2.1 Climate and resources

Name: _____ Class: _____ Date: _____ **Total: 26 marks**

KEY WORDS vulnerability • ecological footprint

Climate and resources

Objective

Distinguish the causes and evidence of climate change, apply vulnerability and resilience, separate mitigation from adaptation, and work the resource-security arithmetic and strategies (core: global climate; global resource consumption and security).

1 Key knowledge and worked examples

Climate + resources toolkit. Causes: natural (orbital, solar, volcanic) vs anthropogenic (CO_2 from fossil fuels and land use, methane). Evidence: instruments, ice cores, sea level. Paris: well below 2°C, pursuing 1.5°C. Vulnerability is exposure plus sensitivity minus capacity; resilience reorganises. MITIGATION removes causes; ADAPTATION adjusts to impacts. Ecological footprint ≈ 2.6 gha per person vs biocapacity ≈ 1.6 gha ≈ 1.7 Earths. Agriculture ≈ 70% of freshwater withdrawals. Food security: availability, access, utilisation, stability. Consumerism vs stewardship.

2 Practice

2.1 Name one natural and one anthropogenic cause of climate change, with the mechanism of each. [2]

2.2 World average ecological footprint is about 2.6 gha per person and biocapacity about 1.6 gha. Calculate the number of Earths being used, and name the term for using more than biocapacity provides. [3]

2.3 Classify each as mitigation or adaptation: (a) a sea wall; (b) replacing coal with wind; (c) drought-resistant crops. [3]

2.4 Agriculture takes about 70% of global freshwater withdrawals. State one implication for water security as demand grows. [2]

2.5 Distinguish a renewable from a non-renewable resource, naming the condition a renewable must satisfy to stay renewable. [2]

3 Exam-style questions

3.1 *(Explain style.)* Explain why a low-lying, low-income delta country is more vulnerable to climate change than a wealthy inland state, using the vulnerability formula from the toolkit, and name one adaptation that builds its resilience. [6]

3.2 *(Evaluate style.)* "Renewable energy is the whole answer to mitigation." Evaluate this claim with one strength and two limitations. [4]

3.3 *(Food security style.)* A country produces enough grain in a normal year, yet a price spike leaves urban poor households unable to buy it. Identify which pillar of food security fails, and one policy that addresses it. [4]

Solutions

2.1 Natural: volcanic eruptions inject aerosols that shade the surface and cool it for years (or Milankovitch orbital cycles altering solar input) (1). Anthropogenic: burning fossil fuels emits carbon dioxide that thickens the greenhouse blanket, trapping more outgoing radiation and warming the surface (1).

2.2 Number of Earths = 2.6/1.6 ≈ 1.7 (2). Using more than biocapacity provides is OVERSHOOT – drawing down natural capital, only possible temporarily (1).

2.3 (a) Adaptation – adjusts to the impact, sea level, without touching the cause (1); (b) mitigation – removes the cause by cutting emissions (1); (c) adaptation (1).

2.4 Any one: as demand grows, the largest user (irrigation) is the first target of efficiency and reallocation, so food output becomes exposed to water policy; or aquifer depletion undermines future irrigation; or competition sharpens between farms and cities (2).

2.5 A renewable resource regenerates within human timescales (solar, wind, biomass, fish); a non-renewable is a finite stock (coal, oil, minerals) (1). The renewable must be harvested at or below its rate of regeneration – its sustainable yield – or it becomes effectively non-renewable (overfished stocks, depleted aquifers) (1).

3.1 Exposure: a delta country sits in the path of sea-level rise, storm surge and salinisation, while the inland state does not (2). Sensitivity: livelihoods are climate-dependent (farming, fishing) and infrastructure is fragile, raising losses from the same hazard (2). Capacity: low income and weak institutions mean weak defences, warning systems and insurance, subtracting little from vulnerability – the wealthy state's capacity lowers its vulnerability despite exposure (1). Adaptation building resilience: cyclone shelters and early-warning systems (the Bangladesh model) that cut death tolls from the same events (1).

3.2 Strength: renewables generate without CO_2 at the point of use, so displacing coal cuts emissions at scale – genuine mitigation (1). Limitation one: wind and solar are intermittent, so storage or backup is needed, and the transition itself mines lithium, cobalt and copper – new resource demands (1). Limitation two: mitigation is more than the electricity mix – transport, industry, land use and demand growth all matter, so a full answer adds efficiency, electrification, reforestation and demand management (2). Judgement: renewables are the centrepiece, not the whole answer.

3.3 The failing pillar is ACCESS (affordability and distribution): availability is met (enough grain) yet households cannot obtain it at spike prices (2). Policies: targeted food subsidies or cash transfers to poor households; grain reserves released to moderate prices; price monitoring and market information – any one, addressing purchasing power rather than production (2).

Local review guidance: the division shown before the Earths figure; structure the answer on the vulnerability formula, term by term; (R1 3.2/3.3) the evaluation reaches a judgement and the pillar named with its evidence. Authored classroom guidance.