Worksheet 02 • Condensation and hydrolysis

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

Worksheet	**Worksheet 02**	**Focus**	**Monomers, polymers, digestion and synthesis of macromolecu**
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. A condensation reaction that joins monomers always produces
A. oxygen gas
B. water
C. carbon dioxide
D. ATP

2. During hydrolysis, water acts as a
A. product only
B. reactant that is split
C. catalyst
D. source of carbon

3. Which pairing of macromolecule and monomer is correct?
A. Protein — nucleotide
B. Nucleic acid — amino acid
C. Carbohydrate — monosaccharide
D. Lipid — glucose

4. The bond formed between two amino acids is called a
A. glycosidic bond
B. peptide bond
C. ester bond
D. ionic bond

5. Which enzyme name most clearly suggests hydrolysis of sucrose?
A. Sucrase
B. Pepsin
C. Invert
D. Catalase

Section B — Short-answer questions [8 marks]

1. Define the terms monomer and polymer.

[2]

2. If 18 amino acids are joined into one polypeptide, calculate the number of peptide bonds and water molecules formed.

[2]

3. Using the taco example from the text, outline how protein eaten in food can become a protein in a body cell.

[4]

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

A student models digestion and synthesis using a simple sequence of reactions involving lactose and a storage polymer.

Stage	Starting material(s)	Observed / expected products	Likely reaction type
1	Lactose + water	Glucose + galactose	Hydrolysis
2	Many glucose molecules	Starch + many water molecules	Condensation
3	Protein + many water molecules	Many amino acids	Hydrolysis
4	Many amino acids	Polypeptide + many water molecules	Condensation

C1. State the reaction type occurring in stage 1.

[1]

C2. Explain why water appears on opposite sides of the equations in stages 2 and 3.

[3]

C3. Suggest why both reaction types require enzymes in living organisms.

[2]

Section D — Extended response [6 marks]

D1. Compare condensation and hydrolysis reactions and explain why both are essential parts of metabolism.

[6]

Worksheet 02 — 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	B	Water is formed in every condensation reaction described in the text.
2	B	Hydrolysis breaks covalent bonds by splitting water into components added to the products.
3	C	Carbohydrates are made from monosaccharides.
4	B	Condensation between amino acids forms a peptide bond.
5	A	The text notes the common naming practice of substrate + -ase, e.g. sucrase.

Section B — Short-answer marking guidance

1. Define the terms monomer and polymer. **[2]**

• Monomer: a smaller subunit / building block molecule.

• Polymer: a larger molecule made by linking many monomers together.

2. If 18 amino acids are joined into one polypeptide, calculate the number of peptide bonds and water molecules formed. **[2]**

• 17 peptide bonds formed.

• 17 water molecules formed.

3. Using the taco example from the text, outline how protein eaten in food can become a protein in a body cell. **[4]**

• Protein in food is hydrolysed in the digestive system.

• Hydrolysis produces amino acids.

• Amino acids are absorbed into the bloodstream and delivered to body cells.

• DNA directs condensation reactions that join amino acids to form a specific protein.

Section C — Data response marking guidance

A student models digestion and synthesis using a simple sequence of reactions involving lactose and a storage polymer.

C1. State the reaction type occurring in stage 1. **[1]**

• Hydrolysis.

C2. Explain why water appears on opposite sides of the equations in stages 2 and 3. **[3]**

• In condensation, water is produced when monomers are linked.

• In hydrolysis, water is a reactant that is split to break covalent bonds.

• Therefore stage 2 releases water, whereas stage 3 uses water.

C3. Suggest why both reaction types require enzymes in living organisms. **[2]**

• Enzymes catalyse the reactions / lower activation energy.

• This allows the reactions to proceed at useful rates under biological conditions.

Section D — Extended response marking guidance

Compare condensation and hydrolysis reactions and explain why both are essential parts of metabolism. **[6]**

• Condensation joins monomers to form larger molecules / polymers.

• Hydrolysis breaks polymers into smaller molecules / monomers.

• Water is produced in condensation but consumed and split in hydrolysis.

• Examples may include formation/breakdown of polysaccharides, proteins or nucleic acids.

• Hydrolysis is needed for digestion and mobilization of stored molecules.

• Condensation is needed for biosynthesis of cell components after monomers are absorbed into cells.

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.