Exercise walk-through

1.1 Environmental systems, feedback and perspectives

International Baccalaureate · IB Diploma · Environmental Systems and Societies ·

INTERNATIONAL BACCALAUREATE · IB DIPLOMA · ENVIRONMENTAL SYSTEMS AND SOCIETIES · HL • EXERCISE SHEET

1.1 Environmental systems, feedback and perspectives

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

KEY WORDS stock • flow

Objective

Environmental systems, feedback and perspectives. Original classroom practice for IB HL; not an official IB paper.

1 Key knowledge and worked examples

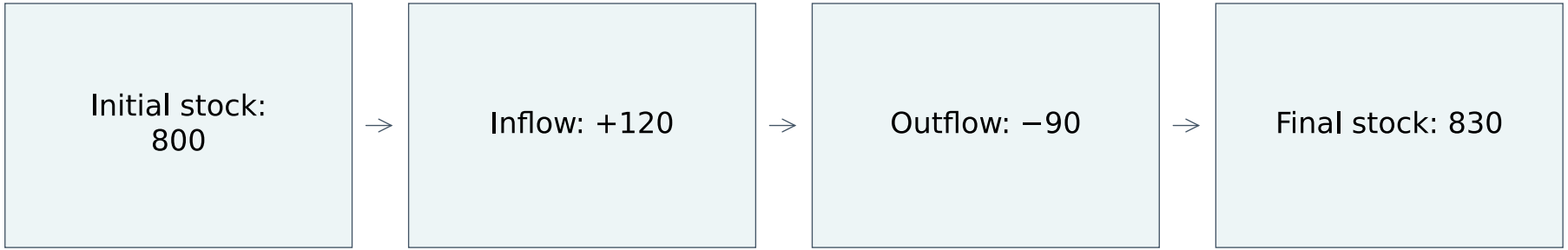
What would explain this observation?

- A lake can respond to the same nutrient input differently depending on its current state. Environmental outcomes depend on **stocks**, **flows** and feedback.

Build the model

- A system model has a boundary, stores and flows.
- Negative feedback counteracts change; positive feedback amplifies it.
- An environmental perspective shapes what people value and which management outcomes they prioritize.

- stock: An amount held within a system.
- flow: Transfer of an amount per unit time.



Choose evidence that can test it

- Separate physical evidence from value judgements.
- A stock is an amount at a time; a flow is an amount per time.
- Sustainability decisions require ecological, social and economic evidence and a stated scale.

In the lab: Draw the system boundary before calculating a budget. Identify inflows, outflows and possible unmeasured terms. Compare stakeholder claims using the same evidence, then explain where values lead to different choices.

Work from known quantities

- Known: a reservoir begins with 800 units, receives 120 and loses 90 during a week.

- Change in storage = inflow-outflow = 120-90 = 30.
- Final storage = 800+30 = 830 units.
- The model assumes no omitted flow.

Your turn: A stock starts at 600, receives 80 and loses 110. Find final stock.

■ Check the conclusion and its limits

- A balance that closes mathematically can still omit a real process if terms were estimated to fit.
- Positive feedback does not mean a socially desirable result.

Not true: Positive feedback always produces a socially beneficial outcome. "Positive" in positive feedback means the change is AMPLIFIED, not that the outcome is good.

Melting permafrost releasing methane is positive feedback with harmful consequences; desirability is a separate judgement.

Key:

- A system model has a boundary, stores and flows.
- Separate physical evidence from value judgements.
- Watch for: A balance that closes mathematically can still omit a real process if terms were estimated to fit.

■ Write from a final stock of 475

- A store starts at 450 units, receives 60 and loses 35.
- Find the final stock. Positive feedback means a change is amplified, not that the

outcome is good.

Exercises 2.1·2.3

2.1 What makes a reservoir budget incomplete? Choose one answer.

- **A** An unmeasured outflow
- **B** An explicit boundary
- **C** Consistent units [1]

2.2 A stock starts at 600, receives 80 and loses 110. Find final stock. Show the relation, substitution and units. [2]

2.3 Decide whether this claim is true and justify: “Positive” in positive feedback means the change is AMPLIFIED, not that the outcome is good. [2]

Exercises 2.1·2.3

2.1 What makes a reservoir budget incomplete? Choose one answer.

- **A** An unmeasured outflow
- **B** An explicit boundary
- **C** Consistent units [1]

2.1 A A budget is incomplete if any real flow is missing: an unmeasured outflow means the books balance only because something was ignored. Consistent units and an explicit boundary are features of a good budget, not defects.

2.2 A stock starts at 600, receives 80 and loses 110. Find final stock. Show the relation, substitution and units. [2]

2.2 final stock$=600+80-110=570$units.

2.3 Decide whether this claim is true and justify: “Positive” in positive feedback means the change is AMPLIFIED, not that the outcome is good. [2]

2.3 True. True. “Positive” in positive feedback means the change is AMPLIFIED, not that the outcome is good. Melting permafrost releasing methane is positive feedback with harmful consequences; desirability is a separate judgement.

Exercises 2.4·3.1

2.4 An amount held within a system: write the technical term. [1]

3.1 A fictional reservoir starts at 500, receives 90 and ends at 550. Evaporation is 20. Infer other outflow and give an alternative explanation if measurements are uncertain. [4]

Exercises 2.4·3.1

2.4 An amount held within a system: write the technical term. [1]

2.4 stock. stock means An amount held within a system.

3.1 A fictional reservoir starts at 500, receives 90 and ends at 550. Evaporation is 20. Infer other outflow and give an alternative explanation if measurements are uncertain. [4]

3.1 Total outflow40, other outflow20. The balance assumes complete flows; errors or omitted inflows change the inference. Distinguish stocks from rates.