

# 2.2 Carbohydrates & Lipids

## Question Paper

Course	DP IB Biology
Section	2. Molecular Biology
Topic	2.2 Carbohydrates & Lipids
Difficulty	Easy

**Time allowed:** 50  
**Score:** /41  
**Percentage:** /100

### Question 1a

a)

State the type of bond that forms between two sugar molecules in a disaccharide.

[1 mark]

[1 mark]

### Question 1b

b)

Place these types of carbohydrate into **decreasing** order of molecular size.

- tetrasaccharides
- monosaccharides
- polysaccharides
- disaccharides

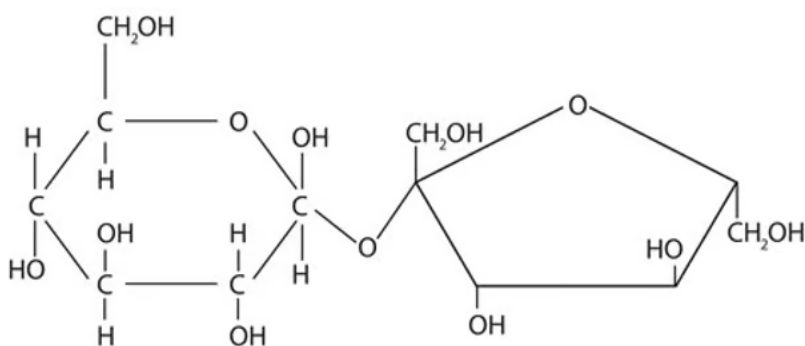
[2 marks]

[2 marks]

### Question 1c

c)

A disaccharide has the formula  $C_{12}H_{22}O_{11}$  and is pictured below.



Draw a ring around the chemical group that bonds two monosaccharides together.

[1 mark]

[1 mark]

### Question 1d

d)

Glucose, galactose and fructose all have the same molecular formula but differ in their physical and chemical properties.

State the collective name for compounds like these, that have the same molecular formula but different properties.

[1 mark]

[1 mark]

### Question 2a

a)

List **two** properties of starch that make it an effective storage polysaccharide.

[2 marks]

[2 marks]

### Question 2b

b)

List **two** properties of cellulose that make it an effective structural polysaccharide.

[2 marks]

[2 marks]

### Question 2c

c)

State the specific type of bond in amylopectin that gives the molecule its highly branched structure.

[1 mark]

[1 mark]

### Question 2d

d)

Glycogen has an even more branched structure than amylopectin, which makes it ideal as an energy storage molecule in animal cells.

Describe how the branched structure of glycogen helps fulfil its role as a short-term energy storage compound.

[2 marks]

[2 marks]

### Question 3a

a)

Identify the two distinct parts of a typical fatty acid molecule.

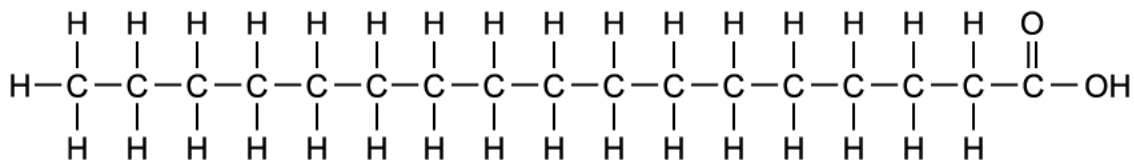
[2 marks]

[2 marks]

### Question 3b

b)

The diagram shows a fatty acid.



i)

Identify the type of fatty acid shown in the diagram.

[1 mark]

ii)

State a reason for your answer in part i).

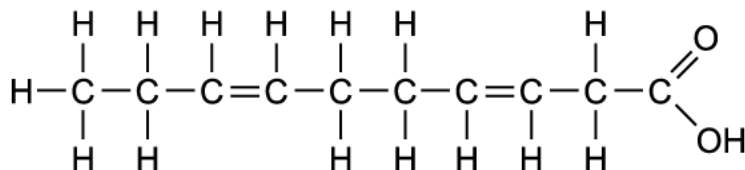
[1 mark]

[2 marks]

### Question 3c

c)

The diagram shows a different fatty acid.



Use a tick (✓) in each table to identify words to describe the structure of the fatty acid shown.

Monounsaturated	Polyunsaturated	Saturated

All Cis	All Trans	Mixture of Cis- and Trans-

[2 marks]

[2 marks]

### Question 3d

d)

The table below gives information on two different unsaturated fatty acids.

Unsaturated Fatty Acid	Number of C=C double bonds	Melting point / °C
A	18	-5
B	18	45

i)

Identify which of these is a cis-fatty acid and which is a trans-fatty acid.

[1 mark]

ii)

State a reason for your answer in part i).

[1 mark]

[2 marks]

### Question 4a

a)

The low oxygen content of lipids enables them to be more energy-dense forms of energy storage than carbohydrates.

Explain why.

[1 mark]

[1 mark]

### Question 4b

b)

Define the term 'metabolic water'.

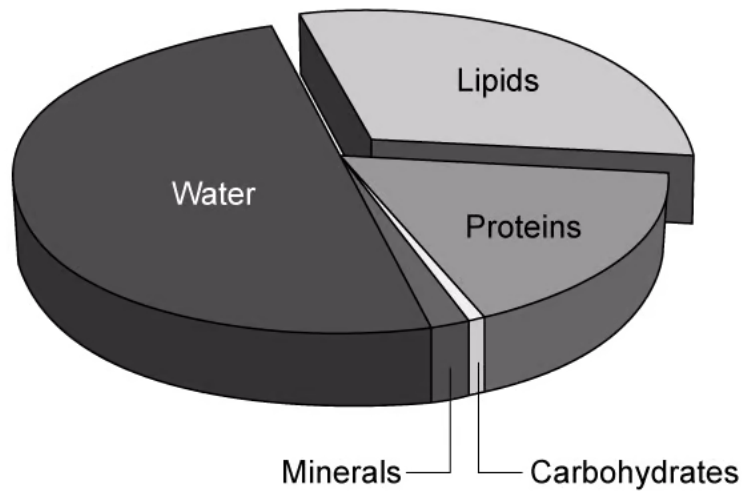
[2 marks]

[2 marks]

### Question 4c

c)

The pie chart gives the proportions of the main food groups in the yolk of a typical hen's egg, which serves as a source of nutrition for the growing embryo. This does not include the 'egg white'.



Suggest why the lipids sector of the chart is so much larger than that of carbohydrates.

[1 mark]

[1 mark]

### Question 4d

d)

State the type of bond, and the number of those bonds, between fatty acids and a glycerol molecule in a typical triglyceride molecule.

[2 marks]

**Question 5a**

One mark is awarded for clarity of communication throughout this question

a)

A woman of height 152cm has a body mass of 55 000g.

Using the formula below, calculate the woman's Body Mass Index (BMI)

$$\text{Body Mass Index} = \frac{\text{Body mass (kg)}}{\text{Height}^2 \text{ (metres)}}$$

[3 marks]

[3 marks]

**Question 5b**

b)

State, with an example in each case, **four** different ways in which lipids are used in nature.

[8 marks]

[8 marks]



### Question 5c

c)

Draw a labelled molecular diagram of a triglyceride which contains **one** monounsaturated fatty acid.

[4 marks]

[4 marks]