Revision practice

International Baccalaureate · IB Diploma · Environmental Systems and Societies · HL

Original open focus revision; complete specification coverage remains unfinished.

1 Environmental systems, feedback and perspectives

- stock
- flow

Question 1

What makes a reservoir budget incomplete?

- An unmeasured outflow
- Consistent units
- An explicit boundary

Available marks: 2.

Worked answer

An unmeasured outflow

- 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.

Question 2

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

Available marks: 4.

Worked answer

570

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

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.

2 Sampling populations without choosing the answer

- quadrat
- population

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Question 1

Which method investigates change from a path into woodland?

- Choose only large plants
- Use a transect with fixed sampling distances
- Take one convenient sample

Available marks: 2.

Worked answer

Use a transect with fixed sampling distances

- Estimate total abundance by multiplying mean density by area, with consistent units. This assumes sampled areas represent the habitat. Patchiness and too few samples widen uncertainty.

Question 2

Mean count is 6 in a 0.5 square metre quadrat. Find density per square metre.

Available marks: 4.

Worked answer

12

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

Quadrats suit organisms that do not move quickly. A food chain arrow shows the direction of energy transfer, not the direction a predator travels.

3 Biodiversity, conservation and sampling evidence

- species richness
- evenness

Question 1

Two sites have three species each. Which can still differ?

- Their evenness
- The definition of a species must change
- They must have identical conservation value

Available marks: 2.

Worked answer

Their evenness

- Compare surveys with similar area, effort, season and identification rules. A diversity index is meaningful only with its formula and conventions specified. Habitat fragmentation can affect movement and gene flow even when total area changes little.

■ Question 2

A survey records 6, 5, 3 and 2 individuals in four species. Find species richness.

Available marks: 4.

Worked answer

4 species

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

An index cannot by itself explain the cause of a difference. A newly recorded species may reflect improved observation rather than a recent ecological arrival.

4 Water, pollution and management trade-offs

- eutrophication
- pollutant load

■ Question 1

Which can occur after dilution without pollutant removal?

- Concentration decreases but pollutant mass remains
- All pollutant disappears
- The water becomes automatically safe

Available marks: 2.

Worked answer

Concentration decreases but pollutant mass remains

- Distinguish concentration from total pollutant load. Dilution can reduce concentration without removing the pollutant mass. A management plan should consider upstream causes, users and effects on other parts of the catchment.

■ Question 2

Concentration is 3 mg/L and flow 200 L/min. Find load in mg/min.

Available marks: 4.

Worked answer

600 mg/min

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

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Clear water is not necessarily safe water. Nutrient enrichment does not directly use up oxygen; the pathway includes biological activity and decomposition.

5 Land, food and resource decisions

- erosion
- resource

■ Question 1

Which comparison measures land productivity?

- Total harvest without land area
- Harvest divided by cultivated area
- Only fertilizer price

Available marks: 2.

Worked answer

Harvest divided by cultivated area

- Distinguish total yield from yield per area and energy input. Sustainable management must consider regeneration rates and impacts beyond the farm boundary. Different stakeholders may rank food security, biodiversity and income differently.

■ Question 2

A farm harvests 28 tonnes from 7 hectares. Find yield per hectare.

Available marks: 4.

Worked answer

4 t/ha

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

A high yield is not proof of long-term soil health. Renewable resources can be depleted when use exceeds regeneration.

6 Climate evidence, energy budgets and policy

- mitigation
- adaptation

■ Question 1

Which action is adaptation to flood risk?

- Raising vulnerable electrical equipment above expected flood level
- Measuring global CO_2 more often to track the cause

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- Assuming the risk is zero until a flood happens

Available marks: 2.

Worked answer

Raising vulnerable electrical equipment above expected flood level

- 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.

■ Question 2

Incoming energy is 240 units and reflected energy 72. Find reflected percentage.

Available marks: 4.

Worked answer

30 %

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

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

7 Population, urban systems and indicators

- immigration
- indicator

■ Question 1

Which contributes positively to population change?

- Emigration
- Immigration
- Deaths

Available marks: 2.

Worked answer

Immigration

- Compare rates with a common denominator and interval. An average can hide unequal access to services. At HL, evaluate how economic incentives, legal responsibilities and ethical priorities change an urban management proposal.

Question 2

A population of 2,000 grows by 40 in a year. Find percentage growth.

Available marks: 4.

Worked answer

2 %

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

A projected population is conditional on assumptions. Urban growth does not automatically mean improved health, income or environmental quality for every resident.

8 Environmental law: rules, evidence and enforcement

- enforcement
- jurisdiction

Question 1

Which evidence most directly tests whether the fictional rule improves water quality?

- Comparable environmental observations with monitoring and confounders recorded
- The existence of a signed document alone
- The number of words in the permit

Available marks: 2.

Worked answer

Comparable environmental observations with monitoring and confounders recorded

- Distinguish the legal instrument from the evidence about its effect. A concentration limit can be satisfied while total pollutant load rises if flow increases. Evaluate monitoring coverage, detection probability, incentives, access to justice and effects on different groups. An observed change after a policy is compatible with an effect but also with rainfall, industrial changes or other interventions.

Question 2

A discharge contains 1.2 mg/L at 500 L/min. Calculate transported mass per minute.

Available marks: 4.

Worked answer

600 mg/min

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

Compliance with one indicator does not prove ecological safety or fair enforcement. Compare actual outcomes with the policy objective and consider both administrative

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feasibility and affected communities.

9 Environmental economics: costs beyond the market price

- externality
- social cost

■ Question 1

What should accompany a single estimated social-cost total?

- Its boundary, valuation assumptions and distribution of effects
- A claim that ecological limits no longer matter
- Only the producer invoice

Available marks: 2.

Worked answer

Its boundary, valuation assumptions and distribution of effects

- In a simplified model, marginal social cost equals marginal private cost plus marginal external cost. A pollution charge can alter incentives, but selecting a charge requires evidence and a stated objective. Monetary totals do not by themselves settle distribution, irreversibility, uncertainty or whether a service can be substituted.

■ Question 2

Private cost is 6 units per item and external cost is 2 units. Calculate social cost for 50 items.

Available marks: 4.

Worked answer

400 cost units

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

A money value is an assumption-dependent estimate, not a measurement of intrinsic ecological value. A policy that lowers total cost can still place a disproportionate burden on a vulnerable group.

10 Environmental ethics: make the value judgement explicit

- intrinsic value
- environmental justice

Question 1

Which statement is a value judgement rather than a measured observation?

- Future generations ought to have access to this ecosystem
- The sampled site contains 12 recorded species
- The surveyed area is 60 hectares

Available marks: 2.

Worked answer

Future generations ought to have access to this ecosystem

- Separate descriptive claims from normative claims. A species count is evidence about the sampled community; deciding that every species has intrinsic value is a value position. Compare consequences, rights, duties and fairness across generations. A defensible argument states its values, uses accurate evidence and acknowledges competing claims rather than disguising a value choice as a calculation.

Question 2

A project affects 9 hectares within a 45-hectare site. Calculate the percentage of area affected.

Available marks: 4.

Worked answer

20 %

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

Worldview labels are analytical aids, not fixed stereotypes of cultures or people. Neither a stakeholder majority nor a numerical index automatically resolves a rights-based or intergenerational objection.

11 Uncertainty, gradients and model testing

- uncertainty
- systematic error

Question 1

Which is most likely a systematic error?

- A balance reads 0.20 g when empty
- Repeated values fluctuate either side of the mean
- Random differences in reaction time

Available marks: 2.

Worked answer

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A balance reads 0.20 g when empty

- For a product or quotient, adding fractional uncertainties is a common maximum-uncertainty approximation. For a difference, add absolute uncertainties. A nonzero intercept can reveal an offset or an incomplete model.

■ Question 2

A 40 cm reading has an absolute uncertainty of 1 cm. Find percentage uncertainty.

Available marks: 4.

Worked answer

2.5 %

- Appropriate relation; consistent substitution; correct result; meaningful unit and interpretation.

Repeating readings reduces random uncertainty in a mean but does not automatically remove a zero error. Do not quote more decimal places than your measurement can support.

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