

Exercise walk-through

5.1

Climate evidence, energy budgets and policy

International Baccalaureate · IB Diploma · Physics · SL

5.1 Climate evidence, energy budgets and policy

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

KEY WORDS mitigation • adaptation

Objective

Climate evidence, energy budgets and policy. Supported SL concept preparation; original classroom practice, not an official IB paper or assessed learner work.

1 Key knowledge and worked examples

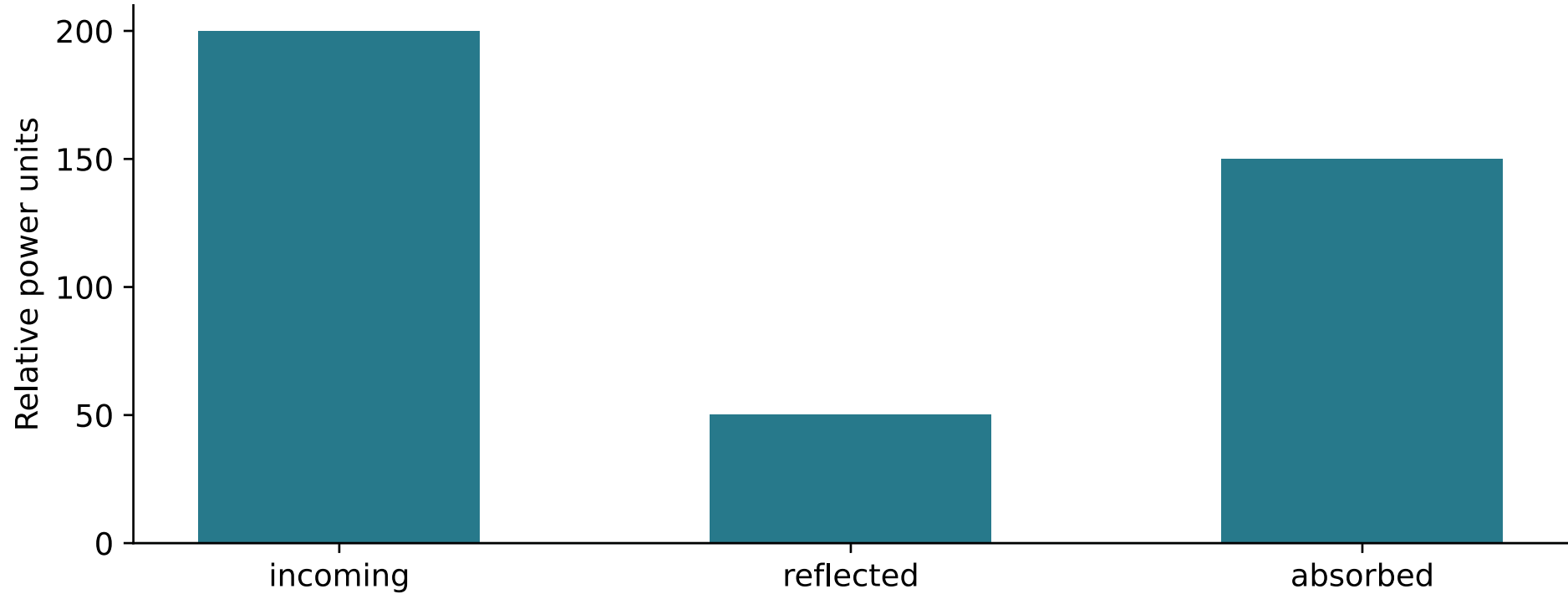
■ What would explain this observation?

- One cold day does not disprove a warming climate. Weather describes short-term conditions; climate describes distributions over longer times and regions.
- Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

■ Build the model

- The Earth energy balance includes incoming solar radiation, reflection, absorption and outgoing infrared radiation. Greenhouse gases absorb and emit infrared radiation. Feedback can alter the response to an initial forcing.

- **mitigation** : Actions addressing causes of environmental change; **adaptation** : Actions reducing harm from environmental impacts.



■ Choose evidence that can test it

- Distinguish mitigation, which addresses drivers, from adaptation, which reduces harm from impacts. A policy assessment needs evidence about effectiveness, cost, equity and uncertainty; one criterion is not the entire decision.
- Compare multi-year data using consistent baselines. State the region, timescale and uncertainty. At HL, connect a management decision to law, economics and ethics rather than treating these lenses as extra definitions only.

■ Work from known quantities

- State the known values and their units. Choose the relation because its assumptions

fit this case, then rearrange before substitution.

- Known: a surface receives 200 power units and reflects 50. Absorbed input = incoming-reflected = $200 - 50 = 150$. Reflected fraction = $50/200 = 0.25 = 25\%$. A change in reflectivity alters the absorbed budget under this model.

Example:

Incoming energy is 240 units and reflected energy 72. Find reflected percentage. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

■ Check the conclusion and its limits

- The greenhouse effect is not the same process as ozone depletion. A carbon footprint

estimate depends on its system boundary.

- Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

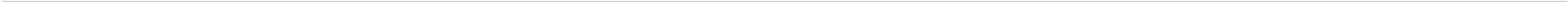
Warn:

One local weather observation establishes a global climate trend. This claim is false: The greenhouse effect is not the same process as ozone depletion. A carbon footprint estimate depends on its system boundary.

Key:

Climate evidence, energy budgets and policy: Distinguish mitigation, which addresses drivers, from adaptation, which reduces harm from impacts. A policy assessment needs evidence about effectiveness, cost, equity and uncertainty; one criterion is not the entire

decision.



Exercises 2.1-2.3

2.1 Which action is adaptation to flood risk? Choose one answer.

- **A** Raising vulnerable electrical equipment above expected flood level
- **B** Only measuring global CO₂
- **C** Pretending the risk is zero

[1]

2.2 Incoming energy is 240 units and reflected energy 72. Find reflected percentage. Show the relation, substitution and units.

[2]

2.3 Decide whether this claim is true and justify: One local weather observation establishes a global climate trend.

[2]

Exercises 2.1-2.3

2.1 Which action is adaptation to flood risk? Choose one answer.

- **A** Raising vulnerable electrical equipment above expected flood level
- **B** Only measuring global CO₂
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[1]

2.1 A Distinguish mitigation, which addresses drivers, from adaptation, which reduces harm from impacts. A policy assessment needs evidence about effectiveness, cost, equity and uncertainty; one criterion is not the entire decision.

2.2 Incoming energy is 240 units and reflected energy 72. Find reflected percentage. Show the relation, substitution and units.

[2]

2.2 reflected percentage = $72/240 \times 100 = 30\%$.

2.3 Decide whether this claim is true and justify: One local weather observation establishes a global climate trend.

[2]

2.3 False. The greenhouse effect is not the same process as ozone depletion. A carbon footprint estimate depends on its system boundary.

Exercises 2.4·3.1

2.4 Actions addressing causes of environmental change: write the technical term. [1]

3 Exam-style questions

3.1 Two fictional surfaces each receive 240 W/m^2 and reflect 60 and 96 W/m^2 . Compare

Exercises 2.4·3.1

2.4 Actions addressing causes of environmental change: write the technical term. [1]

3 Exam-style questions

2.4 mitigation. mitigation means Actions addressing causes of environmental change.

3.1 Two fictional surfaces each receive 240 W/m^2 and reflect 60 and 96 W/m^2 . Compare

3.1 Absorbed inputs 180 and 144 W/m^2 . The first absorbs 36 more. Emission, transport and other boundary conditions are also needed for equilibrium temperatures; mitigation/adaptation judgements require additional evidence.