Worksheet 03 • Monosaccharides and the properties of glucose

IB-style worksheet for trimester assessment practice • Topic: B1.1 Carbohydrates and lipids

Worksheet	**Worksheet 03**	**Focus**	**Pentoses, hexoses, glucose structure and biological use**
Total marks	**25**	**Suggested time**	**35 minutes**
Candidate	_____	Class / date	_____

Instructions: Answer all sections. Use IB Biology terminology where appropriate. The source material for this worksheet is the supplied B1.1 text only. The final pages contain the answer key and marking guidance for teacher use.

Section A — Multiple-choice [5 marks]

1. Which formula fits a monosaccharide with six carbon atoms?
A. C6H6O6
B. C6H10O5
C. C6H12O6
D. C12H22O11

2. Ribose is classified as a pentose because it has
A. five oxygen atoms
B. five carbon atoms
C. five hydroxyl groups
D. a five-membered ring only

3. Which statement about glucose is correct?
A. It is non-polar and insoluble in water.
B. It is used only as a structural molecule.
C. It contains several hydroxyl groups and is polar.
D. It is a lipid monomer.

4. Which property of glucose makes it easy to circulate in blood?
A. Large molecular size
B. High water solubility
C. Hydrophobicity
D. Lack of covalent bonds

5. Which statement is true of deoxyribose according to the text?
A. It fits the general monosaccharide formula exactly.
B. It is a modified monosaccharide.
C. It has six carbons.
D. It is a disaccharide.

Section B — Short-answer questions [8 marks]

1. State what is meant by the terms pentose and hexose.

[2]

2. Predict the molecular formula of a triose and a pentose monosaccharide.

[2]

3. Explain why glucose is both soluble in water and suitable as a transport molecule in organisms.

[4]

Section C — Data response / case study [6 marks]

A teacher compares three carbon-based molecules for use in cells.

Molecule	Water solubility	Ease of transport in aqueous fluids	Energy released on oxidation (relative)
Glucose	High	High	High
Starch	Low	Low	Stored rather than transported directly
Triglyceride	Very low	Very low	Very high per gram

C1. Identify the molecule in the table that best matches the description 'directly usable and easily transported in blood'.

[1]

C2. Use the table and the text to explain why starch is not the main transport form of carbohydrate in animals.

[2]

C3. Suggest one reason why glucose remains important even though triglycerides store more energy per gram.

[3]

Section D — Extended response [6 marks]

D1. Explain the link between the structure of glucose and its importance in photosynthesis, respiration, transport and polysaccharide synthesis.

[6]

Worksheet 03 — Answer key and marking guidance

Teacher version • Since the source text contained no clearly marked HL-only section, questions are based on the common B1.1 content.

Section A — Multiple-choice answers

Item	Answer	Guidance
1	C	Monosaccharides follow the general formula CnH2nOn, so n = 6 gives C6H12O6.
2	B	Pentose refers to a five-carbon backbone.
3	C	Glucose contains multiple hydroxyl groups, making it polar and soluble.
4	B	Because glucose is polar, it dissolves readily in water and can be transported in aqueous fluids.
5	B	The text states that the formula CnH2nOn does not apply to modified monosaccharides such as deoxyribose.

Section B — Short-answer marking guidance

1. State what is meant by the terms pentose and hexose. **[2]**

• Pentose: a monosaccharide with five carbon atoms.

• Hexose: a monosaccharide with six carbon atoms.

2. Predict the molecular formula of a triose and a pentose monosaccharide. **[2]**

• Triose = C3H6O3.

• Pentose = C5H10O5.

3. Explain why glucose is both soluble in water and suitable as a transport molecule in organisms. **[4]**

• Glucose has several hydroxyl groups.

• These O–H bonds make the molecule polar.

• Polar molecules dissolve in water.

• Because body fluids are aqueous, dissolved glucose can be transported in blood and tissue fluid.

Section C — Data response marking guidance

A teacher compares three carbon-based molecules for use in cells.

C1. Identify the molecule in the table that best matches the description 'directly usable and easily transported in blood'. **[1]**

• Glucose.

C2. Use the table and the text to explain why starch is not the main transport form of carbohydrate in animals. **[2]**

• Starch has low solubility in water.

• Therefore it is not readily transported in aqueous body fluids.

C3. Suggest one reason why glucose remains important even though triglycerides store more energy per gram. **[3]**

• Glucose is soluble and easily transported.

• Glucose can be used directly in respiration.

• It also provides a stable, readily available short-term energy source.

Section D — Extended response marking guidance

Explain the link between the structure of glucose and its importance in photosynthesis, respiration, transport and polysaccharide synthesis. **[6]**

• Glucose is a six-carbon monosaccharide / hexose with formula $C_6H_{12}O_6$.

• It contains multiple hydroxyl groups, making it polar.

• Its polarity makes it highly soluble and therefore transportable in aqueous fluids.

• Stable covalent bonds contribute to molecular stability.

• Oxidation of glucose yields a large amount of chemical energy, so it is useful in respiration.

• Glucose also acts as a monomer for polysaccharides such as starch, glycogen and cellulose.

Level	Descriptor
0	Response does not reach a standard described by the descriptors below.
1–2	Limited biological knowledge; major omissions; little linkage between structure and function; uses terminology inconsistently.
3–4	Adequate explanation with some correct biological links and examples from B1.1, but uneven depth or limited comparison/evaluation.
5–6	Clear, accurate explanation using relevant B1.1 terminology and explicit structure–function links; well organised.

Teacher note: Award marks for biologically correct alternatives that stay within the supplied B1.1 content, even if wording differs from the points listed above.