Biological Molecules – AS 9700 Biology June 2022

1. June/2022/Paper_11/No.6

Samples of glucose, sucrose, and a mixture of glucose and sucrose were divided into two halves **M** and **N**.

M was then tested with Benedict's solution.

N was boiled with dilute hydrochloric acid, neutralised and then tested with Benedict's solution.

The colour of the solution was compared to colour standards.

Which table identifies the correct colour changes for these samples?

A

sample	M	N
glucose	blue	blue
sucrose	blue	yellow
mixture	blue	yellow

B

sample	M	N
glucose	yellow	yellow
sucrose	blue	yellow
mixture	blue	yellow

C

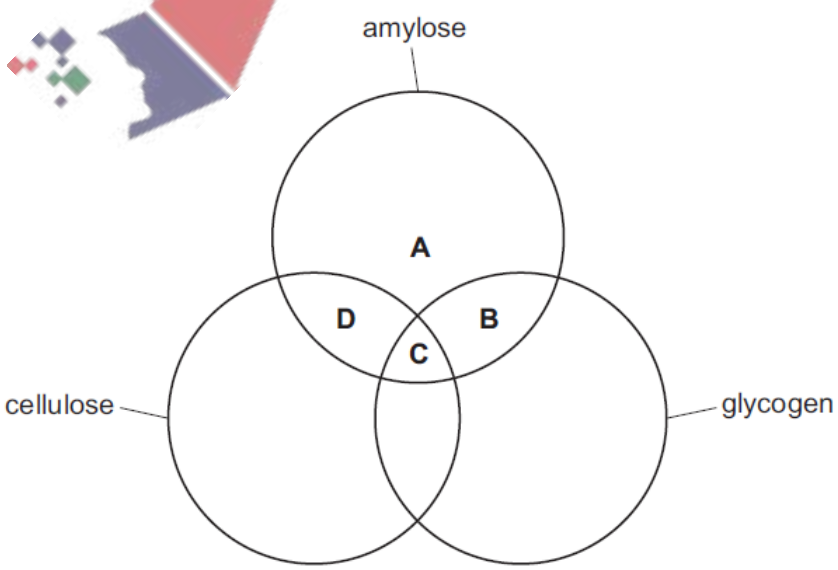
sample	M	N
glucose	yellow	yellow
sucrose	blue	yellow
mixture	yellow	red

D

sample	M	N
glucose	yellow	red
sucrose	blue	red
mixture	yellow	red

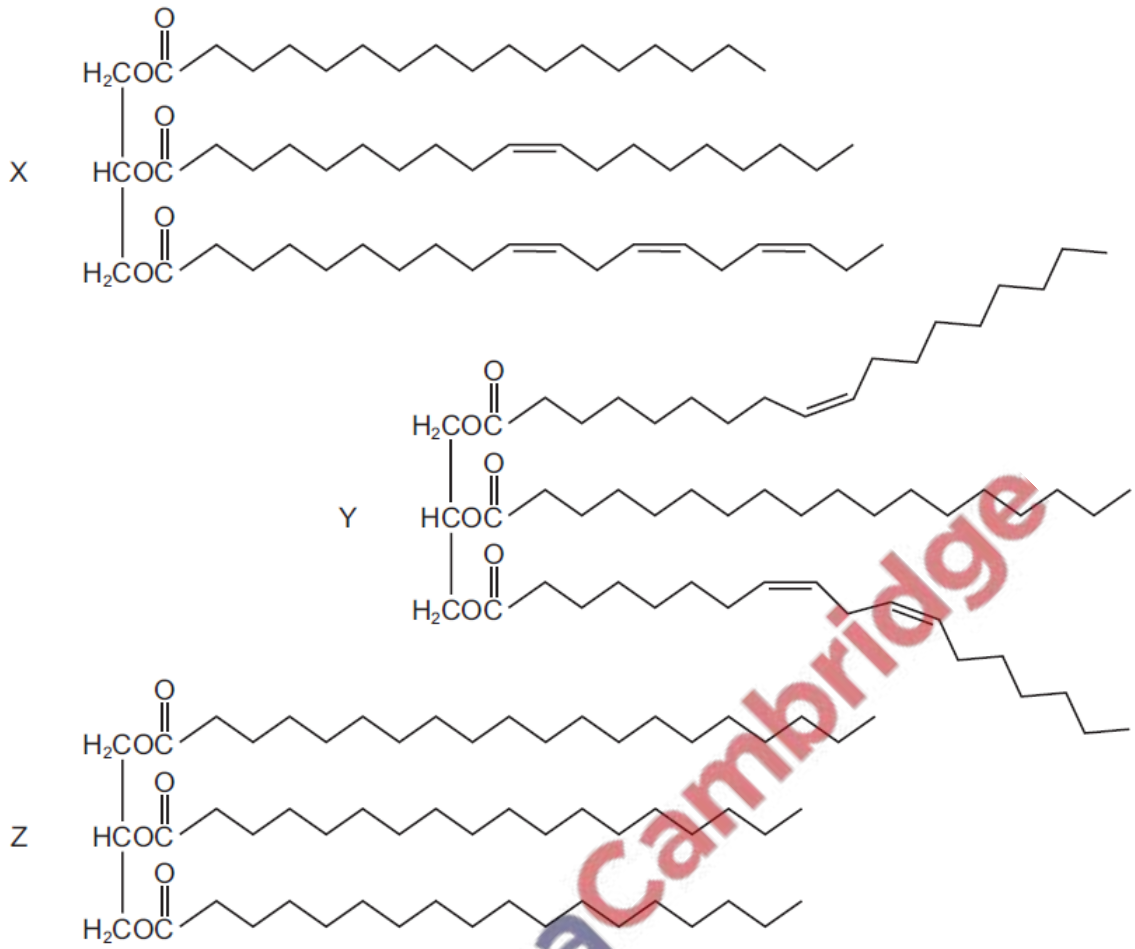
2. June/2022/Paper_11/No.7

Which molecules contain 1,4-glycosidic bonds?



3. June/2022/Paper_11/No.8

The diagram shows three triglycerides, X, Y and Z.



Which row is correct for these triglycerides?

	contains saturated fatty acids	contains unsaturated fatty acids	contains more than two different fatty acids
A	X, Y and Z	X and Y	X and Y
B	X, Y and Z	Z	X and Y
C	X and Y	X, Y and Z	X, Y and Z
D	Z	X and Y	X, Y and Z

4. June/2022/Paper_11/No.9

Some foods contain hydrogenated vegetable fats. These are unsaturated fats that have been converted to saturated fats.

Which property of the fats will have changed?

A Their hydrocarbon chains will fit together more closely.

B Their solubility in water will increase.

C They will have more double bonds in their molecules.

D They will remain liquid at room temperature.

5. June/2022/Paper_11/No.10

A polypeptide contains a specific number of amino acids, n.

How many peptide bonds are present in this polypeptide?

A n – 1 **B** n **C** n + 1 **D** n + 2

6. June/2022/Paper_11/No.11

Which statement is correct?

A Amylase, ribose and phospholipid are all macromolecules.

B Cellulose, glucose and catalase are all polymers.

C Deoxyribose, fructose and ribose are all monosaccharides.

D Sucrose, deoxyribose and amylopectin are all polysaccharides.

7. June/2022/Paper_12/No.6

Four extracts from different plant materials were made and tested with Benedict's solution.

The extracts were boiled with Benedict's solution for 240 seconds and the final colour was recorded.

extract	colour produced after 240 seconds
1	red
2	yellow
3	blue
4	green

Which sequence of plant extracts represents an increasing quantity of reducing sugar?

A 1 → 2 → 4 → 3

B 3 → 1 → 2 → 4

C 3 → 2 → 1 → 4

D 3 → 4 → 2 → 1

8. June/2022/Paper_12/No.7

Which have properties that are dependent on hydrogen bonds?

1 cellulose

2 a molecule of haemoglobin

3 water

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

9. June/2022/Paper_12/No.8

Which statement is correct?

A Cellulose, glycogen and amylopectin are all polymers.

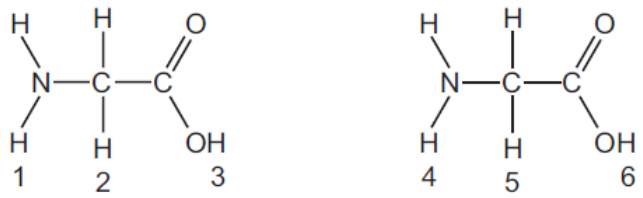
B Ribose, amylase and phospholipid are all macromolecules.

C Starch, glucose and amylose are all monomers.

D Sucrose, deoxyribose and amylopectin are all polysaccharides.

10. June/2022/Paper_12/No.9

The diagram shows two amino acids. Some of the hydrogen atoms are numbered 1 to 6.



Which two numbered hydrogen atoms could contribute to the production of a molecule of water when a peptide bond forms between these two amino acids?

A 1 and 4 **B** 1 and 6 **C** 3 and 5 **D** 2 and 4

11. June/2022/Paper_12/No.10

A student wrote four statements about water.

1 Water has a high specific heat capacity which maintains the temperature of water within cells.

2 Mammals rely on water having a relatively low latent heat of vaporisation to keep them cool.

3 When a negatively charged ion is added to water, the δ^+ charge on the hydrogen atom is attracted to the ion.

4 When surrounded by water, non-polar molecules tend to be pushed apart from one another.

Which statements are correct?

	1	2	3	4
A	✓	✗	✓	✓
B	✓	✗	✓	✗
C	✗	✓	✗	✓
D	✗	✓	✗	✗

key

✓ = correct

✗ = not correct

12. June/2022/Paper_13/No.7

The concentration of reducing sugar in a solution can be found if an observational measurement is compared to a standard.

Which observational measurement could be used to estimate the concentration of reducing sugar in an unknown solution?

1 the colour of the solution after 20 minutes

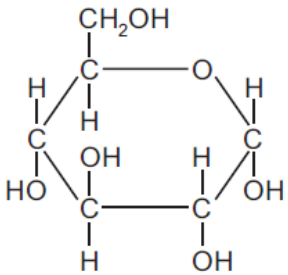
2 the time for the first colour change to occur

3 the rate of formation of solid particles

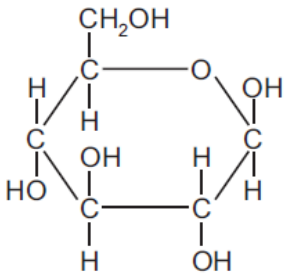
A 1, 2 and 3 **B** 1 and 2 only **C** 2 only **D** 3 only

13. June/2022/Paper_13/No.8

The diagram shows three hexose sugars.



1



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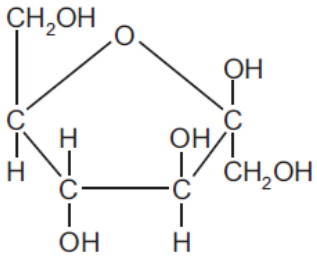


3

Which row correctly shows examples of carbohydrates in which these three hexose sugars occur?

	sucrose	cellulose	amylopectin
A	1	2	3
B	1	3	2
C	2	3	1
D	3	2	1

14. June/2022/Paper_13/No.4

ATP molecules are synthesised in mitochondria.

Which sugar is found in these ATP molecules?

A deoxyribose

B fructose

C glucose

D pentose

15. June/2022/Paper_13/No.9

Trehalose is a sugar that gives a negative result when tested with Benedict's solution.

A molecule of trehalose forms two α-glucose molecules when it is hydrolysed.

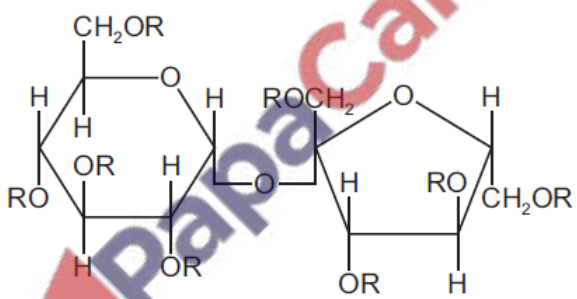
Which row is correct?

	formula of trehalose	sugar that gives the same result with Benedict's as trehalose
A	$C_{12}H_{22}O_{11}$	fructose
B	$C_{12}H_{22}O_{11}$	sucrose
C	$C_{12}H_{24}O_{12}$	fructose
D	$C_{12}H_{24}O_{12}$	sucrose

16. June/2022/Paper_13/No.10

Olestra is an artificial lipid. It is made by attaching fatty acids, by condensation, to a sucrose molecule.

A simplified diagram of olestra is shown. R represents the position where fatty acids would be attached.



Humans cannot hydrolyse olestra. However, other animals may be able to do so.

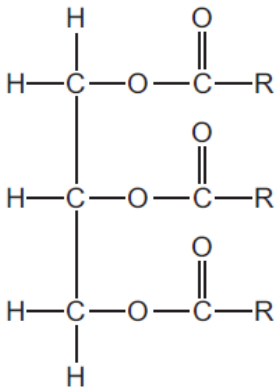
How many molecules of water would be needed to hydrolyse one molecule of olestra into fatty acids, fructose and glucose?

A 11 **B** 10 **C** 9 **D** 8

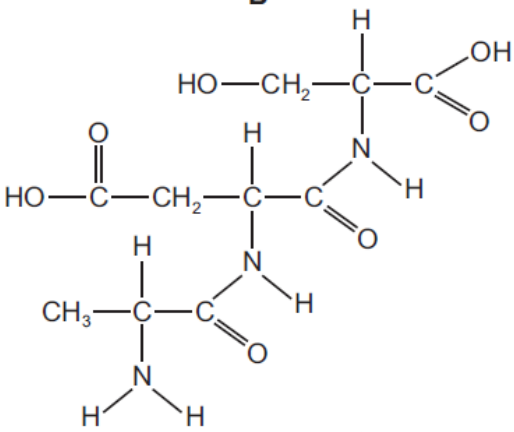
17. June/2022/Paper_13/No.11

Which molecule contains at least one peptide bond?

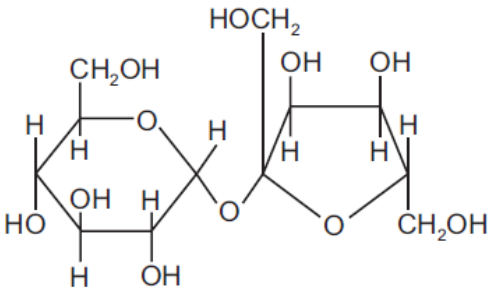
A



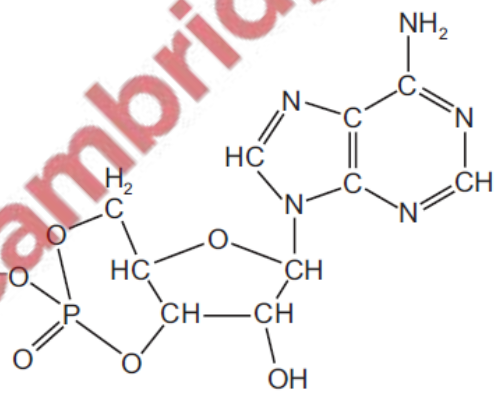
B



C



D



18. June/2022/Paper_21/No.4

Adipocytes are cells found in adipose tissue in mammals. These cells absorb glycerol and fatty acids to make triglycerides for long-term storage.

Fig. 4.1a shows a glycerol molecule and three fatty acids. Fig. 4.1b shows the triglyceride molecule formed from these components.

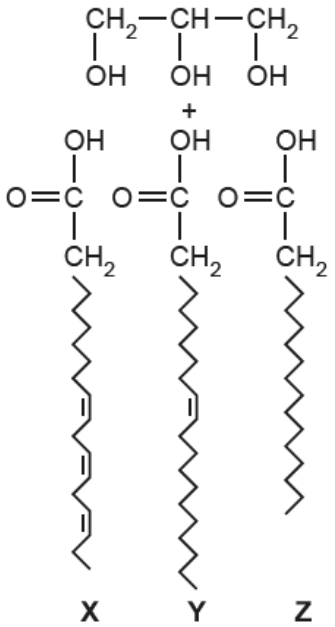


Fig. 4.1a

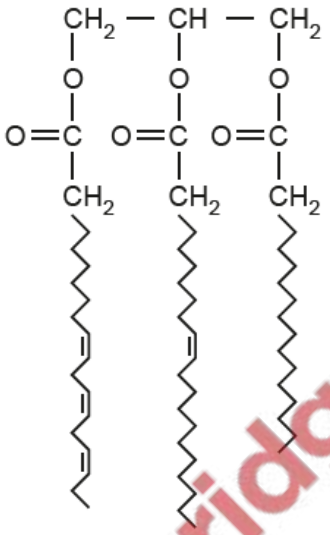


Fig. 4.1b

(a) (i) State the name of the bonds that form between glycerol and fatty acids.

..... [1]

(ii) When a bond forms between glycerol and a fatty acid, water is a product of the reaction.

State the name given to this type of reaction.

..... [1]

(iii) Describe the differences between the fatty acids, **X**, **Y** and **Z**, shown in Fig. 4.1a.

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..... [3]

(b) **(i)** State reasons why triglycerides are described as hydrophobic.

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..... [2]

(ii) Explain why triglycerides are **not** suitable as a component of cell surface membranes.

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..... [2]

[Total: 9]

19. June/2022/Paper_21/No.3

Hummingbirds are the smallest of birds and are found in the Americas. Some species migrate hundreds of kilometres between warmer overwintering areas and summer breeding grounds. Like mammals, birds maintain a constant body temperature.

Hummingbirds have a high requirement for sugars because they have a very high metabolic rate. Fig. 3.1 shows a hummingbird feeding on nectar, one of their main food sources.

Fig. 3.1

(a) Nectar is a sugary liquid containing mainly sucrose, fructose and glucose.
Sucrose has the molecular formula $C_{12}H_{22}O_{11}$. Fructose and glucose each have the molecular formula $C_6H_{12}O_6$.

State **two** differences between sucrose and fructose, other than the number of carbon, hydrogen and oxygen atoms present.

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..... [2]

(b) In preparation for migration, sugars need to be converted to triglycerides to function as energy reserves. Hummingbirds can double their body mass during this time.

(i) Fig. 3.2 shows the structural formula of one type of storage triglyceride. The triglyceride has two types of fatty acid residue, palmitate and oleate.

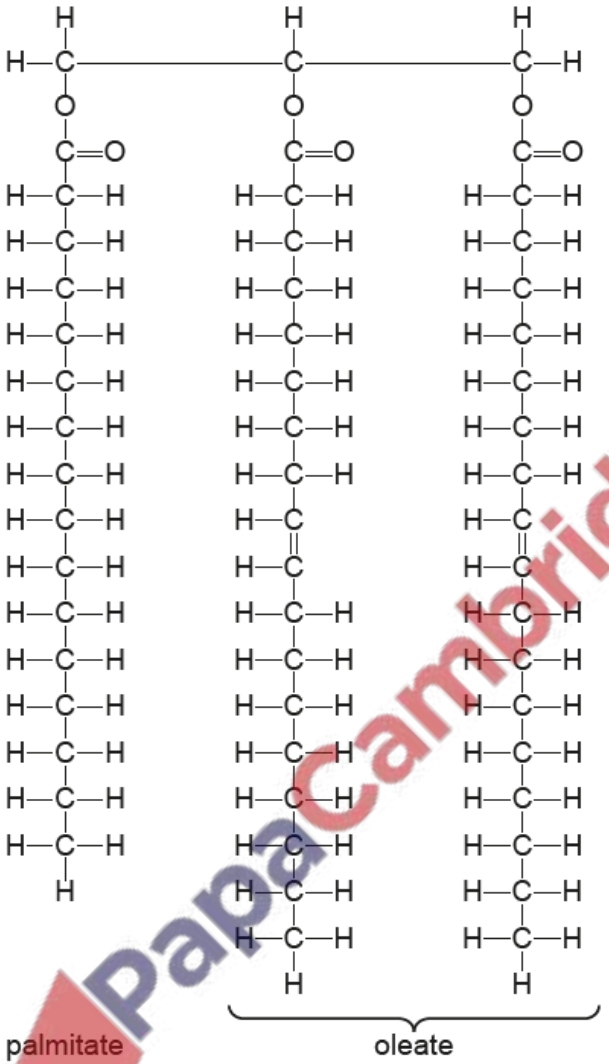

Fig. 3.2

Outline the features of the molecular structure of the triglyceride shown in Fig. 3.2.

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..... [3]

(ii) In hummingbirds, glycogen is the long-term carbohydrate energy store.

Suggest **one** reason why hummingbirds build up a greater energy store in the form of triglyceride, rather than a greater energy store of glycogen, in preparation for migration.

.....

.....

..... [1]

(c) In birds such as hummingbirds:
- blood is kept within vessels
- for each complete circuit of the body, blood passes through the heart twice.

State the term used to describe this type of circulatory system.

..... [1]

(d) The heart of birds has the same structure as the heart of mammals. Compared with the heart of mammals, the heart of birds is larger in proportion to their body size.

Suggest why the heart of birds is larger in proportion to their body size.

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..... [2]

(e) Complete Table 3.1 to show the names and functions of the main blood vessels associated with the heart of mammals.

Table 3.1

function of blood vessel	name of blood vessel
carries blood from the heart to the lungs	
carries blood to the heart from the lungs	
carries blood from the heart to the rest of the body	
carries blood to the heart from the rest of the body	

[3]

[Total: 12]