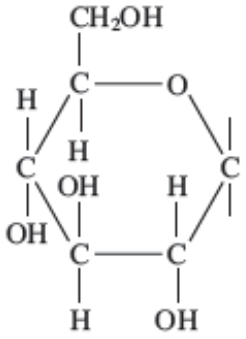
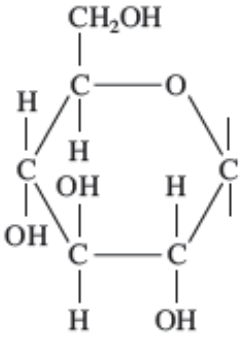
# My Question Paper

| Question | Maximum Mark | Mark Awarded |
|---|---|---|
| 1 | 6 | |
| 2 | 16 | |
| 3 | 10 | |
| 4 | 10 | |
| **Total Mark** | | |

**1.** Carbohydrate molecules contain the chemical elements carbon, hydrogen and oxygen only.
(a) The diagrams below show structural formulae of two isomers of glucose. Complete the drawings to distinguish between the and β isomers.



α glucose



β glucose

(b) (i) Starch and cellulose are both polymers of glucose, but they are formed from different isomers. State the isomer which is found in:

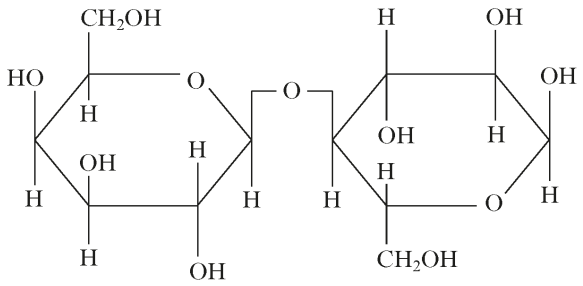
Cellulose . . . . . Starch . . . . . .

(ii) Explain how the structures of starch and cellulose are related to their functions as storage and structural molecules respectively.

[4]

**2.**

Lactose is a disaccharide found in milk. The diagram below shows the structure of lactose.




*(a)* Lactose can be broken down into its constituent monosaccharides.

(i) Complete the diagram above to show how lactose is broken down. [2]

(ii) State the type of reaction involved in the breakdown of lactose. [1]

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(iii) Name the bond that is broken during this reaction. [1]

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(iv) Name the molecules produced when lactose is broken down. [1]

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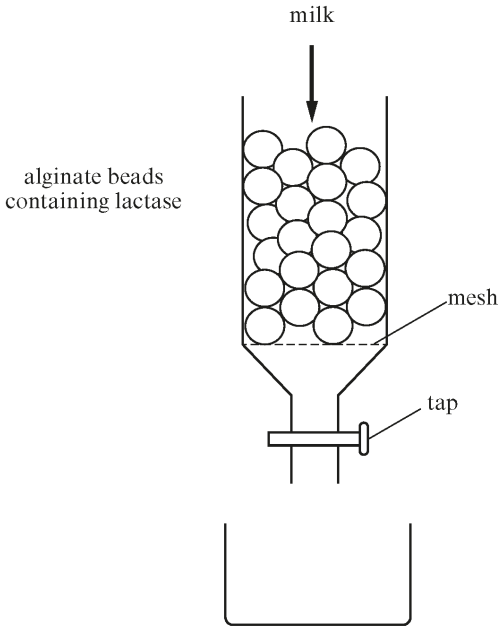
*(b)* The enzyme lactase can be used to break down lactose. In an experiment lactase was immobilised inside alginate beads and placed in a column, as shown in the diagram below. Fresh milk was then poured into the column and left for one minute before being allowed to drain into the beaker below. As the milk passes through the column the lactose in the milk is broken down.




(i) What is meant by the term immobilised enzyme? [1]

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(ii) Describe **two** advantages of using immobilised enzymes in this way. [2]

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*(c)* (i) The products produced from the breakdown of lactose are reducing sugars. Describe how you could test for the presence of a reducing sugar. [2]

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(ii) The products produced could also be detected by a biosensor. What is meant by the term biosensor? [1]

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(iii) What would be the main advantage of using the biosensor to detect the products? [1]

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*(d)* Some bacteria which are found in milk can convert sugars within the milk to lactic acid. Over time the number of these bacteria increase and this eventually causes milk to go sour. The experiment above was repeated with milk that had been left for seven days. State and explain the effect this would have on the concentration of reducing sugars detected. [4]

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**(Total 16 marks)**

**3.** Answer **one** of the following questions.

Any diagrams included in your answers must be fully annotated.

**Either**, (a) Give an account of the structure and function of carbohydrates.

[10]

**Or** (b) Give an account of the structure and function of nucleic acids.

[10]

**4.**

Answer one of the following questions.

Any diagrams included in your answers must be fully annotated.

**Either**, (a) Using examples, describe the functions of carbohydrates and lipids in living organisms.

[10]

**Or** (b) Describe the structure and function of the rough endoplasmic reticulum, Golgi body and lysosomes.

[10]

# Marking Scheme

**1.** 2.
(a)
(i)
α glucose OH on C1 down, H up + β glucose OH on C1 up, H down; Allow HO (both for 1 mark). 1
(b)
(i)
Cellulose -Beta Starch - alpha; (both for 1 mark). 1
Allow symbols.
(ii)
Starch: any 2
correct reference to amylose and/or amylopectin;
glycosidic bonds (α 1-4);
molecules coil/branch (in amylopectin); NOT compact
NOT: amylopectin - coiled or amylase branched
easy to add/remove {glucose / maltose} units; 2

Cellulose: any 2; 2
alternate units rotate / head up, head down / 180° rotation;
straight chain only / no branches; NOT parallel
hydrogen bonds between / reference to cross linking;
gives strength or stability / forming microfibrils;

Question total 6

**2.**

| | | | |
|---|---|---|---|
| *(a)* | (i) | Molecule of water (drawn with arrow towards the O atom of the glycosidic bond); NOT water going out<br>Monosaccharides drawn with –OH groups in correct position on C1 and C4 ( involved in bond); | 2 |
| | (ii) | Hydrolysis; NOT hydrolysation (ignore reference to acid) | 1 |
| | (iii) | Glycosidic; | 1 |
| | (iv) | Glucose and galactose; ignore alpha/ beta | 1 |
| *(b)* | (i) | An enzyme that has been fixed to an inert {matrix/support/ substance}; | 1 |
| | (ii) | The enzyme can easily be recovered/ reused;<br>The product is free from contamination;<br>Enzyme is {stable at / tolerates/ withstand} higher temperatures/denatures at a higher temperature/ functions over a wide range of pH;<br>NOT wider range of temperature alone<br>Several enzymes with differing optima can be used at the same time;<br>More control over the reaction/enzymes easily added or removed/ can be used in a continuous process; | Max 2 |

| | | | |
|---|---|---|---|
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| | (ii) | Hydrolysis; NOT hydrolysation (ignore reference to acid) | 1 |
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**3.**

| Question | | | Marking details | Marks Available |
|---|---|---|---|---|
| 8. | (a) | | A. Monosaccharides / single sugars plus 2 suitable examples;<br>B. Diagram of hexose/glucose;<br>C. Alpha and beta forms of glucose shown; (can be description)<br>D. Pentoses/deoxyribose/ribose and presence in DNA/RNA;<br>E. Trioses in photosynthesis/respiration/metabolic pathways;<br>F. Disaccharides plus 2 suitable examples;<br>G. Correct formation of glycosidic bond (stated or diagrams, labelled);<br>H. 2 suitable examples of where disaccharides are found (milk sugar/germinating seeds/transport in plant stems);<br>I. Starch in plant cells for storage of glucose; NOT energy<br>J. Correct reference to starch structure (alpha glucose/amylose & amylopectin/1 -4 and 1 – 6 linkages/amylose spiral chain/amylopectin branched);<br>K. Glycogen in animal cells for glucose storage ;<br>L. Glycogen has branched chains;<br>M. Cellulose in plant cell walls/structural polysaccharide;<br>N. Correct reference to cellulose structure (beta glucose/microfibrils/ chains held together by H – bonds/alternate 180° glucose);<br>O. Correct reference to chitin (amino groups/ use in {exoskeleton/ fungal cell walls}) | |

| Question | | | Marking details | Marks Available |
|---|---|---|---|---|
| | (b) | | A. Ref to DNA **and** RNA;<br>B. Diagram/description of a nucleotide with correct labels/terms (phosphate & pentose sugar & nitrogenous/eq base);<br>C. DNA named sugar Deoxyribose; must link to DNA<br>D. Ref to purines and pyrimidines;<br>E. Correct identification of purines and pyrimidines (Full names only);<br>F. Ref to Uracil replacing thymine in RNA;<br>G. Correct base pairing A-T, C-G (*Allow letters;allow from diagram)*<br>H. Description/labelled diagram of double helix in DNA;<br>I. Held together by H – bonding;<br>J. Functions of DNA (i) replication in dividing cells;<br>K. (ii) code/ template for protein synthesis;<br>L. Description of RNA as a single chain/ strand (of nucleotides); NOT single helix<br>M. Ref correct sugar Ribose in RNA; correctly linked<br>N. mRNA carries genetic code from the nucleus to the ribosome;<br>O. correct reference to tRNA/ribosomal RNA;<br><br>**Question 8 Total** | **[10]** |

**4.**

| Question | | | Marking details | Marks Available |
|---|---|---|---|---|
| 8 | (a) | | **Carbohydrates** | Max 10 |
| | | A | Glucose for respiration; |
| | | B | Starch for storage of {glucose/energy}in plants; |
| | | C | Cellulose for structural support in plant cell walls/ chitin in {insect exoskeleton/ fungi}; |
| | | D | Glycogen for storage of {glucose/energy} in animals; |
| | | E | {Glycogen/starch} insoluble so no osmotic effect; |
| | | F | Disaccharides or named + function (e.g. sucrose for transport in plants); |
| | | | **Lipids** |
| | | G | Saturated fatty acids for storage in animals/ unsaturated fatty acids for storage in {seeds/plants}; |
| | | H | Thermal insulation/buoyancy; |
| | | I | Waxes for waterproofing in leaves; |
| | | J | Good source of energy, twice as many as carbohydrates or value 38 kJ per g; |
| | | K | Correct ref to protection of organ from physical damage (e.g. kidney); |
| | | L | Electrical insulation in neurons (ref to myelin); |
| | | M | Source of metabolic water from respiration of lipids; |
| | | | **Used to make other molecules**<br>(CHO / glucose / lipids needed to make) |
| | | N+ | Any two for one mark each from: |
| | | O | Chlorophyll *with* magnesium / phospholipids *with* phosphate/ {DNA/RNA/ATP} *with* nitrogen and phosphate / amino acids *with* nitrogen/ glycoprotein *with* protein; |

| Question | | | Marking details | Marks Available |
|---|---|---|---|---|
| 8 | (b) | | **Rough Endoplasmic Reticulum** | Max 10 |
| | | A | Flattened sacs/cisternae (or from diagram); |
| | | B | Continuous with nuclear membrane (or from diagram); |
| | | C | With attached ribosomes (must be clearly labelled on diagram); |
| | | D | Site of {protein synthesis/translation}/transport system; |
| | | | ***Golgi*** |
| | | E | Golgi consists of a {series/system/group/stack} of (dynamic) flattened sacs (diagram must show at least 3); |
| | | F | Function in packaging proteins (for secretion); |
| | | G | Vesicles containing proteins from RER fuse with Golgi membrane and contents are shed into Golgi sacs/ coalescence of vesicles; |
| | | H | (Contents are built into more complex molecules such as) enzymes/glycoproteins; |
| | | I | Other Golgi function, e.g. carbohydrate secretion/ transporting or storing lipids; |
| | | J | {Vesicles containing product/lysosomes} are budded off; |
| | | K | Ref. to exocytosis of contents; NOT in context of lysosomes |
| | | | ***Lysosomes*** |
| | | L | Lysosomes contain digestive enzymes/lysozyme; |
| | | M | Function is to {break down worn out organelles/digest foreign material/ cause autolysis/ intracellular breakdown}; |
| | | N | {Lysosomes/vesicles} fuse with membrane of digestive vacuoles; |
| | | O | Enclosed by phagocytosis; NOT in context of lysosomes |
| | | | *Award Max 8 if only 2 organelles described*<br>*Points A,B,C and E can be accepted from clear diagram* |
| | | | **Question 8 Total** | **[10]** |

# Examiner's Comments

**1.** This question was generally well answered with most candidates scoring a majority of the marks. There was some guesswork in part (a) with OH groups the wrong way up, and some not attempted. Similarly in part (b) *(i)* some alpha and beta the wrong way round and some not attempted. Part (b)*(ii)* was generally well answered. Some candidates went to town and could have been answering a 10 mark question.

*This comment originally referred to question **2** on paper **1071/01 (14/05/2012)***

**2.** (a) The majority of candidates recognised that water was required for the reaction, but very few drew an arrow indicating the water would be inserted into the molecule of lactose; and many went on to correctly draw the resulting monosaccharides. Some candidates lost marks by drawing the 'OH groups' at the bottom of the molecules or they unsuccessfully tried to invert one of the molecules.

(b) Questions on immobilised enzymes are common and the majority gained 2 marks, however here were some candidates who thought that because the enzymes were immobilised this would allow them to function in extremes of temperature and pH.

(c) Many candidates stated that the Benedict's test would be required and that if a reducing sugar was present the solution would turn red, however a significant number failed to state that the solution needs to be heated and/or there would be a colour change from blue to red.

Many candidates failed to state what a biosensor is but instead gave detailed descriptions of how digital biosensors work. Vague responses were given regarding the advantages of using them, such as they are 'more accurate', 'precise' give a faster result' and very few related it to the experiment.

(d) Responses to this question were disappointing. Most candidates stated that there would be a decrease in reducing sugars detected but then simply went on to rewrite the stem of the question. Only the better candidates could make the link between the effects of a reduced substrate concentration and/or a decrease in pH on the rate of the enzyme catalysed reaction.

*This comment originally referred to question **6** on paper **1071/01 (09/01/2013)***

**3.** Both essays required knowledge of biochemistry from different sections of the specification. Routinely good answers were gaining full marks and some were a real pleasure to mark, being succinct and with real knowledge of the structure and function of the molecules. The nucleic acids question was routinely picking up 10 marks with excellent knowledge of DNA/RNA. The usual reason for candidates losing marks with the carbohydrate essay was their superficial coverage of the mono and disaccharides with far too much time spent on the polysaccharides, as though they are the only form of carbohydrate of any importance.

*This comment originally referred to question **8** on paper **1071/01 (21/05/2013)***

**4.** Both essays were seen, with slightly more candidates opting for part (a).

Question (a) required candidates to describe the functions of carbohydrates and lipids, but many described in length the structures of these in detail which gained no credit. We saw some good answers, but some weaker candidates still referred to starch as a carbohydrate store, rather than a store of energy or glucose. We would expect at this level that candidates know that glucose is used in respiration. Whilst waxes serve as waterproofing in leaves and reduce water loss, many candidates referred to their function as reducing transpiration.

Question (b) was answered well where candidates had learnt the structure and function of organelles. Some included diagrams which did gain marks where the quality was good and certain minimum labels were made. A small number of weaker candidates seemed confused between the digestive vacuole and plant central vacuole.

*This comment originally referred to question **8** on paper **1071/01 (21/05/2014)***