Perduria Academic Press **IB DP ESS (2026)**

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Structured Focus Companion

Topic 4 - SL Ch4 Water Part 1

Predictable lesson routine, literal key terms, command-term answer formulas, and single-step exam tasks.

Unit Scope	Topic 4 - SL Ch4 Water Part 1
Syllabus Objectives	4.1.1-4.1.4, 4.1.4-4.1.6, 4.1.5, 4.1.6, 4.2.1-4.2.2, 4.2.3, 4.2.3-4.2.4, 4.2.6-4.2.7, 4.2.8, 4.3.1-4.3.5
Routine Structure	Step 0 Start Here -> 1 Target -> 2 Literal Words -> 3 Model -> 4 Practice -> 5 Check
Print Layout	Every lesson sits on one double-sided 2-page spread (pp. 3+)

How to Use This Companion

- Complete Step 0 (Start Here) first so you begin without blank-page delay.
- Read Card 3 (Command-Term Formula & Full-Mark Model) before writing Card 4.
- Complete one numbered verb step at a time and tick [ ] in the right column.
- Tick Core Tasks Complete before attempting the Optional Extension Synthesis.

Lesson Print Index (Two Pages Per Lesson)

Every lesson follows the same six numbered blocks across two A4 pages. Print the two odd-to-even pages listed below for any single lesson as one double-sided sheet.

Lesson	Topic Title	Objectives	Pages
Lesson 1	Water stores and flows	4.1.1-4.1.4	pp. 3-4
Lesson 2	Land use and water movement	4.1.5	pp. 5-6
Lesson 3	Water budgets and sustainable abstraction	4.1.6	pp. 7-8
Lesson 4	Runoff model practical	4.1.4-4.1.6	pp. 9-10
Lesson 5	Water security and scarcity	4.2.1-4.2.2	pp. 11-12
Lesson 6	Increasing water supply	4.2.3-4.2.4	pp. 13-14
Lesson 7	Reducing water demand	4.2.6-4.2.7	pp. 15-16
Lesson 8	Singapore water management	4.2.8	pp. 17-18
Lesson 9	Water-use audit	4.2.3	pp. 19-20
Lesson 10	Aquatic food webs and fisheries	4.3.1-4.3.5	pp. 21-22

Core Command-Term Answer Formulas

Command Word	Level	Slot Formula	Marking Rule
State	AO1	[Exact Name or Value] + [SI Unit if numerical]	1 mark per distinct item stated.
Define	AO1	[Category or System] + [Exact Distinguishing Feature]	1 mark for category, 1 mark for distinguishing condition.
Outline	AO2	[Key Stage 1] -> [Key Stage 2]	1 mark per distinct stage.
Describe	AO2	[Trend Direction] + [Data Figure 1 + Unit] -> [Rate or Pattern Change]	1 mark for overall trend, 1-2 marks for quoted figures with units.
Calculate	AO2	[Equation] -> [Unit Check & Substitution] -> [Final Value + Unit]	1 mark for correct method, 1 mark for final value with unit.
Explain	AO2	[M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect]	1 mark per completed link across the chain.
Compare and contrast	AO3	[Shared Feature (both)] + [Point of Difference (A whereas B)]	Never write separate unlinked paragraphs for A and B.
Evaluate	AO3	[Criterion] + [Strength + Evidence] + [Limitation + Evidence] + [Judgement]	Full marks require balanced evidence plus a justified conclusion.

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IB DP ESS (2026) · SL Core **Name: _____ Date: _____**

Lesson 1: Water stores and flows

Objectives (4.1.1-4.1.4): Solar energy drives evaporation. Gravity drives drainage

[0] Start Here	[1] Target	[2] Literal Words	[3] Formula & Model	[4] My Turn	[5] Finish Check

0. Start Here · First 60 Seconds [ ] Done

1. Read Term 1 ('Lag time') in Card 2 and underline its main defining condition.

1. What Am I Learning?

Solar energy drives evaporation. Gravity drives drainage

Scope: 1 worked model | 2 structured tasks | 1 finish check



Water stores and flows

2. What Do the Key Words Mean Literally?

Term	Literal Meaning (1 Sentence)	Do Not Confuse With
Lag time	time delay between peak rainfall and peak discharge	Not Peak discharge: maximum stream volume flowing per unit time
Peak discharge	maximum stream volume flowing per unit time	Not Impervious surface: artificial ground cover preventing water infiltration
Impervious surface	artificial ground cover preventing water infiltration	Not Infiltration capacity: maximum rate at which soil absorbs precipitation
Infiltration capacity	maximum rate at which soil absorbs precipitation	Not Lag time: time delay between peak rainfall and peak discharge

3A. Command-Term Formula · Explain (AO2) **Suggested pace: ~5 min**

Rule: Give the full cause-mechanism-effect chain. Do not stop after naming the outcome.

Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect] | 1 mark per completed link across the chain.

3B. Full-Mark Worked Model (Explain · 3 / 3 Marks)

Prompt: Explain how water stores and flows operates.

[M1] Solar energy drives evaporation. Gravity drives drainage.

[M2] Oceans contain most water. Accessible surface freshwater is a tiny share.

[M3] Water moves through transfers and changes state through transformations.

Trap avoided: Naming M1 alone without the mechanism earns 1/3.

4A. Guided Practice (Use Slots: [Key Stage 1] -> [Key Stage 2]) | ~4 min

1. OUTLINE Two linked mechanisms connecting Lag time and Peak discharge. _____	**[ ]**

4B. Independent Exam Turn (Explain Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect]) | ~4 min

1. EXPLAIN How a measurable change in lag time alters the outcome. _____	**[ ]**

Core Tasks Complete [ ] -> Optional Extension Synthesis

Extension: Predict one consequence if lag time changes abruptly, and justify your mechanism.

5. Finish Check & Reset · ~1 min

- [ ] Matched every bold command word in Card 4.
- [ ] Included exact names, slot links, and units where required.
- [ ] Completed a 20-second posture and focus reset.

IB DP ESS (2026) · SL Core **Name: _____ Date: _____**

Lesson 2: Land use and water movement

Objectives (4.1.5): Vegetation intercepts rain and returns water by transpiration

[0] Start Here	[1] Target	[2] Literal Words	[3] Formula & Model	[4] My Turn	[5] Finish Check

0. Start Here · First 60 Seconds **[ ] Done**

1. Read Term 1 ('Percolation') in Card 2 and underline its main defining condition.

1. What Am I Learning?

Vegetation intercepts rain and returns water by transpiration

Scope: 1 worked model | 2 structured tasks | 1 finish check

Core Mechanism

Vegetation intercepts rain and returns water by transpiration

2. What Do the Key Words Mean Literally?

Term	Literal Meaning (1 Sentence)	Do Not Confuse With
Percolation	The downward movement of water through saturated soil layers and porous rock strata under.	Not Infiltration: The physical process by which water on the ground surface enters the upper.
Infiltration	The physical process by which water on the ground surface enters the upper soil.	Not Transpiration: The physiological evaporation of water vapour from plant aerial tissues, predominantly through foliar.
Transpiration	The physiological evaporation of water vapour from plant aerial tissues, predominantly through foliar stomata	Not Riparian: The distinct interface zone between terrestrial land and a surface river, stream.
Riparian	The distinct interface zone between terrestrial land and a surface river, stream, or freshwater.	Not Percolation: The downward movement of water through saturated soil layers and porous rock strata.

3A. Command-Term Formula · Explain (AO2) **Suggested pace: ~5 min**

Rule: Give the full cause-mechanism-effect chain. Do not stop after naming the outcome.

Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect] | 1 mark per completed link across the chain.

3B. Full-Mark Worked Model (Explain · 3 / 3 Marks)

Prompt: Explain how land use and water movement operates.

[M1] Vegetation intercepts rain and returns water by transpiration.

[M2] Impermeable surfaces reduce infiltration.

[M3] Faster runoff can increase flood peaks.

Trap avoided: Naming M1 alone without the mechanism earns 1/3.

4A. Guided Practice (Use Slots: [Key Stage 1] -> [Key Stage 2]) | ~4 min

1. OUTLINE Two linked mechanisms connecting Percolation and Infiltration.

_____ **[ ]**

4B. Independent Exam Turn (Explain Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect]) | ~4 min

1. EXPLAIN How a measurable change in percolation alters the outcome.

_____ **[ ]**

Core Tasks Complete [ ] -> Optional Extension Synthesis

Extension: Predict one consequence if percolation changes abruptly, and justify your mechanism.

5. Finish Check & Reset · ~1 min

- [ ] Matched every bold command word in Card 4.
- [ ] Included exact names, slot links, and units where required.
- [ ] Completed a 20-second posture and focus reset.

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IB DP ESS (2026) · SL Core **Name: _____ Date: _____**

Lesson 3: Water budgets and sustainable abstraction

Objectives (4.1.6): Storage change equals inputs minus outputs

[0] Start Here	[1] Target	[2] Literal Words	[3] Formula & Model	[4] My Turn	[5] Finish Check

0. Start Here · First 60 Seconds **[ ] Done**

1. Read Term 1 ('Evapotranspiration') in Card 2 and underline its main defining condition.

1. What Am I Learning?

Storage change equals inputs minus outputs

Scope: 1 worked model | 2 structured tasks | 1 finish check

Core Mechanism

Storage change equals inputs minus outputs

2. What Do the Key Words Mean Literally?

Term	Literal Meaning (1 Sentence)	Do Not Confuse With
Evapotranspiration	The combined total flux of water returning to the atmosphere via physical evaporation.	Not Salinisation: The accumulation of water-soluble mineral salts in upper soil profiles or aquifers, frequently.
Salinisation	The accumulation of water-soluble mineral salts in upper soil profiles or aquifers, frequently induced.	Not Thermohaline circulation: deep-ocean conveyor driven by temperature and salinity density differences
Thermohaline circulation	deep-ocean conveyor driven by temperature and salinity density differences	Not Pycnocline: ocean layer where water density increases rapidly with depth
Pycnocline	ocean layer where water density increases rapidly with depth	Not Evapotranspiration: The combined total flux of water returning to the atmosphere via physical evaporation.

3A. Command-Term Formula · Explain (AO2) **Suggested pace: ~5 min**

Rule: Give the full cause-mechanism-effect chain. Do not stop after naming the outcome.

Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect] | 1 mark per completed link across the chain.

3B. Full-Mark Worked Model (Explain · 3 / 3 Marks)

Prompt: Explain how water budgets and sustainable abstraction operates.

[M1] Storage change equals inputs minus outputs.

[M2] Abstraction is an output.

[M3] A sustainable rate must also protect environmental flows and quality.

Trap avoided: Naming M1 alone without the mechanism earns 1/3.

4A. Guided Practice (Use Slots: [Key Stage 1] -> [Key Stage 2]) | ~4 min

1. OUTLINE Two linked mechanisms connecting Evapotranspiration and Salinisation. _____	**[ ]**

4B. Independent Exam Turn (Explain Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect]) | ~4 min

1. EXPLAIN How a measurable change in evapotranspiration alters the outcome. _____	**[ ]**

Core Tasks Complete [ ] -> Optional Extension Synthesis

Extension: Predict one consequence if evapotranspiration changes abruptly, and justify your mechanism.

5. Finish Check & Reset · ~1 min

- [ ] Matched every bold command word in Card 4.
- [ ] Included exact names, slot links, and units where required.
- [ ] Completed a 20-second posture and focus reset.

IB DP ESS (2026) · SL Core Name: _____ Date: _____

Lesson 4: Runoff model practical

Objectives (4.1.4-4.1.6): A model comparison should change one factor at a time

[0] Start Here	[1] Target	[2] Literal Words	[3] Formula & Model	[4] My Turn	[5] Finish Check

0. Start Here · First 60 Seconds [ ] Done

1. Read Term 1 ('Salinity') in Card 2 and underline its main defining condition.

1. What Am I Learning?

A model comparison should change one factor at a time

Scope: 1 worked model | 2 structured tasks | 1 finish check

Core Mechanism

A model comparison should change one factor at a time

2. What Do the Key Words Mean Literally?

Term	Literal Meaning (1 Sentence)	Do Not Confuse With
Salinity	total dissolved mineral salts in seawater	Not Dissolved oxygen: free non-compound oxygen dissolved in water
Dissolved oxygen	free non-compound oxygen dissolved in water	Not Specific energy consumption: electricity consumed per volume of freshwater produced
Specific energy consumption	electricity consumed per volume of freshwater produced	Not Water reclamation: advanced purification of municipal wastewater to potable standards
Water reclamation	advanced purification of municipal wastewater to potable standards	Not Salinity: total dissolved mineral salts in seawater

3A. Command-Term Formula · Explain (AO2) **Suggested pace: ~5 min**

Rule: Give the full cause-mechanism-effect chain. Do not stop after naming the outcome.

Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect] | 1 mark per completed link across the chain.

3B. Full-Mark Worked Model (Explain · 3 / 3 Marks)

Prompt: Explain how runoff model practical operates.

[M1] A model comparison should change one factor at a time.

[M2] Measure both runoff volume and collection time.

[M3] Model results need cautious transfer to real catchments.

Trap avoided: Naming M1 alone without the mechanism earns 1/3.

4A. Guided Practice (Use Slots: [Key Stage 1] -> [Key Stage 2]) | ~4 min

1. OUTLINE Two linked mechanisms connecting Salinity and Dissolved oxygen.

_____

[ ]

4B. Independent Exam Turn (Explain Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect]) | ~4 min

1. EXPLAIN How a measurable change in salinity alters the outcome.

_____

[ ]

Core Tasks Complete [ ] -> Optional Extension Synthesis

Extension: Predict one consequence if salinity changes abruptly, and justify your mechanism.

5. Finish Check & Reset · ~1 min

- [ ] Matched every bold command word in Card 4.
- [ ] Included exact names, slot links, and units where required.
- [ ] Completed a 20-second posture and focus reset.

IB DP ESS (2026) · SL Core **Name: _____ Date: _____**

Lesson 5: Water security and scarcity

Objectives (4.2.1-4.2.2): Water security requires sufficient safe accessible water

[0] Start Here	[1] Target	[2] Literal Words	[3] Formula & Model	[4] My Turn	[5] Finish Check

0. Start Here · First 60 Seconds **[ ] Done**

1. Read Term 1 ('Specific energy consumption') in Card 2 and underline its main defining condition.

1. What Am I Learning?

Water security requires sufficient safe accessible water

Scope: 1 worked model | 2 structured tasks | 1 finish check

Core Mechanism

Water security requires sufficient safe accessible water

2. What Do the Key Words Mean Literally?

Term	Literal Meaning (1 Sentence)	Do Not Confuse With
Specific energy consumption	electricity consumed per volume of freshwater produced	Not Water reclamation: advanced purification of municipal wastewater to potable standards
Water reclamation	advanced purification of municipal wastewater to potable standards	Not Reverse osmosis: membrane separation forcing water through pores against osmotic pressure
Reverse osmosis	membrane separation forcing water through pores against osmotic pressure	Not Water security: reliable access to sufficient quantities of acceptable quality water
Water security	reliable access to sufficient quantities of acceptable quality water	Not Specific energy consumption: electricity consumed per volume of freshwater produced

3A. Command-Term Formula · Explain (AO2) **Suggested pace: ~5 min**

Rule: Give the full cause-mechanism-effect chain. Do not stop after naming the outcome.

Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect] | 1 mark per completed link across the chain.

3B. Full-Mark Worked Model (Explain · 3 / 3 Marks)

Prompt: Explain how water security and scarcity operates.

[M1] Water security requires sufficient safe accessible water.

[M2] Physical scarcity concerns limited available water.

[M3] Economic scarcity concerns inadequate infrastructure or access.

Trap avoided: Naming M1 alone without the mechanism earns 1/3.

4A. Guided Practice (Use Slots: [Key Stage 1] -> [Key Stage 2]) | ~4 min

1. OUTLINE Two linked mechanisms connecting Specific energy consumption and Water reclamation. _____	**[ ]**

4B. Independent Exam Turn (Explain Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect]) | ~4 min

1. EXPLAIN How a measurable change in specific energy consumption alters the outcome. _____	**[ ]**

Core Tasks Complete [ ] -> Optional Extension Synthesis

Extension: Predict one consequence if specific energy consumption changes abruptly, and justify your mechanism.

5. Finish Check & Reset · ~1 min

- [ ] Matched every bold command word in Card 4.
- [ ] Included exact names, slot links, and units where required.
- [ ] Completed a 20-second posture and focus reset.

IB DP ESS (2026) · SL Core **Name: _____ Date: _____**

Lesson 6: Increasing water supply

Objectives (4.2.3-4.2.4): Dams store water but alter river systems

[0] Start Here	[1] Target	[2] Literal Words	[3] Formula & Model	[4] My Turn	[5] Finish Check

0. Start Here · First 60 Seconds **[ ] Done**

1. Read Term 1 ('Desalination') in Card 2 and underline its main defining condition.

1. What Am I Learning?

Dams store water but alter river systems

Scope: 1 worked model | 2 structured tasks | 1 finish check

Core Mechanism

Dams store water but alter river systems

2. What Do the Key Words Mean Literally?

Term	Literal Meaning (1 Sentence)	Do Not Confuse With
Desalination	Industrial separation processes (reverse osmosis, thermal distillation) that remove dissolved mineral salts from saline.	Not Reverse osmosis: membrane separation forcing water through pores against osmotic pressure
Reverse osmosis	membrane separation forcing water through pores against osmotic pressure	Not Water security: reliable access to sufficient quantities of acceptable quality water
Water security	reliable access to sufficient quantities of acceptable quality water	Not Transboundary basin: river catchment shared across sovereign international political borders
Transboundary basin	river catchment shared across sovereign international political borders	Not Desalination: Industrial separation processes (reverse osmosis, thermal distillation) that remove dissolved mineral salts.

3A. Command-Term Formula · Explain (AO2) **Suggested pace: ~5 min**

Rule: Give the full cause-mechanism-effect chain. Do not stop after naming the outcome.

Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect] | 1 mark per completed link across the chain.

3B. Full-Mark Worked Model (Explain · 3 / 3 Marks)

Prompt: Explain how increasing water supply operates.

[M1] Dams store water but alter river systems.

[M2] Desalination removes salts and needs energy.

[M3] Rainwater harvesting and wetland protection can support supply.

Trap avoided: Naming M1 alone without the mechanism earns 1/3.

4A. Guided Practice (Use Slots: [Key Stage 1] -> [Key Stage 2]) | ~4 min

1. OUTLINE Two linked mechanisms connecting Desalination and Reverse osmosis. _____	**[ ]**

4B. Independent Exam Turn (Explain Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect]) | ~4 min

1. EXPLAIN How a measurable change in desalination alters the outcome. _____	**[ ]**

Core Tasks Complete [ ] -> Optional Extension Synthesis

Extension: Predict one consequence if desalination changes abruptly, and justify your mechanism.

5. Finish Check & Reset · ~1 min

- [ ] Matched every bold command word in Card 4.
- [ ] Included exact names, slot links, and units where required.
- [ ] Completed a 20-second posture and focus reset.

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Name: _____ Date: _____

Lesson 7: Reducing water demand

Objectives (4.2.6-4.2.7): Domestic conservation can reduce avoidable use

[0] Start Here	[1] Target	[2] Literal Words	[3] Formula & Model	[4] My Turn	[5] Finish Check

0. Start Here · First 60 Seconds [ ] Done

1. Read Term 1 ('Transboundary basin') in Card 2 and underline its main defining condition.

1. What Am I Learning?

Domestic conservation can reduce avoidable use

Scope: 1 worked model | 2 structured tasks | 1 finish check

Core Mechanism

Domestic conservation can reduce avoidable use

2. What Do the Key Words Mean Literally?

Term	Literal Meaning (1 Sentence)	Do Not Confuse With
Transboundary basin	river catchment shared across sovereign international political borders	Not Impoundment rate: annual volume of streamflow captured behind a dam
Impoundment rate	annual volume of streamflow captured behind a dam	Not Consumptive use: water extracted from a catchment that is not returned to streamflow
Consumptive use	water extracted from a catchment that is not returned to streamflow	Not Equitable utilisation: international legal doctrine balancing fair water use among riparians
Equitable utilisation	international legal doctrine balancing fair water use among riparians	Not Transboundary basin: river catchment shared across sovereign international political borders

3A. Command-Term Formula · Explain (AO2) **Suggested pace: ~5 min**

Rule: Give the full cause-mechanism-effect chain. Do not stop after naming the outcome.

Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect] | 1 mark per completed link across the chain.

3B. Full-Mark Worked Model (Explain · 3 / 3 Marks)

Prompt: Explain how reducing water demand operates.

[M1] Domestic conservation can reduce avoidable use.

[M2] Efficient irrigation and crop choices influence agricultural demand.

[M3] Efficiency gains can be offset if total activity expands.

Trap avoided: Naming M1 alone without the mechanism earns 1/3.

4A. Guided Practice (Use Slots: [Key Stage 1] -> [Key Stage 2]) | ~4 min

1. OUTLINE Two linked mechanisms connecting Transboundary basin and Impoundment rate. _____	**[ ]**

4B. Independent Exam Turn (Explain Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect]) | ~4 min

1. EXPLAIN How a measurable change in transboundary basin alters the outcome. _____	**[ ]**

Core Tasks Complete [ ] -> Optional Extension Synthesis

Extension: Predict one consequence if transboundary basin changes abruptly, and justify your mechanism.

5. Finish Check & Reset · ~1 min

- [ ] Matched every bold command word in Card 4.
- [ ] Included exact names, slot links, and units where required.
- [ ] Completed a 20-second posture and focus reset.

IB DP ESS (2026) · SL Core **Name: _____ Date: _____**

Lesson 8: Singapore water management

Objectives (4.2.8): Singapore combines catchment water, imports, NEWater and desalination

[0] Start Here	[1] Target	[2] Literal Words	[3] Formula & Model	[4] My Turn	[5] Finish Check

0. Start Here · First 60 Seconds **[ ] Done**

1. Read Term 1 ('Desalination') in Card 2 and underline its main defining condition.

1. What Am I Learning?

Singapore combines catchment water, imports, NEWater and desalination

Scope: 1 worked model | 2 structured tasks | 1 finish check

Core Mechanism

Singapore combines catchment water, imports, NEWater and desalination

2. What Do the Key Words Mean Literally?

Term	Literal Meaning (1 Sentence)	Do Not Confuse With
Desalination	Industrial separation processes (reverse osmosis, thermal distillation) that remove dissolved mineral salts from saline.	Not Consumptive use: water extracted from a catchment that is not returned to streamflow
Consumptive use	water extracted from a catchment that is not returned to streamflow	Not Equitable utilisation: international legal doctrine balancing fair water use among riparians
Equitable utilisation	international legal doctrine balancing fair water use among riparians	Not Maximum sustainable yield: highest annual harvest harvested without depleting the breeding stock
Maximum sustainable yield	highest annual harvest harvested without depleting the breeding stock	Not Desalination: Industrial separation processes (reverse osmosis, thermal distillation) that remove dissolved mineral salts.

3A. Command-Term Formula · Explain (AO2) **Suggested pace: ~5 min**

Rule: Give the full cause-mechanism-effect chain. Do not stop after naming the outcome.

Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect] | 1 mark per completed link across the chain.

3B. Full-Mark Worked Model (Explain · 3 / 3 Marks)

Prompt: Explain how singapore water management operates.

[M1] Singapore combines catchment water, imports, NEWater and desalination.

[M2] Diversification reduces dependence on one source.

[M3] Water treatment, energy demand and public trust remain important.

Trap avoided: Naming M1 alone without the mechanism earns 1/3.

4A. Guided Practice (Use Slots: [Key Stage 1] -> [Key Stage 2]) | ~4 min

1. OUTLINE Two linked mechanisms connecting Desalination and Consumptive use. _____	**[ ]**

4B. Independent Exam Turn (Explain Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect]) | ~4 min

1. EXPLAIN How a measurable change in desalination alters the outcome. _____	**[ ]**

Core Tasks Complete [ ] -> Optional Extension Synthesis

Extension: Predict one consequence if desalination changes abruptly, and justify your mechanism.

5. Finish Check & Reset · ~1 min

- [ ] Matched every bold command word in Card 4.
- [ ] Included exact names, slot links, and units where required.
- [ ] Completed a 20-second posture and focus reset.

IB DP ESS (2026) · SL Core **Name: _____ Date: _____**

Lesson 9: Water-use audit

Objectives (4.2.3): An audit measures a defined activity and period

[0] Start Here	[1] Target	[2] Literal Words	[3] Formula & Model	[4] My Turn	[5] Finish Check

0. Start Here · First 60 Seconds **[ ] Done**

1. Read Term 1 ('Desalination') in Card 2 and underline its main defining condition.

1. What Am I Learning?

An audit measures a defined activity and period

Scope: 1 worked model | 2 structured tasks | 1 finish check

Core Mechanism

An audit measures a defined activity and period

2. What Do the Key Words Mean Literally?

Term	Literal Meaning (1 Sentence)	Do Not Confuse With
Desalination	Industrial separation processes (reverse osmosis, thermal distillation) that remove dissolved mineral salts from saline.	Not Maximum sustainable yield: highest annual harvest harvested without depleting the breeding stock
Maximum sustainable yield	highest annual harvest harvested without depleting the breeding stock	Not Carrying capacity: maximum population biomass an ecosystem supports sustainably
Carrying capacity	maximum population biomass an ecosystem supports sustainably	Not Spawning stock biomass: total mass of mature fish capable of reproduction
Spawning stock biomass	total mass of mature fish capable of reproduction	Not Desalination: Industrial separation processes (reverse osmosis, thermal distillation) that remove dissolved mineral salts.

3A. Command-Term Formula · Explain (AO2) **Suggested pace: ~5 min**

Rule: Give the full cause-mechanism-effect chain. Do not stop after naming the outcome.

Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect] | 1 mark per completed link across the chain.

3B. Full-Mark Worked Model (Explain · 3 / 3 Marks)

Prompt: Explain how water-use audit operates.

[M1] An audit measures a defined activity and period.

[M2] Use direct measurements where safe and avoid personal disclosures.

[M3] Check overlap before adding savings.

Trap avoided: Naming M1 alone without the mechanism earns 1/3.

4A. Guided Practice (Use Slots: [Key Stage 1] -> [Key Stage 2]) | ~4 min

1. OUTLINE Two linked mechanisms connecting Desalination and Maximum sustainable yield. _____	**[ ]**

4B. Independent Exam Turn (Explain Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect]) | ~4 min

1. EXPLAIN How a measurable change in desalination alters the outcome. _____	**[ ]**

Core Tasks Complete [ ] -> Optional Extension Synthesis

Extension: Predict one consequence if desalination changes abruptly, and justify your mechanism.

5. Finish Check & Reset · ~1 min

- [ ] Matched every bold command word in Card 4.
- [ ] Included exact names, slot links, and units where required.
- [ ] Completed a 20-second posture and focus reset.

IB DP ESS (2026) · SL Core **Name: _____ Date: _____**

Lesson 10: Aquatic food webs and fisheries

Objectives (4.3.1-4.3.5): Phytoplankton and macrophytes support aquatic production

[0] Start Here	[1] Target	[2] Literal Words	[3] Formula & Model	[4] My Turn	[5] Finish Check

0. Start Here · First 60 Seconds **[ ] Done**

1. Read Term 1 ('Phytoplankton') in Card 2 and underline its main defining condition.

1. What Am I Learning?

Phytoplankton and macrophytes support aquatic production

Scope: 1 worked model | 2 structured tasks | 1 finish check

Core Mechanism

Phytoplankton and macrophytes support aquatic production

2. What Do the Key Words Mean Literally?

Term	Literal Meaning (1 Sentence)	Do Not Confuse With
Phytoplankton	Microscopic autotrophic organisms inhabiting the sunlit upper layer of aquatic systems, serving.	Not Spawning stock biomass: total mass of mature fish capable of reproduction
Spawning stock biomass	total mass of mature fish capable of reproduction	Not Fishing effort: composite measure of fleet capacity, gear efficiency and operating days
Fishing effort	composite measure of fleet capacity, gear efficiency and operating days	Not Feed conversion ratio: mass of dry feed required to produce one unit mass of fish biomass
Feed conversion ratio	mass of dry feed required to produce one unit mass of fish biomass	Not Phytoplankton: Microscopic autotrophic organisms inhabiting the sunlit upper layer of aquatic systems, serving.

3A. Command-Term Formula · Explain (AO2) **Suggested pace: ~5 min**

Rule: Give the full cause-mechanism-effect chain. Do not stop after naming the outcome.

Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect] | 1 mark per completed link across the chain.

3B. Full-Mark Worked Model (Explain · 3 / 3 Marks)

Prompt: Explain how aquatic food webs and fisheries operates.

[M1] Phytoplankton and macrophytes support aquatic production.

[M2] Harvest can exceed replacement and reduce stocks.

[M3] Destructive fishing can damage habitats as well as target populations.

Trap avoided: Naming M1 alone without the mechanism earns 1/3.

4A. Guided Practice (Use Slots: [Key Stage 1] -> [Key Stage 2]) | ~4 min

1. OUTLINE Two linked mechanisms connecting Phytoplankton and Spawning stock biomass. _____	**[ ]**

4B. Independent Exam Turn (Explain Formula: [M1 · Cause] -> [M2 · Mechanism] -> [M3 · Measurable Effect]) | ~4 min

1. EXPLAIN How a measurable change in phytoplankton alters the outcome. _____	**[ ]**

Core Tasks Complete [ ] -> Optional Extension Synthesis

Extension: Predict one consequence if phytoplankton changes abruptly, and justify your mechanism.

5. Finish Check & Reset · ~1 min

- [ ] Matched every bold command word in Card 4.
- [ ] Included exact names, slot links, and units where required.
- [ ] Completed a 20-second posture and focus reset.