

Section A (40 marks)
Attempt **all** questions (Compulsory)

- 1. For each question, there are four alternatives A, B, C and D. Choose the correct alternative and circle it. Do not circle more than ONE alternative. If there are more than one circled, NO score will be awarded.**

[1x15]

- (i) Cleaning campaigns organized by schools in public places is an example of
- A option value.
 - B bequest value.
 - C altruistic value.
 - D existence value.
- (ii) Which one of the following is the main aim of the green economy?
- A To maintain green surrounding.
 - B To enable economic growth and good governance.
 - C To enable economic growth and development of the country.
 - D To enable economic growth and increase environmental quality.
- (iii) The growth of lower plants on bare rocks is
- A primary succession.
 - B allogenic succession.
 - C secondary succession.
 - D autogenic succession.
- (iv) Which is the effect of salinization on soil?
- A Increases toxicity in the soil.
 - B Reduces the retentivity of the soil.
 - C Leads to the dehydration of plants.
 - D Reduces availability of nitrates to plants.

- (v) Bhutan Agriculture and Food Regulatory Authority (BAFRA) monitors and implements biosafety regulations by not allowing certain vegetables and fruits to be imported in the country.

This is to

- A strengthen local market.
 - B prevent the outflow of national capital.
 - C protect the people from harmful biological or biochemical agents.
 - D protect native plant and animal species from imported invasive species.
- (vi) Direct linkage approach is followed for the creation of protected areas as it
- A recognizes dependency of people's livelihood on conservation.
 - B considers protection as primary aim and views people as a threat.
 - C takes into account the socio-economic development of communities.
 - D requires fencing off of protected areas and removal of anyone within the perimeter.
- (vii) All of the following are characteristics of good indicator of Sustainable Development Goals **EXCEPT**
- A universal.
 - B consensus based.
 - C clear and straight forward.
 - D managed by all non-governmental organizations.
- (viii) Thimphu is developing rapidly due to several factors.
Identify the factor that is both a cause and impact of urbanization.
- A pollution
 - B epidemics
 - C migration
 - D climate change

- (ix) In 2016, Sarpang town was washed away by a flood. However, people residing in the town were relocated to a safer place after the flood.

This falls under

- A response phase.
 - B recovery phase.
 - C mitigation phase.
 - D preparedness phase.
- (x) “Ecotourism is designed to prevent rural-urban migration and distribute financial benefits received from tourists amongst the rural population.”

Ecotourism has caused human-wildlife conflict by

- A disturbing the habitats of animals.
 - B protecting the plants and animals in the forest.
 - C ignoring the spiritual significance of environment.
 - D protecting the natural habitats and pristine environment.
- (xi) Hydrogen fuel is not preferred to be used in a car because it
- A does not produce CO₂.
 - B can cool the vehicle skin.
 - C is highly inflammable and explosive in nature.
 - D can be used as gas at high pressure and can be stored.
- (xii) With the rise in awareness and concern about the effects of climate change, some power plants and mining companies provide financial support for programs to reduce the emission of greenhouse gases.

Which technology is being described in the above statement?

- A Carbon capture
- B Carbon offsetting
- C Carbon separation
- D Carbon sequestration

(xiii) Bhutan is distinguished as one of the countries in the world with negative carbon emission. However, Bhutan's status as a negative carbon emitter does not make it immune to the impacts of climate change because

- A industries in Bhutan produce less carbon dioxide.
- B the rich forest cover of Bhutan absorbs carbon dioxide.
- C more carbon dioxide in the air increases plant population.
- D carbon dioxide is produced in large quantities in the world.

(xiv) Aeration of soil is very important for plants because it

- A reduces the level of organic matter.
- B makes O₂ available to the microorganisms.
- C makes soil available to plants for photosynthesis.
- D improves the water holding capacity of the soil.

(xv) Bhutan needs to push its developmental activities and become more sustainable by minimizing its dependence on foreign aid.

What can she do to achieve this?

- A increase the country's GNP
- B surpass exports by imports
- C increase the country's GDP
- D minimize the private companies

2. Fill in the blanks with appropriate word/s.

[0.5x10]

- (i) Current global development is guided by _____ development goals.
- (ii) A hotel targets to save water by installing sensor tap. The key cyclic element of EMS adapted here is _____
- (iii) When water is pumped and distributed through a system of pipes and sprayed is called _____ irrigation.
- (iv) When GM plants cross pollinate with closely related non GM plants resulting in the loss of identity of wild species, it causes genetic _____.
- (v) The _____ phase of Biodiversity Management System is responsible for monitoring and reporting on changes in biodiversity.
- (vi) The estimation of health effects resulting from various exposure conditions to potentially hazardous substances fall under risk _____.
- (vii) The ultimate goal of _____ to climate change is to lower emission of greenhouse gases that leads to global warming.
- (viii) A succession marked by the presence of bacteria and fungi as the pioneer species is _____ succession.
- (ix) Increasing number of vehicles lead to the increased emission of greenhouse gases. The tool to measure this emission is _____ footprint.
- (x) Ground water is one of the sources of fresh water and is important for wetlands and estuaries as it neutralizes the _____.

3. Match each item under column A with the most appropriate item in column B. Rewrite the correct pairs by writing the alphabet against the number in the space provided. [0.5x10]

Column A	Column B
(i) A major environmental disturbance leading to the loss of the entire ecosystem.	(a) secondary industry
(ii) The part of the country's economy concerned with providing services.	(b) endangered
(iii) Sulphur dioxide undergo chemical reactions and return to the soil in the form of wet deposition.	(c) bioblitz
(iv) Removal of sulphur dioxide from the exhaust by a variety of methods.	(d) nudation
(v) Intense biological survey to record all the living species in an area within the given period of time.	(e) reclamation
(vi) Species restricted to a defined geographical area.	(f) green manufacturing
(vii) Species susceptible to disappearance due to poaching and hunting.	(g) acidification
(viii) Restoring land that has been mined while extracting mineral deposits.	(h) aggregation
(ix) Redesigning the production systems and products, recycling used products and by products.	(i) transformational
(x) Preventing and reducing marine pollution from land based activities.	(j) flue gas desulphurization
	(k) tertiary industry
	(l) endemic

(i)
(ii)
(iii)
(iv)

(v)
(vi)
(vii)
(viii)
(ix)
(x)

4. Write TRUE or FALSE for the following statements. Rewrite the false statements in the correct forms.

[1x 5]

- (i) When greenhouse gas emission is less than its absorption by forests, it makes the place carbon neutral.

- (ii) Carcinogens are cancer causing agents and many of them are considered as threshold chemicals.

- (iii) The purpose of GM technique is to produce genetically altered organisms with enhanced quality.

- (iv) When the value of BOD or COD is higher, the dissolved oxygen level in the water increases.

- (v) The achievement of sustainable development goals relies on the fulfillment of its targets.

5. Answer the following questions briefly. [10]

- (i) What do you mean by biophysical environment? [1]

- (ii) Give **TWO** advantages of waste management. [1]

- (iii) In a forest ecosystem there were ten species living together. One of the species was prairie dogs. The removal of the prairie dogs from the ecosystem led to the disturbance in the ecosystem.

- (a) What are these species called? Why? [1]

- (b) How are they different from the dominant species? [1]

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- (iv) For lighting your home, which bulb would you prefer, compact fluorescent bulb or regular incandescent bulb? Why? Give **TWO** reasons. [2]

- (v) Forest fire leads to the destruction of large forest area, however it has an advantage too. Do you agree? Justify. [1]

- (vi) In your opinion, what will happen if the ecosystem is not restored? [1]

- (vii) If an earthquake occurred when you were in the school, what steps would you follow to be safe? [2]

Section B (60 marks)
Answer any **SIX** questions.

Question 1

- (a) Explain any **TWO** regulating services of the ecosystem. [2]

- (b) The standard of air quality index as per environmental protection agency for PM 2.5 is $40 \mu\text{g}/\text{m}^3$. In Kolkata, the annual average level of PM 2.5 in 2015 was $110 \mu\text{g}/\text{m}^3$.

- (i) Calculate the air quality index of PM 2.5. [1]

- (ii) What does this air quality index value indicate? [1]

- (iii) Which group of people should avoid outdoor physical activities? [1]

(c) Observe the figure given below and answer the questions that follow.



(i) What would you do during such times of disaster? [1]

(ii) Why are Bhutanese traditional houses prone to such disasters? [1]

(iii) What can people do to be prepared for such kind of disaster? [1]

- (d) “Electric cars are one of the modes of green transport and are encouraged by many environmentalists.”

Would you purchase an electric car instead of petroleum based cars?
Support your answer with **TWO** points.

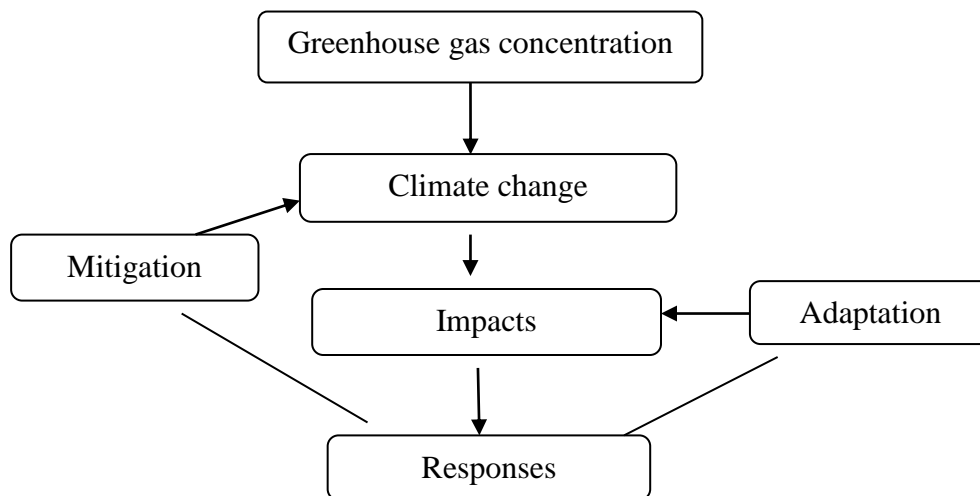
[2]

Question 2

- (a) Explain ecological succession and **ONE** of its causes.

[2]

- (b) Study the figure below and answer the questions that follow.



- (i) How does climate change affect the phenophase of plants?

[1]

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(ii) Why are mitigation and adaptation to climate change important? [2]

(c) Ap Sangay in Laya collects *Cordyceps sinensis* during the harvesting season and earns a good income. He is very thankful to the government for permitting the highlanders to harvest *Cordyceps sinensis*.

(i) What do you think is the purpose of regulating *Cordyceps sinensis* collection? [1]

(ii) What can Ap Sangay practise to sustain the harvesting of *Cordyceps sinensis*? [1]

(iii) State **TWO** importance of *Cordyceps sinensis*. [1]

- (d) State **TWO** advantages of using alternative energy sources with any **TWO** examples. [2]

Question 3

- (a) Agricultural practices and developmental activities can cause land degradation if not carried out in a sustainable manner. Explain. [2]

- (b) (i) What needs to be done to set up ecofriendly industries? Mention **TWO** points. [1]

- (ii) Explain **TWO** impacts of industrialization. [2]

- (c) Soil biota includes all microorganisms such as bacteria, fungi, amoeba, soil insects, earthworms and plants.

(i) Why are bacteria and fungi important for soil?

[1]

(ii) What will be the consequence if all the earthworms are removed from the soil?

[1]

(iii) What threatens the survival of these soil biota?

[1]

- (d) If you are the education minister, what will you do to achieve the 4th Sustainable Development Goal, quality of education? Mention **FOUR** points.

[2]

Question 4

- (a) Write **ONE** function of National Biodiversity Strategies and Action Plan. [1]

- (b) Biofuel is preferred over fossil fuel in automobiles. Do you agree? Support your stand with **TWO** reasons. [2]

- (c) Study the figure given below and answer the questions that follow.



Store materials



Combine materials & turn them



Ready for use

- (i) How is composting process carried out? [1]

(ii) What are the advantages of composting?

[1]

(iii) How can you promote these practices in your locality?

[1]

(d) How is terrace farming and strip cropping practiced by farmers?
What are the advantages of these practices?

[3]

(e) Prepare a slogan to prevent a forest fire.

[1]

Question 5

- (a) Explain ecotone and edge effect. [2]

- (b) Bhutan is the member of Convention on Biological Diversity (CBD), an international agreement established by the United Nations.

- (i) What is the purpose of Bhutan joining CBD? [1]

- (ii) How does Bhutan work in order to achieve the objectives of CBD? [2]

- (c) Study the two figures given below and answer the questions that follow.



A



B

Where would you prefer to settle, place A or B? Provide **TWO** reasons to support your answer.

[2]

- (d) Climate change is a global issue and Bhutan is no exception.

(i) Predict the climatic condition of Bhutan after 25 years.

[1]

(ii) What can you do to slow down the rate of climate change?

[1]

- (e) Why is green building approach important? [1]

Question 6

- (a) Describe **TWO** challenges faced by South Asian Countries to fulfill sustainable development goal. [2]

- (b) Explain and write **ONE** example each for practicing sustainable agriculture and forestry. [3]

- (c) Karma owns a piece of land on a steep slope where he cultivates wheat and potatoes. The land was fertile and high yielding in the past years. However, this year he was disappointed to find the top soil lost from the land.

(i) What natural factors might have led to the loss of top soil? [1]

(ii) How can human action accelerate the process? [1]

(iii) What will be the impact of such process in the long run? [1]

(d) If you are a keen bird watcher, how will you create awareness about the endangered White-bellied Heron? [1]

- (e) How are the data collected by students on plant phenology used in Bhutan Phenology Network? [1]

Question 7

- (a) In the mitigation phase of disaster management, mitigation strategies include both structural and non-structural components. Explain the two components. [2]

- (b) What is the purpose of ecosystem service valuation? Briefly explain **ONE** importance. [2]

- (c) One of the initiating causes for secondary ecological succession is volcanic eruption. However, volcanic eruption has many disadvantages on the ecosystem. Do you agree? Give **TWO** reasons.

[2]

- (d) There are 17 sustainable development goals adopted by different countries. **Good health and well-being** and **gender equality** are the two of the 17 SDGs. From those two SDGs, which one will you give more priority? Justify your answer with **TWO** reasons.

[2]

- (e) Genetically modified organisms (GMOs) are those organisms (plant, animal, bacteria or virus) that possess foreign gene(s) transferred from a selected donor organism into their DNA, typically conferring desired traits.

- (i) Write the benefits of GMOs in biodiversity conservation.

[1]

(ii) How do GMOs affect the soil fertility?

[1]
