



## International Green Warrior Olympiad (IGWO)

# Sample Paper

## Pattern and Marking Scheme

Grade	Topic/Section	No. of Questions	Marks per Question	Total Marks
Grade 10	Green Champ	40	3	120
	Green Challenger	10	6	60
<b>Grand Total</b>		<b>50</b>		<b>180</b>

The total duration of the exam is 60 minutes. There's a negative marking of  $1/3^{\text{rd}}$  marks for every wrong answer.

## Syllabus

Clean Water and Sanitation, Affordable and Clean Energy, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Life Below Water, Life on Land, Zero Hunger

For more details, visit <https://www.crestolympiads.com/green-olympiad-gwo>.

## Green Champ (Each Question is 3 Marks)

- Over-extraction of groundwater can lead to various negative consequences. Which of the following is NOT a potential consequence of excessive groundwater extraction?
  - Increased soil fertility
  - Land subsidence
  - Saltwater Intrusion
  - Decreased baseflows in rivers
- A community is experiencing increased forest fires due to prolonged droughts caused by climate change. As a disaster management expert, which of the following strategies would you recommend to reduce the impact of forest fires on the community?
  - Clearing all trees and vegetation near residential areas to create firebreaks.
  - Implementing controlled burns during periods of low fire risk to remove excess vegetation and prevent large-scale wildfires.
  - Installing sprinkler systems on rooftops and encouraging residents to water their lawns frequently.
  - Ignoring the issue as forest fires are a natural part of the ecosystem.
- A rural village has limited access to electricity, relying primarily on kerosene lamps for lighting. Kerosene use has been linked to respiratory problems and indoor air pollution. The village council is considering ways to improve access to clean and reliable electricity. Which of the following would be the most effective long-term solution to address both health concerns and energy needs?
  - Distributing more kerosene lamps with improved ventilation.
  - Providing solar-powered lighting systems to each household.
  - Encouraging households to use candles instead of kerosene lamps.
  - Constructing additional diesel-powered generators for increased electricity.
- A municipality is debating between establishing a waste-to-energy incineration plant or a biogas plant for managing its organic waste. Which option would be more environmentally sustainable, considering the waste reduction and energy generation potential?
  - Waste-to-energy incineration plant
  - Biogas plant
  - Both options hold equal environmental sustainability
  - It depends on the specific composition of the municipality's waste
- A local river, which serves as a crucial water source for the community, has been experiencing deteriorating water quality. Which parameter is primarily used to indicate organic pollution in freshwater systems?
  - Dissolved oxygen
  - pH
  - Total Dissolved Solids (TDS)
  - Turbidity

6. A small community in a rural area relies on a well for its drinking water. However, recent tests have shown that the well water is contaminated with bacteria. The community is concerned about the health risks posed by the contaminated water and is considering various options for addressing the problem.

Which of the following options would be the most effective, sustainable and long-term solution for the community to protect its drinking water source?

1. Install a water filtration system at the well.
2. Educate the community about the importance of proper sanitation practices
3. Find a new source of drinking water, such as a bottled water supplier.

- |                 |                 |
|-----------------|-----------------|
| a. Only 1       | b. Only 1 and 2 |
| c. Only 2 and 3 | d. 1, 2, and 3  |

7. You're in the market to purchase a new refrigerator for your home. While browsing, you notice an Energy Star label on a refrigerator that displays a rating of 3. Intrigued by this energy efficiency indicator, you decide to understand what this rating signifies. What does an Energy Star rating of 3 on a refrigerator indicate?

- a. The refrigerator is 3 times more energy efficient than the average refrigerator.
- b. The refrigerator is 30% more energy efficient than the average refrigerator.
- c. The refrigerator is 3% more energy efficient than the average refrigerator.
- d. The refrigerator is 300% more energy efficient than the average refrigerator.

8. You're a municipal waste manager responsible for handling electronic waste (e-waste) in your city. During a routine inspection of the e-waste disposal facility, you notice a significant amount of discarded electronic devices, including computers, monitors, and smartphones. Concerned about potential health hazards, you decide to educate the public about the risks associated with improper disposal of these devices.

Which of the following group of heavy metals is commonly found in electronics and can pose serious health risks if not properly disposed of?

- |                       |                       |
|-----------------------|-----------------------|
| a. Aluminium and zinc | b. Iron and magnesium |
| c. Lead and mercury   | d. Copper and zinc    |

9. Scientists at a climate research institute are investigating the relationship between water vapour and Earth's greenhouse effect. They aim to identify the accurate description of this relationship to better understand its implications.

Which of the following accurately describes the relationship between water vapour and Earth's greenhouse effect?

- a. Water vapour primarily acts as a cooling agent by reflecting solar radiation away from Earth's surface.
- b. Increased water vapour directly causes a reduction in the greenhouse effect, leading to global cooling.
- c. Water vapour amplifies the greenhouse effect by trapping heat radiated from Earth, contributing to global warming.
- d. Elevated water vapour levels in the atmosphere do not influence the greenhouse effect nor climate change.

10. A scientist is studying the effects of climate change on a tropical rainforest. She measures the amount of water vapour in the atmosphere and finds that it has increased by 10% over the past decade. What does this suggest?

- a. The rainforest is becoming drier.
- b. The rainforest is becoming wetter.
- c. The rainforest is becoming warmer.
- d. The rainforest is becoming colder.

11. Consider the case study given below and answer the following question:

**Title: Forests as Crucial Carbon Capture Systems**

Forests play a critical role in mitigating climate change by capturing and storing carbon dioxide from the atmosphere. Trees absorb carbon dioxide through photosynthesis and use it to grow. The carbon is then stored in the tree's biomass (wood, leaves, branches, and roots) and soil. Forests also help to regulate the climate by releasing water vapour into the atmosphere, which can form clouds and reflect sunlight back into space.

Trees are the most significant carbon sink in forests, storing carbon in their biomass. The amount of carbon stored in a tree depends on its species, size, and age. Young forests capture carbon rapidly due to the quick growth of trees. Middle-aged forests store relatively greater amounts of carbon as trees grow slower but sequester more carbon. Old-growth forests contain large trees that retain carbon for extended periods, albeit at a slower rate due to fewer trees overall.

Forest soils contain diverse forms of carbon influenced by soil type, vegetation, and geography. Soil properties, such as high organic content or frozen conditions, significantly impact carbon storage potential.

The carbon captured by forests is eventually returned to the atmosphere through processes like decomposition and respiration. Different forest types exhibit varying rates of carbon capture and release. Tropical forests capture carbon rapidly but can release it quickly too. In contrast, temperate forests offer a balanced solution.

Effective management strategies, such as forest preservation, sustainable forestry practices, forest expansion, and invasive species control, are crucial in optimising carbon sequestration potential while maintaining ecosystem balance.

A farmer is contemplating converting a section of their farmland into a forest to optimise carbon sequestration potential. Which set of actions would best help the farmer achieve this goal?

- 1. Plant a mix of tree species known for fast growth and high carbon storage capacity.
- 2. Plant trees that are native to the region.
- 3. Leave the soil unplanted and unattended to encourage natural regeneration of native vegetation.

- a. Only 1
- b. Only 1 and 2
- c. Only 2 and 3
- d. 1, 2, and 3

12. Consider the case study given below and answer the following question:

**Case study: Combatting Global Food Waste**

In a study conducted by the World Resources Institute, it was estimated that one-third of all food produced globally is wasted. This staggering amount represents a significant loss of resources, including water, land, and energy, and contributes to greenhouse gas emissions. To address this pressing issue, researchers have developed various strategies to reduce food waste, each tailored to specific stages of the food supply chain.

At the household level, meal planning and proper storage practices can significantly reduce food waste. Planning meals ahead of time helps individuals avoid impulse purchases and ensures that ingredients are used before they spoil. Proper storage, such as keeping fruits and vegetables in the refrigerator and storing pantry items in airtight containers, extends the shelf life of food.

In the retail sector, implementing innovative technologies like dynamic pricing and smart packaging can help reduce food waste. Dynamic pricing adjusts the price of perishable items based on their freshness, encouraging consumers to purchase items before they spoil. Smart packaging incorporates sensors that monitor the freshness of food, alerting retailers when items are nearing their expiration dates.

Food waste reduction strategies also extend to the production and processing stages of the food supply chain. Improved harvesting techniques and post-harvest handling practices can minimise damage to crops and reduce food losses. Additionally, diverting inedible food scraps from landfills to composting facilities can convert waste into valuable nutrient-rich soil amendments.

By implementing these strategies at various stages of the food supply chain, we can collectively reduce food waste, conserve resources, and minimise our environmental impact.

Based on the scenario provided, which statement best summarises the overall impact of the food waste reduction initiative?

1. Food waste reduction conserves resources and minimises environmental impact.
2. Food waste reduction improves food security and reduces hunger.
3. Food waste reduction promotes sustainable agriculture and economic growth.

- |                 |                 |
|-----------------|-----------------|
| a. Only 1       | b. Only 1 and 2 |
| c. Only 2 and 3 | d. 1, 2, and 3  |

13. The government of a country is planning to build a new nuclear power plant to meet increasing energy demands. The scientists and engineers involved are discussing the choice of uranium isotopes for fuel. During the discussion, they are considering various factors for the most suitable isotope.

Considering the discussion among the scientists and engineers, why is uranium-235 (U-235) preferred for nuclear fission in power plants?

- a. It is more abundant in nature compared to other isotopes.
- b. It releases less heat compared to other isotopes.
- c. Its atoms are easily split apart, releasing energy.
- d. It requires minimal processing before use as a fuel.

14. An environmental organisation has embarked on a project aimed at restoring a degraded river ecosystem. The project involves reintroducing native fish species that have declined due to habitat degradation and water quality issues. Additionally, efforts are being made to improve overall water quality by implementing measures to reduce pollution and restore natural habitat.

What could be an anticipated outcome of this restoration effort in the degraded river ecosystem?

- a. Increased biodiversity with the recovery of native fish populations and the return of other aquatic species.
- b. Further degradation due to competition among reintroduced fish species and disruption of the existing ecosystem balance.
- c. Decline in water quality as a result of releasing additional fish into an already stressed environment.
- d. No significant impact on the river ecosystem as previous damage is irreversible.

15. Biodiversity loss due to deforestation can have a cascading effect on the ecosystem. Which of the following is the LEAST likely consequence of widespread species extinction?

- a. Decreased competition among surviving species.
- b. Loss of pollination services, impacting plant reproduction and agricultural yields.
- c. Increase in greenhouse gas emissions due to reduced carbon sinks.
- d. Disruption of the food chain, leading to imbalances in predator-prey populations.

16. In a discussion regarding the significance of tropical rainforests in global climate regulation, a group of environmental researchers is examining the mechanisms by which these forests contribute to this role.

Which mechanism or mechanisms among the following options significantly contribute to the crucial role of tropical rainforests in regulating the global climate?

- 1. Carbon sequestration through photosynthesis
- 2. Release of moisture into the atmosphere
- 3. Absorption of solar radiation

- a. Only 1
- b. Only 1 and 2
- c. Only 2 and 3
- d. 1, 2, and 3

17. A small town located in a desert region is experiencing frequent power outages due to an ageing grid infrastructure. The town council is considering investing in renewable energy to improve energy security and reduce reliance on the grid. The system needs to be reliable, cost-effective, and able to meet the community's energy needs throughout the year.

Which combination of renewable energy sources would be the most appropriate for this project?

- a. Geothermal energy and tidal energy
- b. Solar power and wind power
- c. Biomass energy and hydro energy
- d. Solar power and hydro energy

- 18.** You are part of a community initiative aiming to reduce carbon emissions and combat climate change. The group is discussing strategies, and one member proposes focusing on energy efficiency. Which statement best supports the role of energy efficiency in this context?
- Energy efficiency has minimal impact on reducing carbon emissions compared to other measures.
  - Prioritising energy efficiency leads to a rise in carbon emissions due to increased energy usage.
  - Energy efficiency strategies primarily increase energy consumption, hindering efforts to combat climate change.
  - Implementing energy-efficient practices can significantly reduce carbon emissions by decreasing energy consumption.

- 19.** You're passionate about reducing your environmental footprint, particularly concerning packaging materials. You've come across a study that highlights the significance of recycling and reuse in lessening the environmental impact of packaging.

Which of the following statements accurately reflects the environmental impact of recycling and reuse in relation to packaging materials?

- Recycling is always the most environmentally friendly option, regardless of the material.
  - Recycling and reuse are equally effective in reducing the environmental impact of packaging.
  - Recycling and reuse are not effective strategies for reducing the environmental impact of packaging.
  - Reuse is generally more environmentally friendly than recycling, especially for non-recyclable materials.
- 20.** A study conducted in the North Atlantic found that a specific population of cod had been overfished for decades. As a result, the average size of cod in the population had decreased by 20%. What are the potential consequences of this decrease in size for the cod population?
- Increased spawning success due to smaller fish being quicker to reproduce
  - Reduced predation pressure due to smaller fish being less visible to predators
  - Decreased survival rates due to smaller fish being weaker and less competitive
  - Increased genetic diversity due to the introduction of new genetic material

- 21.** Jason is an environmental enthusiast concerned about the sustainability of fish and seafood due to overfishing and its impact on marine ecosystems. He's looking for alternative protein sources to reduce his reliance on fish and seafood in his diet.

What are some alternative protein sources that Jason can consider to help reduce his reliance on fish and seafood?

- Plant-based proteins such as beans and lentils
- Soy-based products like tofu
- Vegan products such as sunflower and olive oil

- Only 1
- Only 1 and 2
- Only 2 and 3
- 1, 2, and 3

22. Consider the following statements and choose the correct option:

Statement 1: Climate change impacts are predictable, and their effects remain constant across different regions and communities.

Statement 2: Climate change mitigation involves adapting to its effects rather than reducing greenhouse gas emissions.

- a. Statement 1 is correct but statement 2 is incorrect.
- b. Statement 1 is incorrect but statement 2 is correct.
- c. Both the statements are correct.
- d. Both the statements are incorrect.

23. Considering the impact of climate change, which region might experience a significant rise in the frequency of extreme weather events such as heatwaves and the formation of heat domes?

- a. Polar regions
- b. Coastal regions with strong sea breezes
- c. Mid-latitude regions
- d. Mountainous regions

24. Boreal forests, found predominantly in the Northern Hemisphere, play a significant role in global carbon storage. How do the cold temperatures in these regions affect carbon storage in boreal forests?

- a. Accelerates tree growth
- b. Slows down decomposition rates
- c. Reduces the need for photosynthesis
- d. Increases evaporation rates

25. In a city, a significant portion of food from households and restaurants is discarded. Which factor explains the direct link between food waste and its contribution to greenhouse gas emissions and climate change?

- a. Food waste releases toxic chemicals that deplete the ozone layer.
- b. Decomposing food waste in landfills produces methane, a potent greenhouse gas.
- c. Food waste leads to deforestation, increasing carbon emissions.
- d. Food waste increases the energy consumption of waste disposal facilities.

26. A community relies on a rainwater harvesting system for its water supply. The system collects rainwater from rooftops and stores it in large underground tanks. After a heavy rainfall, the residents notice that the stored water has a brownish colour and an unpleasant odour.

What could be the most likely cause of this contamination?

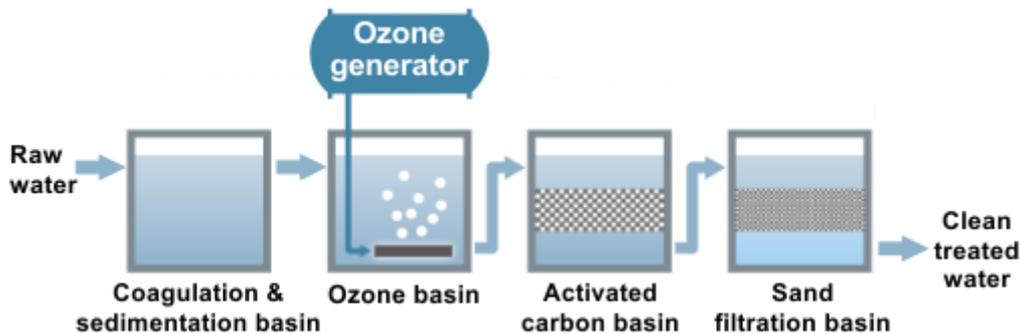
- 1. Insufficient filtration and disinfection of the rainwater
- 2. Accumulation of organic debris in the storage tanks
- 3. Leaching of pollutants from roofing materials

- a. Only 1
- b. Only 1 and 2
- c. Only 2 and 3
- d. 1, 2, and 3

27. A group of conservationists is conducting a study in a coastal region known for its diverse ecosystem. They notice a significant decline in the population of native plant species due to the introduction of non-native plants by human activities. As they delve deeper into their research, they aim to assess the significance of native species within this ecosystem. What role do native species most likely play in this coastal ecosystem?
- Native species contribute minimally to the ecosystem compared to non-native species.
  - Native species only survive in isolated pockets and do not significantly impact the ecosystem.
  - Native species offer cultural significance but have little ecological importance.
  - Native species are crucial for ecosystem stability, providing habitat and resources for various organisms.
28. A team of environmental researchers embarked on an expedition to study the impact of rising temperatures on Arctic wildlife. During their research, they noticed a significant decline in the population of polar bears due to habitat loss caused by melting ice caps. Which of the following statements best describes the direct consequence of this decline in the polar bear population?
- Increased predation on seals by other Arctic predators
  - Reduced tourism opportunities in the Arctic region
  - Increased scavenging on land by polar bears
  - Disruption of balance of Arctic marine food webs, impacting various species
29. A coastal area witnesses a significant decrease in the population of shellfish due to water contamination. Analysis reveals the presence of persistent organic pollutants (POPs). POPs are resistant to environmental degradation through chemical, biological, and photolytic processes. For this reason, they persist in the environment for a long time. Which method is most effective in reducing POPs in aquatic environments?
- Bioremediation with specialised bacteria
  - Bioaccumulation
  - Sedimentation
  - Aeration and dilution
30. A team of environmentalists is proposing the establishment of a protected area that integrates conservation efforts with sustainable development. This proposed area aims to safeguard biodiversity while allowing human activities that are compatible with nature conservation. Which type of protected area aligns best with the team's objectives?
- National Parks
  - Wildlife Sanctuaries
  - Biosphere Reserves
  - Marine Protected Areas
31. In a region prone to erratic weather patterns, farmers face the recurring challenge of water scarcity. A group of agricultural researchers suggests adopting sustainable practices to mitigate the effects of drought. What would be the most effective way to implement this solution?
- Installing rainwater collection tanks connected to drip irrigation systems
  - Educating farmers on traditional irrigation methods
  - Introducing large-scale sprinkler systems for uniform water distribution
  - Encouraging farmers to rely solely on groundwater extraction

32. Your town currently relies on chlorine for water disinfection, but concerns about its byproducts have prompted the exploration of alternative methods. Using ozone treatment during wastewater treatment (shown in the picture below) has emerged as a promising option.

Which of the following is the main advantage of ozone in water purification?



- It adds taste and odour to water, improving its quality for consumption.
  - It effectively kills bacteria and viruses, ensuring safer and cleaner drinking water.
  - It assists in the sedimentation process, aiding in the removal of particles from water.
  - It lowers the pH level of water, making it less acidic and more suitable for consumption.
33. Imagine two households, the Smiths and the Joneses, who both live in similar apartments with identical appliances like refrigerators, washing machines, and TVs. However, their energy-saving habits differ. Which scenario best demonstrates an effective energy-saving habit?
- The Smiths replaced all their light bulbs with LEDs.
  - The Smiths run their dishwasher and washing machine with small loads.
  - Jonases seals air leaks around windows and doors to improve insulation.
  - Jonases leave their TVs and game consoles on standby mode overnight.
- Only 1 and 2
  - Only 1 and 3
  - Only 1, 2 and 3
  - Only 2, 3 and 4
34. Imagine you're a conservation biologist studying the environmental impact of electronics. You're particularly concerned with the extraction of raw materials needed for manufacturing, like lithium and cobalt. Which of the following indirect consequences is likely to negatively affect ecosystems due to this mining activity?
- Improved ecosystem resilience
  - Increased carbon sequestration
  - Improved connectivity in the area
  - Habitat destruction and soil degradation
35. In a workshop discussing electronic waste reduction, participants explore devices that are more susceptible to shorter lifespans because of rapid advancements in technology and frequent model upgrades. Which of the following devices is MOST prone to shorter lifespans due to these factors?
- Smartphones and laptops
  - Refrigerators and kitchen appliances
  - Washing machines and dryers
  - Microwave ovens and coffee makers

36. A scientist is monitoring the water quality of a lake used for recreational activities. She observes a sudden increase in the lake's phytoplankton population, followed by a decrease in the DO level and a rise in fish mortality. This phenomenon is most likely due to:
- An accidental oil spill in the lake
  - A natural seasonal shift in the lake's ecosystem
  - Increased water flow from a nearby industrial facility
  - Excessive nutrient runoff from agricultural lands
37. You are watching a wildlife documentary where a pod of migrating humpback whales suddenly changed their course, avoiding a polluted area in the river. It was later shown that the scientists discovered high levels of mercury in the water. How could this pollution potentially threaten the whales?
- Weaken their immune system
  - Damage their nervous system, impacting movement
  - Blur their vision, hindering navigation and hunting
- Only 1
  - Only 2 and 3
  - Only 1 and 2
  - 1, 2, and 3
38. Researchers conducted an experiment to assess the effectiveness of green roofs in reducing indoor temperatures. They compared the energy consumption of buildings with and without green roofs during summer months. The results showed a noticeable decrease in energy usage in buildings with green roofs. What does this experiment suggest about the role of green roofs in climate change mitigation?
- Green roofs increase energy consumption, contributing to climate change.
  - Green roofs have no impact on indoor temperatures or energy usage.
  - Green roofs release greenhouse gases, exacerbating global warming.
  - Green roofs decrease energy consumption, mitigating the urban heat island effect.
39. Rohan is a fitness enthusiast and prioritises protein intake. He usually opts for whey protein powder derived from dairy after workouts. His friend Raj suggests trying plant-based alternatives like pea protein or soy protein for environmental reasons. Rohan is sceptical about their effectiveness. What is the most accurate and helpful information Rohan can share with Raj to consider?
- While some plant-based proteins may be slightly less effective, they offer environmental benefits and can still support fitness goals.
  - Plant-based proteins are inferior to whey proteins in terms of muscle building and recovery.
  - The environmental impact of protein powder is minimal compared to other food choices, so switching is unnecessary.
  - The protein source doesn't matter as long as the total protein intake is sufficient.

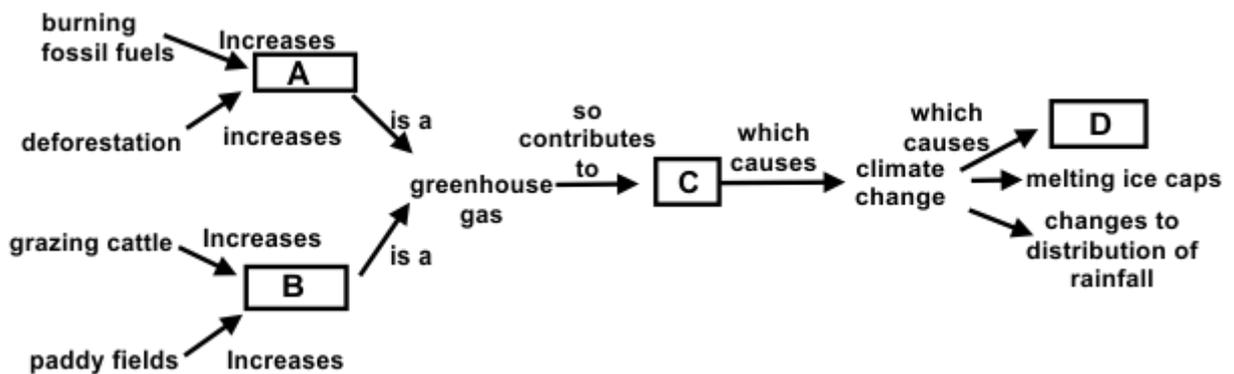
40. You typically wash a full load of laundry with hot water (40°C). Based on the provided information, which of the following options would have the potential to reduce your total laundry energy consumption?

1. Washing smaller loads more frequently instead of a full load once a week.
2. Switching to warm water (30°C) for most washes.
3. Air-drying your clothes instead of using the dryer entirely.
4. Cleaning the lint screen in your dryer after every load to improve airflow.

- a. Only 1  
 b. Only 1 and 2  
 c. Only 2, 3 and 4  
 d. 1, 2, 3 and 4

## Green Challenger (Each Question is 6 Marks)

41. Given below is a flowchart illustrating how human activities contribute to climate change and its consequences. Identify the gaps marked as A, B, C, and D based on your understanding.



- a. A: Atmospheric CO<sub>2</sub>  
 B: Atmospheric CH<sub>4</sub>  
 C: Carbon sequestration  
 D: Natural disasters
- b. A: Atmospheric CO  
 B: Atmospheric CH<sub>4</sub>  
 C: Global warming  
 D: Wildfires
- c. A: Atmospheric CH<sub>4</sub>  
 B: Atmospheric CO<sub>2</sub>  
 C: Ozone layer depletion  
 D: Sea level rise
- d. A: Atmospheric CO<sub>2</sub>  
 B: Atmospheric CH<sub>4</sub>  
 C: Global warming  
 D: Extreme weather events

42. The following table shows the average temperature and precipitation for three different biomes.

Based on your understanding, answer the following questions.

- A. Which biome is expected to experience the most severe drought stress due to reduced rainfall?
- B. Which biome is expected to experience the most significant changes in soil drainage and nutrient availability due to melting permafrost?
- C. Which biome is expected to experience the changes in the distribution of oak species due to rising temperatures?

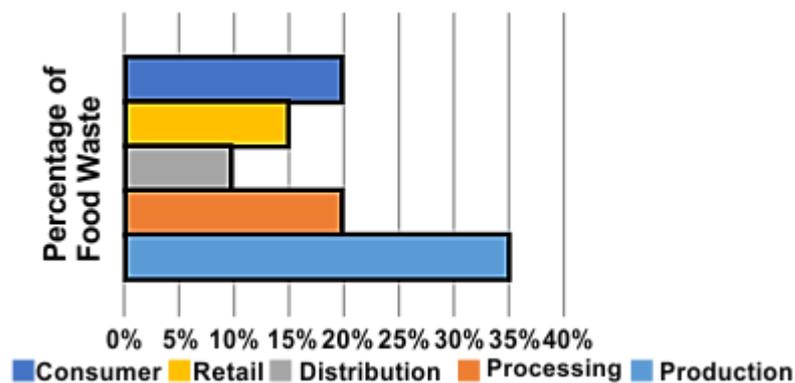
Biome	Average Temperature (°C)	Average Precipitation (mm)
Temperate forest	10	800
Tropical rainforest	25	2,500
Boreal forest	-5	500

- a. A: Boreal forest  
B: Temperate forest  
C: Tropical rainforest
- b. A: Tropical rainforest  
B: Boreal forest  
C: Temperate forest
- c. A: Temperate forest  
B: Tropical rainforest  
C: Boreal forest
- d. A: Tropical rainforest  
B: Temperate forest  
C: Boreal forest

43. You are part of a student-led environmental club focused on sustainability within the local community. As part of a research project, your team collected data on food waste percentages at different stages of the local food supply chain.

Considering the information provided, which of the following strategies could effectively reduce food wastage?

- 1. Optimise transportation methods
- 2. Implement quality control
- 3. Promote landfill disposal
- 4. Minimise overproduction



- a. Only 1, 2 and 3
- b. Only 1, 2 and 4
- c. Only 2, 3 and 4
- d. 1, 2, 3 and 4

44. Consider the case study given below and answer the following question:

### **Case Study: The Müller Family's Journey to Renewable Energy**

The Müller family, residing in a charming village in the German countryside, had always been conscious about their environmental impact. In 2022, they decided to take an active step towards a greener lifestyle by installing a rooftop solar panel system. Their primary motivation was to reduce their reliance on fossil fuels and contribute to mitigating climate change. However, as they embarked on this journey, they discovered a plethora of other benefits:

#### Environmental Benefits:

- Reduced Carbon Footprint: The solar panels generated clean energy, leading to a significant reduction in their carbon emissions. This translated to a cleaner environment for their family, their community, and the planet.
- Improved Air Quality: By relying less on fossil fuels, the Müllers contributed to cleaner air in their region, which improved their overall health and well-being.

#### Financial Benefits:

- Reduced Electricity Bills: The solar panels generate enough electricity to cover a significant portion of their household energy needs, resulting in substantial savings on their monthly electricity bills. This provided them with financial stability and freed up resources for other expenses.
- Government Incentives: The German government offers various financial incentives for individuals and families adopting renewable energy solutions. The Müllers took advantage of these incentives, further reducing the cost of their solar panel system and accelerating their return on investment.

#### Lifestyle Benefits:

- Energy Independence: The Müllers achieved a sense of energy independence by generating their own clean energy. This gave them greater control over their energy consumption and reduced their dependence on the national grid, especially during peak hours.
- Enhanced Home Value: Homes with renewable energy systems are becoming increasingly sought-after, leading to a potential increase in the value of the Müller's property.

#### Overall Impact:

The Müller family's experience showcases the numerous benefits of adopting renewable energy in a domestic setting. Their commitment to environmental sustainability not only helped them create a cleaner future but also resulted in financial savings and enhanced their quality of life. Their story serves as an inspiration for others to consider switching to renewable energy and contribute to a more sustainable future.

Which of the following statements best describes the primary motivation of the Müller family to switch to renewable energy?

1. Environmental sustainability
2. Financial savings
3. Increased energy independence
4. Minimising the environmental impact

- a. Only 1, 2 and 3  
c. Only 2, 3 and 4

- b. Only 1, 2 and 4  
d. 1, 2, 3 and 4

45. John is considering installing a heating and cooling system in his new home. He wants an energy-efficient and environmentally friendly option. After researching various systems, he learned about geothermal heat pumps. Which of the following statements is true about geothermal heat pumps?

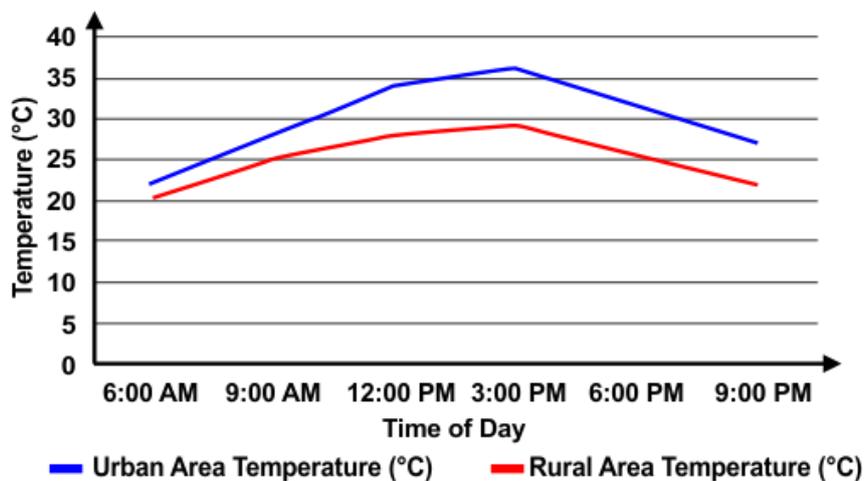
1. Geothermal heat pumps use the Earth's constant temperature to heat and cool homes.
2. Geothermal heat pumps maintain consistent efficiency in all weather conditions.
3. Geothermal heat pumps have a longer lifespan than traditional systems.

- a. Only 1  
b. Only 1 and 2  
c. Only 2 and 3  
d. 1, 2 and 3

46. During a summer heatwave, a meteorological study compares temperature variations between an urban area and its nearby rural surroundings. The findings are provided in the graph below.

Which of the statement(s) accurately describes the observed temperature variations between the urban and rural areas?

1. Urban areas generally have lower vegetation cover, leading to increased temperatures due to reduced shade and less evaporative cooling.
2. The urban areas have more concrete and asphalt surfaces, retaining more heat.
3. Decreased wind circulation in the rural area causes temperature drops.
4. Rural areas contain more open spaces, facilitating better air circulation and lower temperatures.

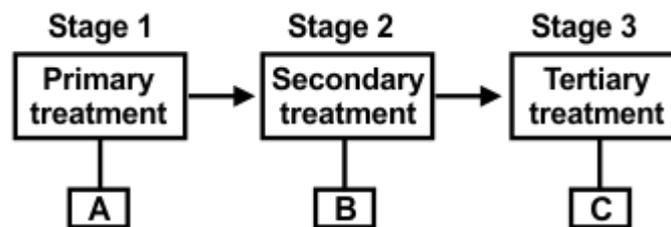


- a. Only 1, 2 and 4  
b. Only 1 and 4  
c. Only 2, 3 and 4  
d. 1, 2, 3 and 4

47. In a community relying on private well water, residents suspect mercury contamination due to industrial activities in the vicinity. They conduct water tests, and the results show varying mercury concentrations across different households. Analyse the provided table showcasing mercury levels in parts per billion (ppb) from five different wells. Based on the data, which conclusion is most likely accurate regarding the mercury contamination in the private wells?

Well Number	Mercury Concentration (ppb)
Well 1	0.8
Well 2	4.3
Well 3	1.5
Well 4	0.3
Well 5	3.9

- The contamination is evenly distributed across all wells due to a single, widespread source.
  - The shallowest well (with the lowest water table) is likely the most contaminated.
  - Only some wells show elevated mercury levels, suggesting localised sources of contamination.
  - The contamination originates from an industrial facility located closest to Well 2.
48. A bustling city faces challenges with its growing wastewater volume and outdated treatment facilities. This untreated wastewater is discharged into a nearby river, leading to algal blooms, low oxygen levels, and fish die-offs. Complete the flowchart by accurately identifying the specific methods and techniques A, B and C utilised in primary, secondary, and tertiary wastewater treatment aimed at enhancing the quality of discharged water.



- A: Screening → Grit removal → Sedimentation  
 B: Filtration → Disinfection  
 C: Biological treatment → Clarification
  - A: Biological treatment → Clarification  
 B: Screening → Grit removal → Sedimentation  
 C: Filtration → Disinfection
  - A: Biological treatment → Clarification  
 B: Filtration → Disinfection  
 C: Screening → Grit removal → Sedimentation
  - A: Screening → Grit removal → Sedimentation  
 B: Biological treatment → Clarification  
 C: Filtration → Disinfection
49. You're the sustainability coordinator for your school, tasked with analysing and improving waste management practices. To assess current methods, you gather information on various practices used by students and staff.

Analyse each scenario and identify the most appropriate 5R category it falls into: Reduce, Reuse, Recycle, Repurpose, or Refuse.

Scenario 1: The school cafeteria replaces single-use plastic water bottles with reusable water bottles for students to bring from home.

Scenario 2: The school declines any subscription to promotional materials.

Scenario 3: The school installs motion sensor lights in hallways and classrooms to minimise unnecessary energy usage.

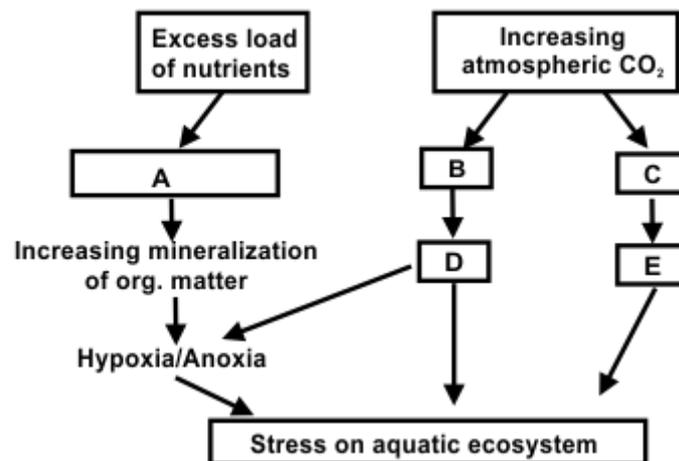
Scenario 4: The art department uses leftover fabric scraps from previous projects to create new artwork and decorations.

Scenario 5: The school has separate bins for paper, cardboard, and plastic bottles.

- |  |  |
|--|--|
| a. Scenario 1: Reuse<br>Scenario 2: Refuse<br>Scenario 3: Reduce<br>Scenario 4: Repurpose<br>Scenario 5: Recycle | b. Scenario 1: Repurpose<br>Scenario 2: Refuse<br>Scenario 3: Recycle<br>Scenario 4: Reuse<br>Scenario 5: Reduce |
| c. Scenario 1: Repurpose<br>Scenario 2: Recycle<br>Scenario 3: Reduce<br>Scenario 4: Reuse<br>Scenario 5: Refuse | d. Scenario 1: Reduce<br>Scenario 2: Repurpose<br>Scenario 3: Reuse<br>Scenario 4: Refuse<br>Scenario 5: Recycle |

50. Geneva is an aquatic biologist working for a local environmental agency. She is studying the impact of excess nutrients and increasing atmospheric CO<sub>2</sub> on the health of a nearby bay. She is concerned that the combined effects of these factors could be harming marine life and disrupting the ecosystem. She has developed a flow chart representing the relationships between various elements.

Based on your understanding of aquatic ecosystems, identify A, B, C, D, and E.



- |  |  |
|--|--|
| a. A: Eutrophication<br>B: Climate change<br>C: Decreased pH<br>D: Warming<br>E: Acidification                 | b. A: Decline in biodiversity<br>B: Climate change<br>C: Decreased pH<br>D: Dead zones<br>E: Coral bleaching |
| c. A: Biomagnification<br>B: Increase in greenhouse gases<br>C: Increased pH<br>D: Warming<br>E: Acidification | d. A: Dead zones<br>B: Global warming<br>C: Acidification<br>D: Decreased O <sub>2</sub><br>E: Increased Ph  |

## Answer Key

1.	a	2.	b	3.	b	4.	b	5.	a	6.	b	7.	b
8.	c	9.	c	10.	b	11.	b	12.	d	13.	c	14.	a
15.	a	16.	d	17.	b	18.	d	19.	d	20.	c	21.	b
22.	d	23.	c	24.	b	25.	b	26.	d	27.	d	28.	d
29.	a	30.	c	31.	a	32.	b	33.	b	34.	d	35.	a
36.	d	37.	b	38.	d	39.	a	40.	c	41.	d	42.	b
43.	b	44.	d	45.	d	46.	a	47.	c	48.	d	49.	a
50.	a												