changes in pressure at various stages of the cardiac cycle.



Which statement describes the events at point Y of the graph?

**A. Ventricular systole**

The ventricle contracts

↓

Pressure in the left ventricle goes higher than in the aorta

↓

Aortic valve opens and blood is forced into the aorta

**B. Early diastole**

Left ventricle is empty



Muscles in the walls of the left ventricle relax and pressure drops below the pressure in the aorta



Aortic valve closes

**C. Diastole**

The relaxed left atrium fills with blood, causing the pressure in the atrium to exceed that in the empty ventricle



The AV valve opens

**D. Late diastole**

There is a short period of time during which the left ventricle expands due to relaxing muscles



This increases the internal volume of the left ventricle and decreases the ventricular pressure



At the same time, blood is flowing slowly through the newly opened AV valve into the left ventricle, causing a brief decrease in pressure in the left atrium



The pressure in both the atrium and ventricle then increases slowly as they continue to fill with blood

**(1 mark)**

**26** Which are chambers of the heart?

- I. Atrium
- II. Aorta
- III. Ventricle
- IV. Lumen

- A.** I and III
- B.** I, II and III
- C.** III and IV
- D.** I and II

**(1 mark)**

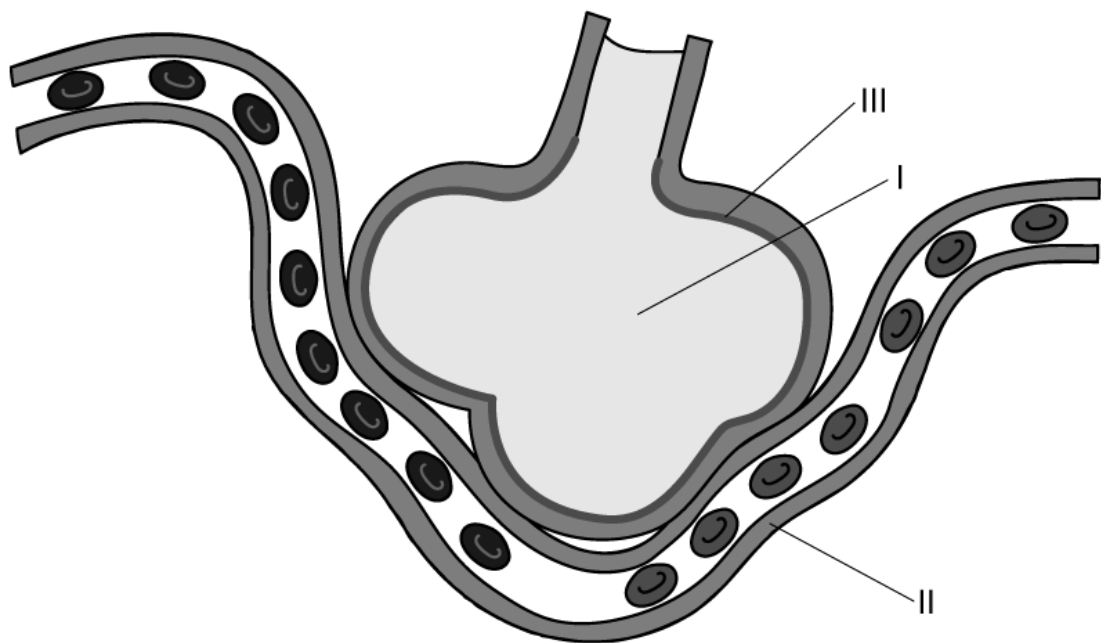
**27** Which of the following is **not** a contributing factor towards the development of antibiotic resistance in bacteria?

- A.** Stopping a course of antibiotics once symptoms improve.
- B.** Development of new antibiotics.
- C.** Natural selection which favours mutations in bacteria.
- D.** Overuse of antibiotics in agriculture

**(1 mark)**

**28** An alveolus has several features to allow efficient gas exchange.



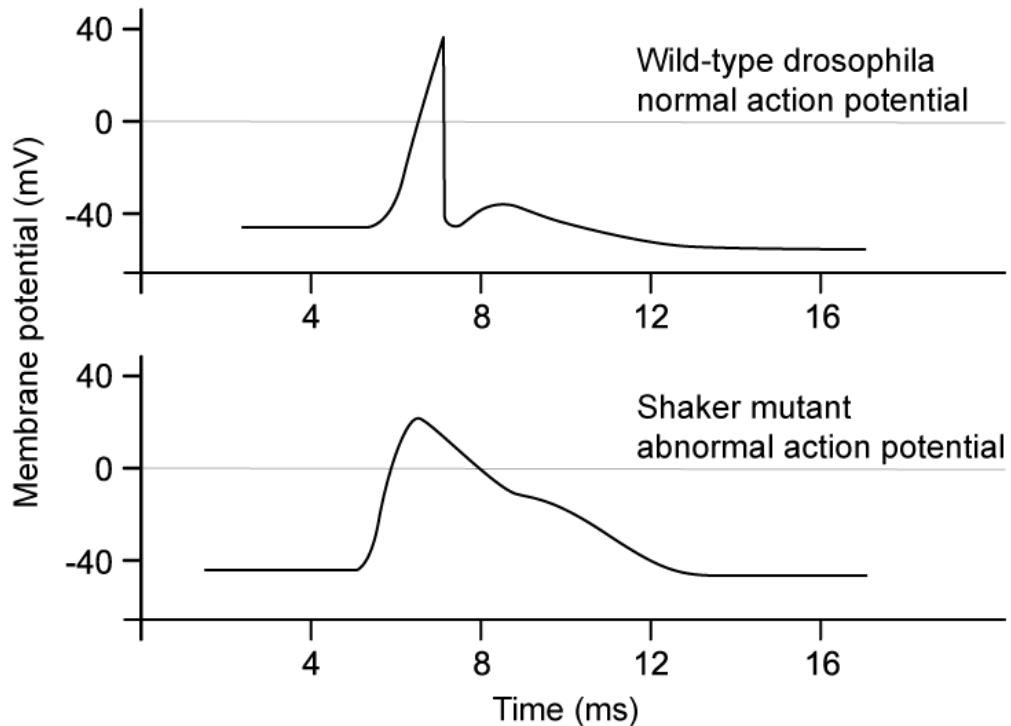


Which row of the table below matches each feature of gas exchange to the correct label on the alveolus?

	I	II	II
<b>A</b>	High concentration of oxygen to maintain a steep concentration gradient	One cell thick for short diffusion distance	Allows gases to dissolve to aid diffusion
<b>B</b>	High concentration of carbon dioxide to maintain steep concentration gradient	Allows gases to dissolve to aid diffusion	One cell thick for short diffusion distance
<b>C</b>	One cell thick for short diffusion distance	High concentration of oxygen to reduce the concentration gradient	Allows gases to dissolve to aid diffusion
<b>D</b>	Allows gases to dissolve to aid diffusion	Allows gases to dissolve to aid diffusion	High concentration of oxygen to maintain a steep concentration gradient

(1 mark)

- 29 A research group of geneticists found a fruit fly mutant that shakes vigorously when anaesthetized with ether. Their studies showed that the shaker mutant has  $K^+$  channels that do not function properly. An action potential of a normal fruit fly and a shaker mutant is shown below.



Which of the following statements (I - IV) could be possible explanations for the differences between the action potentials?

- I. The faulty  $K^+$  channels don't open for as long so there is slower diffusion of  $K^+$  ions.
- II. The faulty  $K^+$  channels may be opening early, preventing maximum depolarisation.
- III. The faulty  $K^+$  channels cause  $K^+$  ions to diffuse back into the axon more slowly, resulting in slower repolarisation.
- IV. In wild-type drosophila, the functioning  $K^+$  channels allow for a faster rate of depolarisation.

- A. I only
- B. II and III
- C. I, II and IV

**D.** I and II

**(1 mark)**

**30** A one year old child displays fatigue and excessive thirst over a period of time. A urine test reveals the presence of glucose.

Which of the following would be the most likely diagnosis?

- A.** Type I diabetes as the body is unable to respond to the presence of insulin.
- B.** Type I diabetes as the beta cells in the islets of Langerhans were destroyed.
- C.** Type II diabetes as the body does not have sufficient insulin receptors on target cells.
- D.** Type II diabetes as the alpha cells in the islets of Langerhans was destroyed.

**(1 mark)**