Model Answers: Hard

1

The correct answer is **C** because:

- The triglyceride is the molecule on the right, the phospholipid is on the left
- Statements **2** and **4** are **true**
- Statement **1** is false because the fatty acid chains in the triglyceride molecule are all the same length, whereas one of the chains in the phospholipid is longer and contains a double bond (causing a 'kink' in the chain)
- Statement **3** is false because the triglyceride in a nonpolar molecule (is not charged) and would therefore not be able to form hydrogen bonds with water molecules

2

The correct answer is **D** because:

- Molecule Q is cellulose, composed of β-glucose subunits
- Molecule R could be glycogen or amylopectin, composed of α-glucose subunits
- Molecule S is a phospholipid composed of a glycerol backbone, fatty acids and glycerol
- Molecule T is amylose, composed of α-glucose subunits

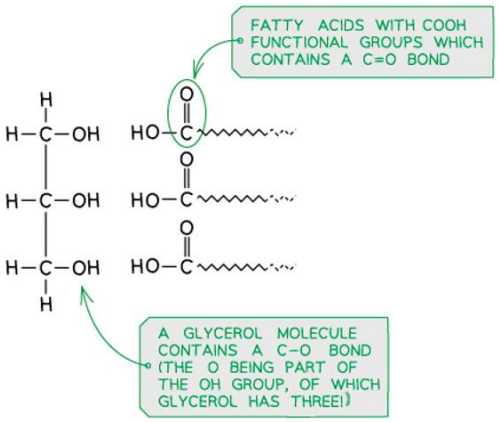
3

The correct answer is **B** because the question is asking for the statements that are not true:

- Statement 1 is false: Molecule **P** is part of the primary structure of a protein and does contain peptide bonds but Molecule **R** contains two types of glycosidic bond (1-4 and 1-6) whereas Molecule **Q** only has one type (1-4)
- Statement 2 is false, as although **R** could be representative of glycogen (it has 1-4 and 1-6 glycosidic bonds) **T** is amylose which is a component of starch and therefore wouldn't be found in animals. **Q** is cellulose (notice the alternating orientation of the 1-4 glycosidic bond between β-glucose molecules) which is found in plant and algae cell walls, never in animal cells
- Statement 3 is false, **S** is a glucosylceramide, an important component in neuronal membranes. It has two hydrocarbon chains which are hydrophobic which enable it to form part of the cell membrane. **Q** (cellulose) does have a structural role.
- Statement 4 could be true; **K** could be amylopectin (a component of starch) and **M** is amylose which would form a helical structure, starch is an important energy storage molecule in plants.

4

The correct answer is **C** as only fatty acids contain a **C=O** bond:



5

The correct answer is **C** because:

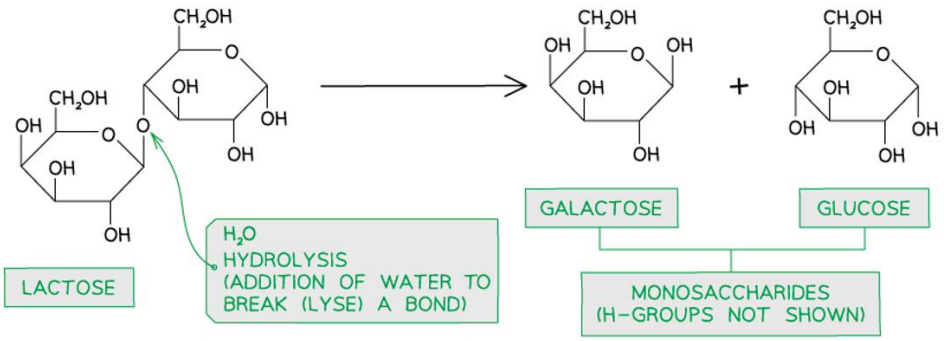
- Statement 1 is not true as hydrolysis of amylose releases α-glucose molecules
- Statement 2 is not true as glycogen contains bond 1,4 and 1,6-glycosidic bonds whereas amylose only contains 1,4-glycosidic bonds
- Statement 3 is not true as triglycerides are not polymers – the definition of a polymer is a molecule made from many repeating or similar smaller subunits ('poly' meaning 'many').

Triglycerides are made from simpler biomolecules, but this does not make them polymers; they are only formed from four subunits (three fatty acid chains and one glycerol molecule).

6

The correct answer is **A** because:

- Lactose is a disaccharide composed of one molecule of glucose and one molecule of galactose held together by a glycosidic bond
- Hydrolysis of lactose releases galactose and glucose:



7

The correct answer is **D** maltose is a reducing sugar, whereas sucrose is not. In order to prove that a solution contains sucrose, it needs to first test negative for the Benedict's test (no colour change). After acid hydrolysis of a new sample of the same solution, a subsequent Benedict's test will be positive (showing a colour change from blue to green/orange/brick-red dependent on concentration). This is because acid hydrolysis of sucrose releases the monosaccharides fructose and glucose (both are reducing sugars)

8

The correct answer is **D** because:

- For **α-glucose**, the rule for OH group placement from ^{1}C to ^{4}C is: 'down-down-up-down'
- For **β-glucose**, the rule for OH group placement from ^{1}C to ^{4}C is: 'up-down-up-down'