IB · Standard Level · Biology

30 mins 30 questions

Practice Paper 1A

Total Marks /30

1.

The table below shows four biological molecules and their component elements.

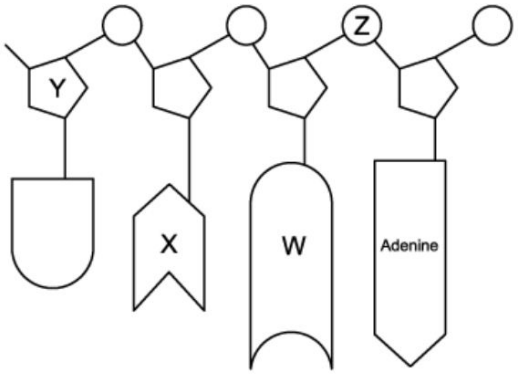
Which of the rows, **A** to **D**, correctly identifies the elements in each molecule?

	Sucrose	**Triglyceride**	**Insulin**	**DNA nucleotide**
A	C, H, O	C, H, O, N	C, H, O	C, H, O, N, P
B	C, H, O, N	C, H, O	C, H, O, N, P	C, H, O, N, S
C	C, H, O	C, H, O	C, H, O, N, S	C, H, O, N, P
D	C, H, O, N	C, H, O, P	C, H, O, N, P	C, H, O, N, S

(1 mark)

2.

The diagram shows part of an RNA molecule.



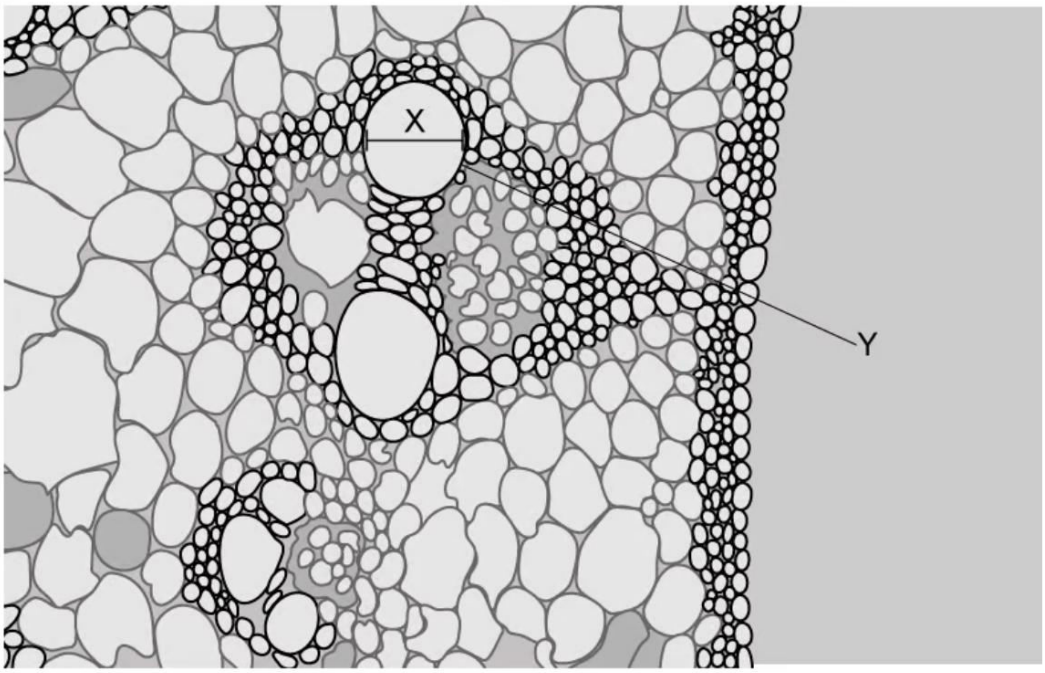
Which row of the table below is correct?

	Uracil	Phosphate	Ribose	Guanine
A	W	Z	Y	X
B	W	Y	Z	X
C	X	Z	Y	W
D	X	Y	Z	W

(1 mark)

3.

The electron micrograph below shows a root vascular system. The magnification of the image is ×200. A student uses a ruler to measure distance X and finds it to be 10 mm.



What is the diameter of the cell labelled Y?

A. 100 µm

B. 50 µm

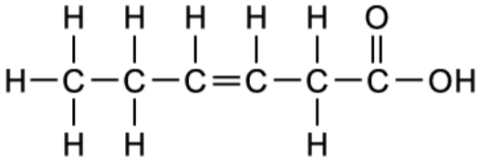
C. 10 µm

D. 5 µm

(1 mark)

4.

The diagram below shows a component of a triglyceride.



Which of the following correctly identifies this component?

A. Saturated fatty acid

B. Monounsaturated fatty acid

C. Polyunsaturated fatty acid

D. Phospholipid

(1 mark)

5.

Which of the following chemical formulae shows a carbohydrate molecule?

A. $C_{18}H_{34}O_2$

B. $C_{18}H_{32}O_{16}$

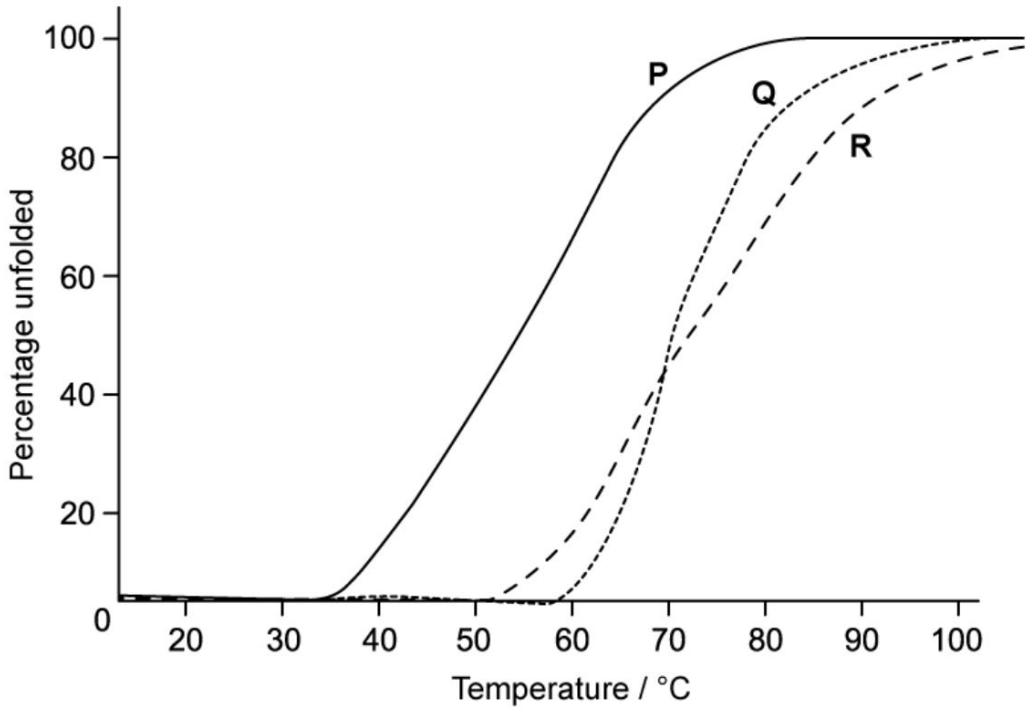
C. $C_{18}H_{32}O_2$

D. $C_3H_8O_3$

(1 mark)

6.

The denaturation of three different proteins (**P**, **Q** and **R**) at different temperatures were investigated. The more denatured a protein is, the less stable the molecule becomes. The following graph shows the results of this investigation.



Which of the following would be the most valid conclusion that the scientists can draw from these results?

A. Protein **R** would be less stable and had a lower rate of denaturation above 70°C compared to protein **Q**, while protein **P** was fully denatured by 80°C

B. Protein **R** would be more stable and had a lower rate of denaturation above 70°C compared to protein **Q**, while protein **P** was the least heat tolerant of all the proteins

C. Protein **Q** would be more stable and had a lower rate of denaturation below 70°C compared to protein **R**, while protein **P** was fully denatured by 80°C

D. Protein **Q** would be less stable and had a higher rate of denaturation below 70°C compared to protein **R**, while protein **P** was the least heat tolerant of all the proteins

(1 mark)

7.

What is the difference between simple diffusion and facilitated diffusion?

	Simple diffusion	**Facilitated diffusion**
A	Diffusion rate inversely proportional to concentration gradient	Diffusion rate proportional to concentration gradient
B	Never involves a membrane	Always involves a membrane
C	Occurs across any part of a membrane	Occurs via channels in the membrane
D	A passive process that does not require energy from ATP	An active process that requires energy from ATP

(1 mark)

8.

Which set of conditions is required to allow the intake of air into the lungs during ventilation?

A. Contracted diaphragm, increased volume and increased pressure inside the thorax.

B. Relaxed diaphragm, increased volume and decreased pressure inside the thorax.

C. Relaxed diaphragm, decreased volume and increased pressure inside the thorax.

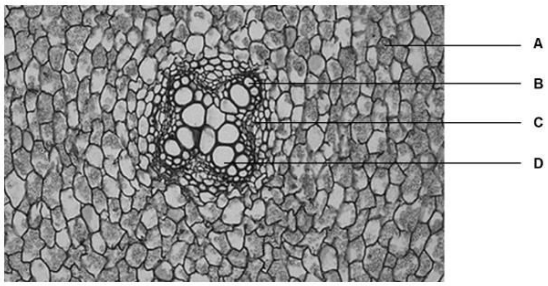
D. Contracted diaphragm, increased volume and decreased pressure inside the thorax.

(1 mark)

9.

The following photomicrograph shows the vascular bundle in a root.

Which letter identifies the phloem?



(1 mark)

10.

A student studied the structure of a blood vessel and found:

1. An innermost layer of endothelial cells
2. A thick middle layer of smooth muscle and elastic tissue
3. An outer layer of collagen fibres

Which vessel was the student studying?

A. Vein

B. Capillary

C. Venule

D. Artery

(1 mark)

11.

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

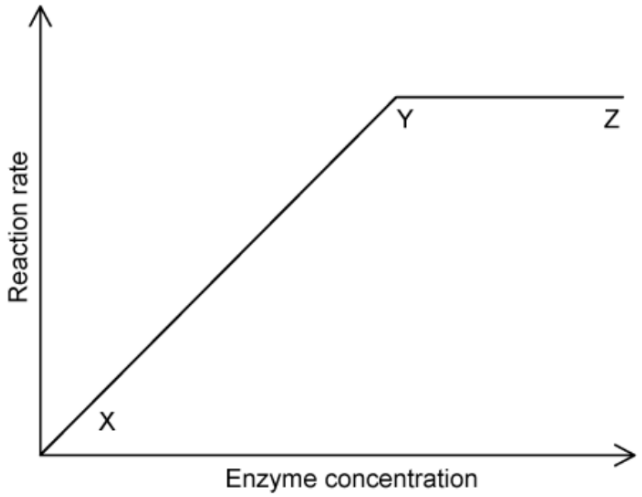
C. Endergonic, condensation reaction, an example is photosynthesis

D. Exergonic, hydrolysis reaction, an example is deamination

(1 mark)

12.

The graph shows the effect of enzyme concentration on the rate of an enzyme-controlled reaction. The substrate concentration is constant.



Which statement about the graph is correct?

A. Between **X** and **Z,** the number of enzyme molecules is limiting.

B. Between **Y** and **Z**, the number of enzyme molecules is limiting.

C. Between **X** and **Z**, the number of substrate molecules is limiting.

D. Between **Y** and **Z**, the number of substrate molecules is limiting.

(1 mark)

13.

Which of the following require ATP?

1. Making DNA, RNA and proteins.
2. Active transport of ions across membranes.
3. Osmosis.
4. Muscle contractions.

A. I, II, and IV

B. III and IV

C. II and IV

D. IV

(1 mark)

14.

What happens when ATP is converted to ADP?

A. A net release of energy.

B. A net amount of energy is destroyed.

C. It can never be reconverted to ATP.

D. A phosphate is added.

(1 mark)

15.

A plant is grown in increasing concentrations of carbon dioxide, whilst other factors are kept constant.

What will happen to the rate of photosynthesis?

A. There will be no change.

B. It will increase to a maximum level.

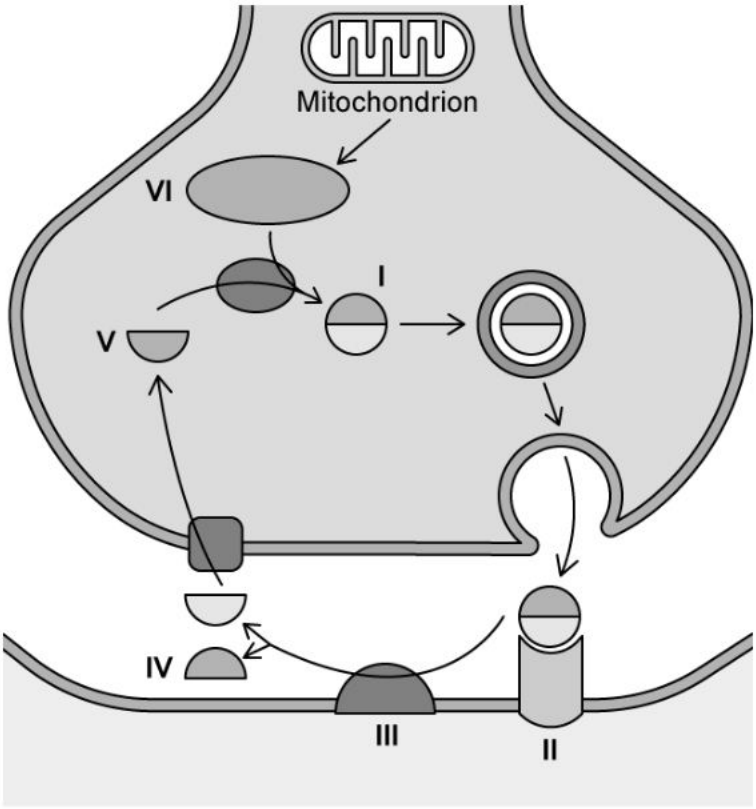
C. It will keep increasing exponentially.

D. It will increase to an optimal level and then decrease.

(1 mark)

16.

Study the diagram below.



Which of the following table rows correctly identifies **I – VI**?

	I	II	III	IV	V	VI
A	Acetylcholine	Acetyl-cholinesterase	Cholinergic receptor	Choline	Acetyl group	Acetyl-CoA
B	Acetyl-cholinesterase	Acetyl-CoA	Acetylcholine	Cholinergic receptor	Choline	Acetyl group
C	Acetylcholine	Cholinergic receptor	Acetyl-cholinesterase	Acetyl group	Choline	Acetyl-CoA
D	Acetylcholine	Cholinergic receptor	Acetyl-CoA	Choline	Acetyl group	Acetyl-cholinesterase

(1 mark)

17.

Which of the following statements about melatonin are correct?

I. Melatonin secretion increases in the evening in response to darkness and decreases at dawn in response to light.

II. Increasing melatonin levels stimulate the body, preparing it for waking up and staying awake during the day.

III. Melatonin is secreted by the hypothalamus.

IV. The night-time drop in core body temperature triggers an increase in melatonin secretion.

V. Melatonin levels vary during a 12–hour cycle known as a circadian rhythm.

A. II, IV and V

B. I, III and IV

C. I only

D. II and V

(1 mark)

18.

Which words or phrases can be used to fill spaces (I) and (II) in the following sentence?

Scientists have particular concerns about the spread of diseases in animals that may result in ……(I)……. transfer of pathogens to humans. Examples of these diseases include tuberculosis and …….(II)……..

	I	II
A	Zoonotic	Rabies
B	Species-specific	COVID-19
C	Zoonotic	Measles
D	Mutated	Japanese encephalitis

(1 mark)

19.

What is adaptive immunity?

A. Treating a specific disease through use of antibiotics.

B. Production of monoclonal antibodies.

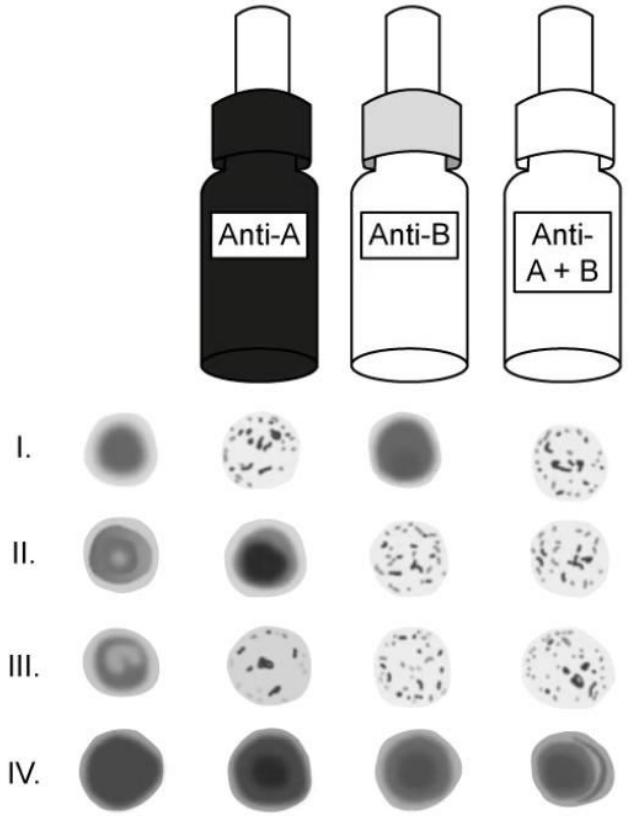
C. Production of antibodies by lymphocytes.

D. Endocytosis of pathogens by phagocytes.

(1 mark)

20.

If a patient is given a transfusion of the wrong blood type, an immune response results. This response involves agglutination followed by haemolysis, where red blood cells are destroyed and blood may then coagulate. Blood typing involves mixing blood samples with antibodies. The diagram below shows the results of a blood typing test, showing the reactions between blood types (rows) and antibody serums (columns). The first column shows the appearance of each blood sample before testing occurred.



Identify the row in the table below that correctly identifies the blood type of blood samples I - IV.

	I	II	III	IV
A	O	O	O	AB
B	A	B	AB	O
C	AB	AB	AB	O
D	B	A	AB	O

(1 mark)

21.

The following steps describes the events taking place during the elongation of a polypeptide in no particular order.

I. Free tRNA molecules bind to their corresponding amino acids due to their specific anticodon and transport it to the ribosome

II. A tRNA with a complementary anticodon binds to the "A" site bringing its specific amino acid along

III. The initiator tRNA moves from the "P" to the "E" site on the ribosome where it initiates translation

IV. The amino acid carried by the tRNA at the "P" site is linked to the polypeptide chain by a peptide bond

V. tRNA carrying the peptide chain moves from the "A" site to the "P" site as the ribosome moves in the 5' → 3' direction along the mRNA molecule

Which of these steps contain incorrect information?

A. I., III. and V.

B. II., III. and V.

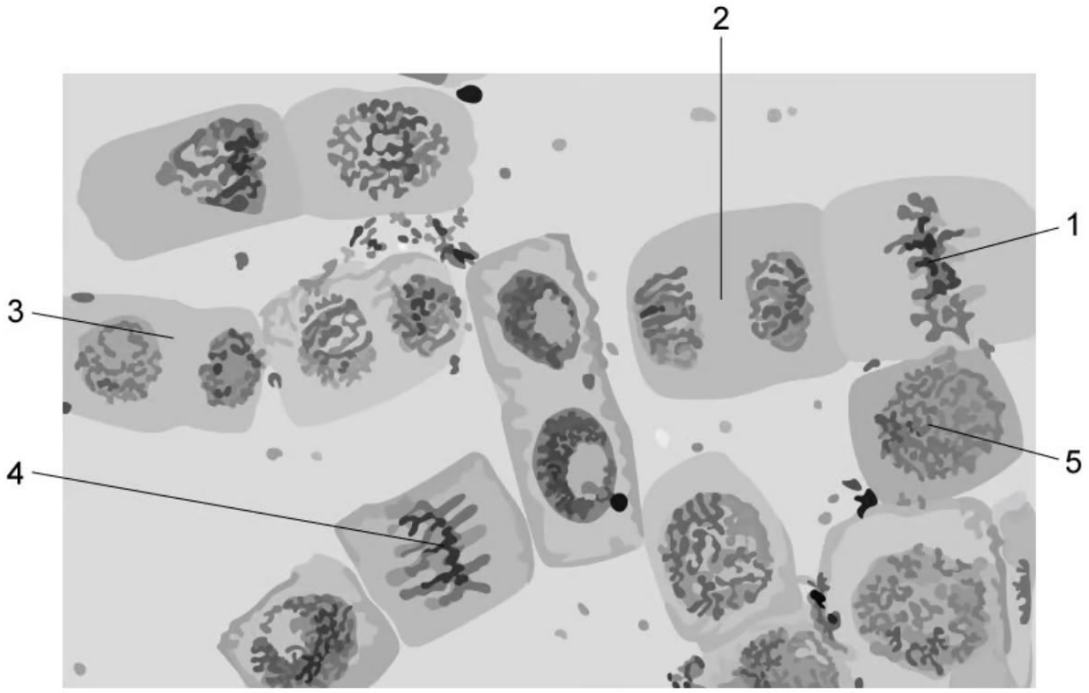
C. I., III. and IV.

D. I., III., IV. and V.

(1 mark)

22.

The photomicrograph shows cells in different stages of mitosis.



In which order do these stages occur?

A. 4 → 1 → 3 → 2 → 5

B. 4 → 1 → 2 → 3 → 5

C. 4 → 3 → 5 → 1 → 2

D. 4 → 5 → 1 → 2 → 3

(1 mark)

23.

Which of the following properties of water are a result of intermolecular forces?

1. High surface tension.
2. Good solvent.
3. Cohesiveness.
4. High specific heat capacity.

A. I and II

B. I, II and III

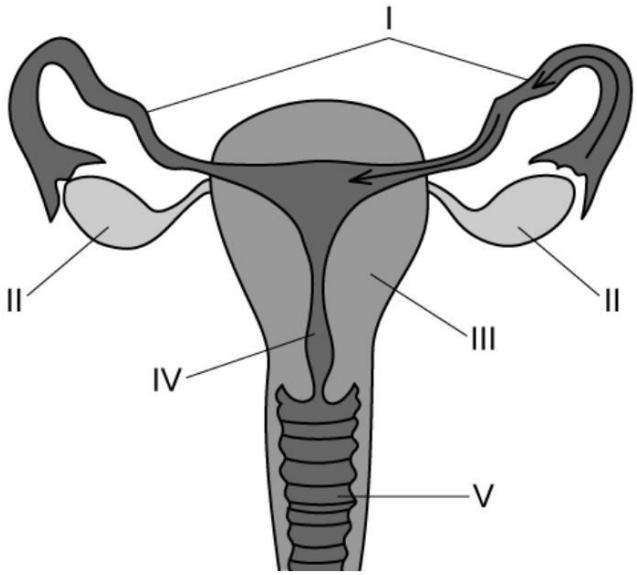
C. I, II and IV

D. All

(1 mark)

24.

The diagram shows the female reproductive system.



Which row correctly identifies the structures?

	I	II	III	IV	V
A	Oviduct	Ovary	Uterus	Vagina	Cervix
B	Ovary	Oviduct	Uterus	Vagina	Cervix
C	Oviduct	Ovary	Uterus	Cervix	Vagina
D	Oviduct	Ovary	Cervix	Uterus	Vagina

(1 mark)

25.

A couple are trying to decide whether their children may be at risk of inheriting Huntington's disease. One parent is heterozygous for Huntingtons and the other is a healthy individual.

Calculate the % chance that their offspring are likely to suffer from the disease.

A. 50%

B. 25%

C. 100%

D. 75%

(1 mark)

26.

Which of the following statements are true for the determination of sex?

I. The chromosomes inherited through the maternal gametes determine the sex of the offspring

II. Females have a larger quantity of DNA than males

III. Sex is determined by the 23rd pair of chromosomes in humans

IV. Sex of an individual can be identified using an image taken of chromosomes during interphase

A. I and II only

B. III only

C. II and III only

D. I, III and IV only

(1 mark)

27.

Which of the following are roles of thyroxin?

I. Targets metabolically active regions, such as adipose tissue.

II. Increase the rate of protein synthesis.

III. Inhibits the appetite and reduces food intake.

IV. Increase the generation of body heat.

A. II only

B. I and II only

C. II and IV only

D. I, II, III and IV

(1 mark)

28.

In adult humans, the ability to digest the lactose sugar in milk depends on the presence of an allele known as -13910*T. Individuals with this allele continue to produce the enzyme lactase into adulthood; this is known as lactase persistence. Individuals without this allele are not able to produce lactase after infancy and cannot digest lactose as adults. The table below shows the frequency of the -13910*T allele in European Neolithic hunter-gatherers who lived around 5 000 years ago and in modern Europeans.

	European Neolithic hunter-gatherers	**Modern Europeans**
Frequency of -13910*T allele	0.03 (+/- 0.11)	0.74 (+/- 0.06)

Which of the following can be concluded from the table?

A. There is no significant difference in the frequency of the -13910*T allele between Neolithic hunter-gatherers and modern day humans in Europe

B. Lactase persistence gave a survival advantage to humans at some stage between Neolithic and modern-day times

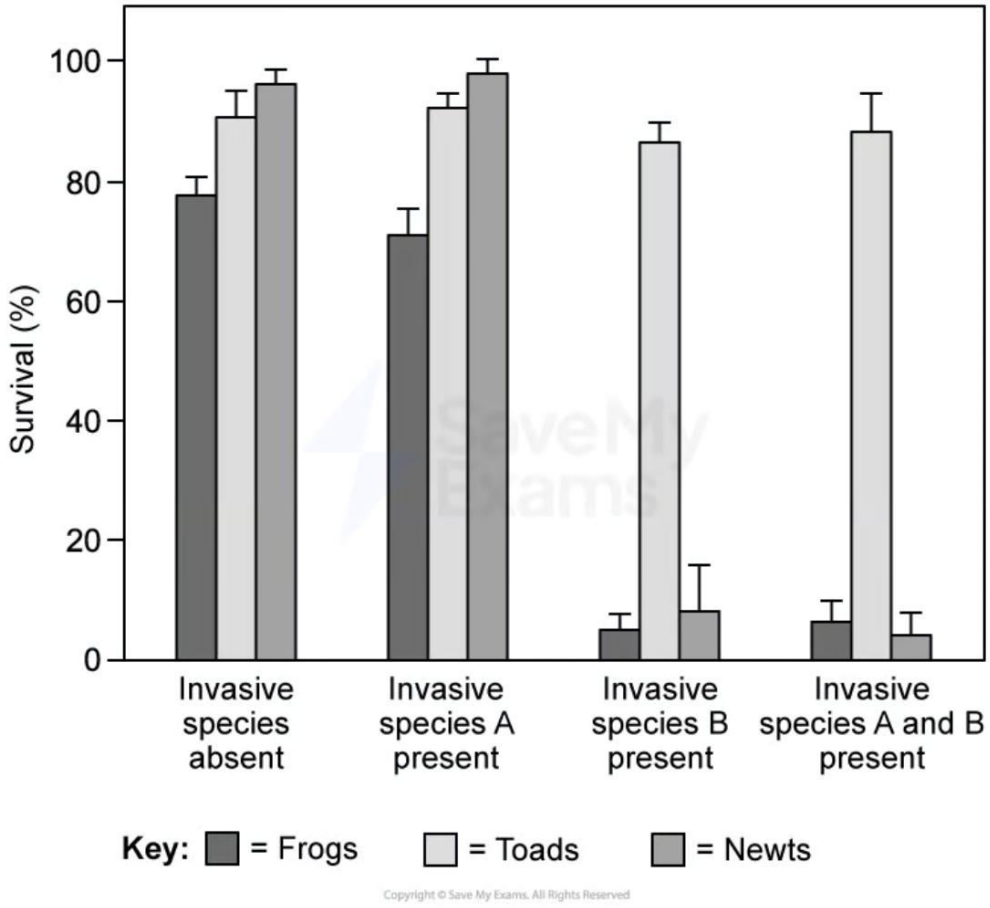
C. Lactase persistence gave a survival advantage to European Neolithic hunter-gatherers

D. Adult European Neolithic hunter-gatherers did not consume milk

(1 mark)

29.

A team of scientists used mesocosms to investigate the effect of invasive species A and B on native species of frog, toad and newt that would normally be found in a wetland ecosystem. Their mesocosms contained the frog, toad and newt species in the absence of invasive species, in the presence of each invasive species individually, and in the presence of both invasive species at the same time. 20 mesocosms, set up on land in 400 litre tanks, allowed each condition to be replicated 5 times. Some of the results are shown in the graph. The error bars show standard error.



Which of the statements about the mesocosm experiment are correct?

A. It can be concluded that introducing species B to a wetland ecosystem would damage populations of frogs.

B. The mesocosms provide a realistic representation of the wetland habitat of the frog, newt and toad species.

C. The mesocosms provided a model that allowed data on the effect of the invasive species to be collected.

D. Invasive species B had a significant impact on all of the native amphibian species.

(1 mark)

30.

The pH content of a water body in Australia was measured over a 10 year period. Scientists are concerned about the general downward trend of the data, which shows less alkali conditions than is characteristic.

Which of the statements suggests why the scientists may have cause for concern?

I. Decreased rates of photosynthesis may occur at low pH

II. Decreasing pH increases calcium carbonate solubility

III. Some species of algae thrive in extreme pH levels

A. I and II only

B. II and III only

C. None of the above

D. II only

(1 mark)