

SECTION A (40 MARKS)
ANSWER ALL QUESTIONS

Question 1

a) 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 is more than one choice circled, NO score will be awarded. [25]

i. Which one of the following land use patterns will you recommend for agriculture practices in Bhutan to boost economic development?

A Tseri
B Tsamdro
C Chuzhing
D Kamzhing

ii. Sangay is planning to purchase jerseys. Each jersey consumes an average of 30 kg of grass per day. If he grows 300 kg of grass, how many jerseys can he buy?

A 10
B 20
C 30
D 40

iii. The following are the consequences of unsustainable lifestyle EXCEPT

A increased poverty.
B depletion of resources.
C reduced waste production.
D competition for resources.

iv. Bhutan's natural resources are increasingly coming under various pressures due to gradual increase in

I population.
II urbanization.
III industrialization.

Which combination of the factors pose a pressure on natural resources?

A I and II
B I and III
C II and III
D I, II and III

v. You as the disaster focal person of a school has been given the task of planning a disaster risk reduction framework. The first thing you will conduct is

- A risk assessment.
- B top-down initiatives.
- C bottom-up initiatives.
- D dialogue with communities.

vi. Biodiversity is broadly classified as genetic diversity, species diversity and ecosystem diversity. The example of species diversity is

- A flora and forest.
- B flora and fauna.
- C agriculture and fauna.
- D forest and agriculture.

vii. Thorthormi in Lunana is one of the biggest glacial lake in Bhutan. A team of experts assessed the risk and found it vulnerable to cause Glacial Lake Outburst Flood. Thus, they decided to reduce the water level by 5 meters every year. This is an example of

- A disaster relief.
- B disaster mitigation.
- C disaster preparation.
- D disaster rehabilitation.

viii. When an ecosystem undergoes disturbances that are non-catastrophic over time, the particular ecosystem may adjust or show little deviation to the disturbances. This is called

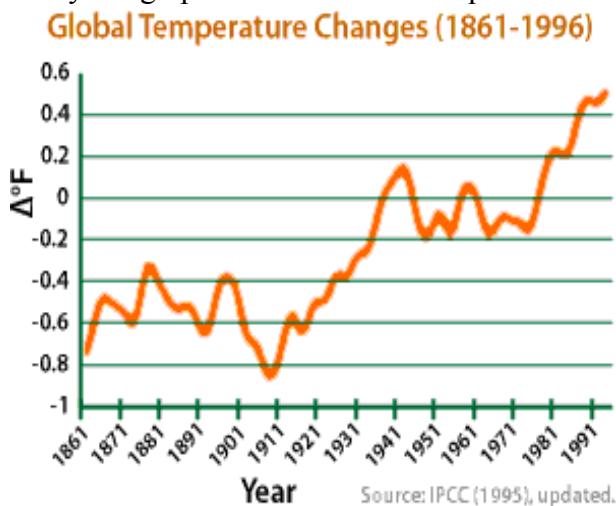
- A recover.
- B resistance.
- C resilience.
- D regeneration.

ix. The Earth has everything for each generation and everybody has the right to a healthy, clean and safe environment. It is our duty to make sustainable use of resources.

The following are the ways to practice sustainability **EXCEPT**

- A encourage alternative sources of energy.
- B efficient use of non-renewable resources.
- C encourage the use of resources to meet our desires.
- D carry out scientific environment impact assessment.

x. Study the graph below and answer question number x.



(<https://www.researchgate.net/figure/Global-average-temperature>)

The graph represents the global average temperature and if such trend continues, then its immediate effect would be

- A climate change.
- B weather change.
- C global warming.
- D ozone depletion.

x. A plant species blooms earlier than previous years in the absence of pollinators. This results in the plant population declining as there is no pollination that aid in their reproductive success.

The above statement refers to phenological

- A events.
- B studies.
- C mismatch.
- D observation.

xii. Consider Bhutan's Sustainable Development Goals given below:

- I The Sustainable Development Goals have to be achieved by 2030.
- II No challenges to implement Sustainable Development Goals.
- III Sustainable Development Goal focus on the future generations.

Which of the statements are correct?

- A I and II
- B II and III
- C I and III
- D I, II and III

xiii. As per Living Planet Report of 2000 done by World Wildlife Fund, total global consumption of natural resources has steadily risen by 50 percent since 1970. This does not correspond with the natural resources as the earth's natural resources have decreased by over 30 percent. Currently, according to Global Footprint Network, if everyone lived the lifestyle of the average American US citizen i.e. similar eating, transportation, living, and consumption habits, we would need 5 planets to support ourselves.

(<https://www.conserve-energy-future.com/what-is-ecological-footprint.php>)

Considering the amount of consumption presented in the excerpt above, which one of the following actions will help to reduce consumption?

- A dispose wastes in landfills
- B encourage to consume dairy products
- C use bicycles and electric cars for transportation
- D emphasize the use of disposable plastic bags for shopping

xiv. What kind of bulbs would you use for the electrification of your home?

- A fluorescent and LED
- B fluorescent and halogen
- C halogen and incandescent
- D incandescent and fluorescent

xv. All of the following are the challenges faced by farmers **EXCEPT**

- A poor quality of seeds.
- B poor quality of soil fertility.
- C inadequate supply of manure.
- D lack of market for surplus products.

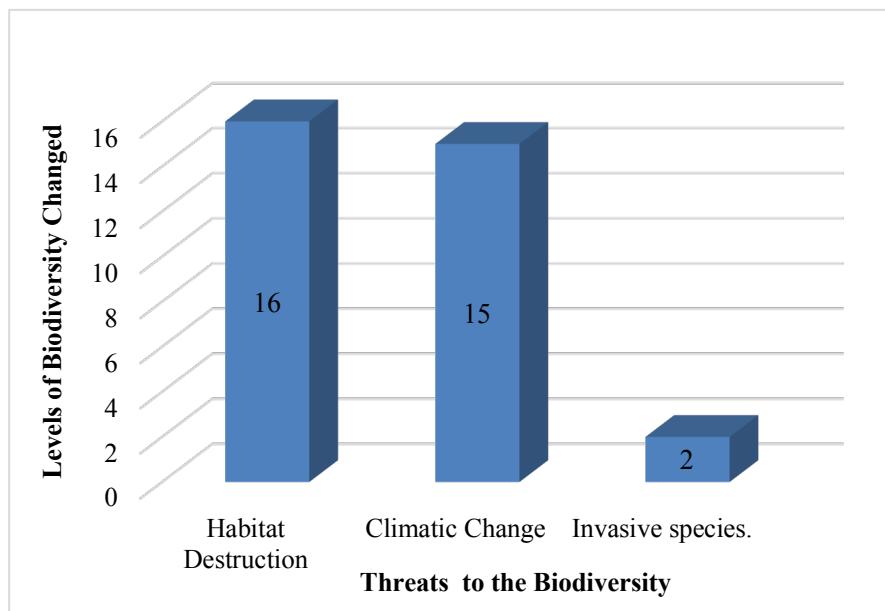
xvi. Birds that predominantly live in hilly and broadleaved forests at altitudes of 150 - 2,200 meters have their nesting period from March to June on tall trees having broad girths. This best describes the habitat of the

- A White Bellied Heron.
- B Clamator Coromandus.
- C Cuculus Sparverioides.
- D Rufous necked Hornbill.

xvii. Ecological and socio-economic equity are the necessary conditions for achieving

- A social development.
- B economic development.
- C ecological development.
- D sustainable development.

xviii. Study the graph given.



Calculate the percentage of change in biodiversity brought about by habitat destruction.

- A 48%
- B 45%
- C 16%
- D 15%

xix. Which of the following renewable sources of energy are currently being used in Bhutan?

- I Solar
- II Wind energy
- III Hydropower
- IV Geothermal energy

- A I, II, and IV
- B I, II, and III
- C I, III, and IV
- D II, III, and IV

xx. Unlike other countries around the world, Bhutan has been able to conserve its environment. This is mainly due to its

- A rich biodiversity.
- B favorable climatic condition.
- C cooperative community in the locality.
- D sound environmental conservation policies and laws.

xxi. In an ecosystem, cycling of nutrients is called

- A chemical cycle.
- B geological cycle.
- C geochemical cycle.
- D biogeochemical cycle.

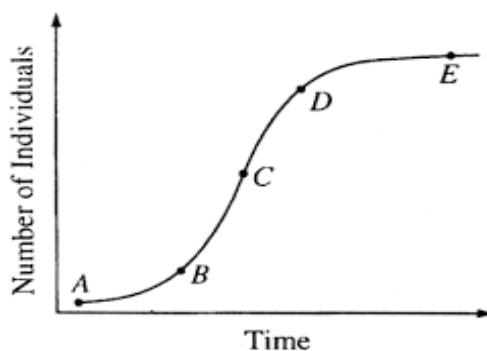
xxii. What is the order of waste management hierarchy ranging from most to least favoured?

- A Prevention-Reuse-Disposal-Recycle
- B Prevention-Reuse-Recycle-Disposal
- C Prevention-Disposal -Reuse-Recycle
- D Prevention- Recycle-Reuse- Disposal

xxiii. The society in which large amount of goods and services are used can be referred to as

- A primitive society.
- B industrial society.
- C agricultural society.
- D consumerist society.

xxiv. Study the following figure.



At which point do the resources become limiting in the carrying capacity curve?

- A A
- B C
- C D
- D E

xxv. Disaster Risk Management includes a wide range of actions, whose primary aim is to lessen the impacts of natural hazards and technological disasters. These actions are divided into steps in the disaster management cycle.

- I Disaster relief
- II Contingency plan
- III Disaster mitigation
- IV Disaster preparedness
- V Disaster rehabilitation

The correct sequence of the disaster management cycle is

- A I, II, III, IV and V.
- B II, V, IV, I and III.
- C III, IV, I, V and II.
- D IV, V, I, III and II.

b) Fill in the blanks with appropriate word(s).

[5]

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| i. The process of converting ammonium to nitrates during the nitrogen cycle is _____. | |
| ii. The destruction of natural biodiversity by clearing forest for construction and agricultural purposes is known as _____ activities. | |
| iii. Gases like carbon dioxide, methane, nitrous oxide gases in the atmosphere are capable of trapping the infrared radiation radiated from the Earth's surface that help to maintain the average temperature of the Earth. This phenomenon is known as _____. | |
| iv. The benefits people obtain from the ecosystem are termed as ecosystem _____. | |
| v. The building in which windows and walls are installed to collect, store and distribute solar energy in the form of heat during winter is called _____ solar design. | |

c) Match the items of column A with the most appropriate items in column B. [5]
 Rewrite the correct pairs by writing the alphabets against the numbers in the space provided.

| Column A | Column B |
|---|-------------------------|
| i. Extrinsic and intrinsic factors | a. forest |
| ii. Overshoot in the carrying capacity | b. ecological footprint |
| iii. Most dominant land use form in Bhutan | c. ecosystem collapse |
| iv. Key economic sector of Bhutan | d. ecosystem stability |
| v. A tool to educate people on carrying capacity and over-consumption of bio-productive areas | e. resistance |
| | f. pasture land |
| | g. agriculture |
| Column A | Column B |
| i. | |
| ii. | |
| iii. | |
| iv. | |
| v. | |

d) State TRUE or FALSE against the statements in the space provided. [5]

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| i. If the biodiversity is less, the stability of an ecosystem will be more. | | |
| ii. Natural resources are also called as natural capital. | | |
| iii. Warning about a disaster is important as it allows people to take measures for protection. | | |
| iv. Ecotourism is one of the ways to conserve biodiversity. | | |
| v. Non-renewable resources have the potential to produce green energy. | | |

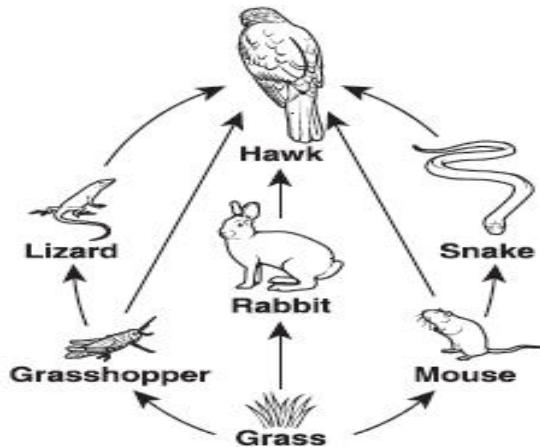
SECTION B (60 MARKS)
ANSWER ANY SIX QUESTIONS

Question 2

a) Name **ONE** gaseous biogeochemical cycle.

[1]

b) The diagram below represents a feeding relation in an ecosystem. The arrow means 'eaten by'.



What would happen if grasshopper is removed from the feeding relationship?

Mention any **TWO** points.

[2]

c) Why do wild animals and birds become endangered? Give any **TWO** reasons.

[2]

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d) Construction of hydropower plants play an important role in the socio-economic development of Bhutan. Do you agree? Support your answer with **TWO** points. [2]

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e) Practicing sustainable consumption can help to ensure that the ecosystem has sufficient resources in the future. What role does each of the following play in resource management? List **THREE** points each. [3]

- i. Car pooling
- ii. Use of renewable resources

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Question 3

a) What do you understand by indigenous practices in biodiversity conservation? [1]

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b) Confinement measures imposed to slow the spread of the Covid-19 pandemic last year have resulted in an unprecedented fall in air pollutants across the country. [2]

Mention **TWO** impacts that would arise due to the pandemic.

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c) Name any **FOUR** natural disasters. [2]

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d) “A landowner without a house and having only inherited ‘chuzhing’ in his Thram may apply for one plot of 50 decimals in rural area for residential land from such ‘chuzhing’

(The Land Act of Bhutan 2007)

What would happen if the Land Act of Bhutan 2007 did not have restriction on
‘chuzhing’ conversion?

[2]

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e) With the increasing demand for cordyceps in the international markets, people are spending months in collecting and overharvesting them. Explain **THREE** ways to control the overharvesting of cordyceps.

[3]

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Question 4

a) Define energy security.

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b) Sustainable development is fundamental to the global developmental process towards promoting equitable, social and economic well-being of people. Bhutan upholds its commitment to the future generations through the alignment of national developmental priorities with the global sustainable development goals. However, there are many challenges in implementing these goals.

What are some of the challenges in the implementation of the above initiatives?

[2]

Mention **TWO**.

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c) Study the figure below.



(<https://kuenselonline.com/khothakpa-gypsum-mine>)

Mention **TWO** impacts of mining.

[2]

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d) Bhutan is rich in natural resources, particularly in terms of forest cover. The Constitution of Bhutan mandate to have 60% of our land is covered by forest for all the time. Currently 71% of the total land is covered by forest.

Do we need to conserve our forest cover hereafter? Give **TWO** reasons.

[2]

e) Use the table given below to answer the questions.

| Species | Ecosystem A | Ecosystem B |
|-----------|-------------|-----------------------|
| Blue pine | 4 | 12 |
| Chirpine | 16 | 240 |
| Fir | 2 | 2 |
| Hemlock | 2 | 2 |
| Juniper | 6 | 30 |
| Total | N=30 | $\Sigma n(n-1) = 286$ |

i. Calculate the Simpson's Diversity Index using the information from the above table.

[1]

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ii. Calculate Simpson's Index of Diversity (1-D).

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iii. What conclusion can you draw about the diversity of species?

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Question 5

a) What do you understand by green energy?

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b) In the recent years, Bhutanese youths have ventured into agricultural activities such as growing of vegetables and dairy farming. However, such activities have given more pressure on the land. What are some of the common impacts of the current land use pattern in Bhutan? Mention **TWO**. [2]

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c) A flash flood of Serkang stream that occurred at 2:45pm on a clear weathered afternoon is suspected to have washed away the three boys. [2]

(www.kuenselonline.com)

Suggest **TWO** ways to mitigate such disaster.

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d) Explain Ecological Footprint. [2]

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e) Mention **THREE** ways to maintain a constant flow of nitrogen in an ecosystem other than the nitrogen cycle. [3]

Question 6

a) In a biogeochemical cycle, phosphorous cycle plays a vital role in providing essential elements to all living organisms. What happens to the phosphates when plants and animals die? [1]

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b) What are some of the ways to reduce ecological footprint? Mention any **TWO** ways. [2]

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c) The world is tested by multiple challenges like Global Food Security, Climate Change and Global warming, Natural Disasters and pandemic like COVID-19.

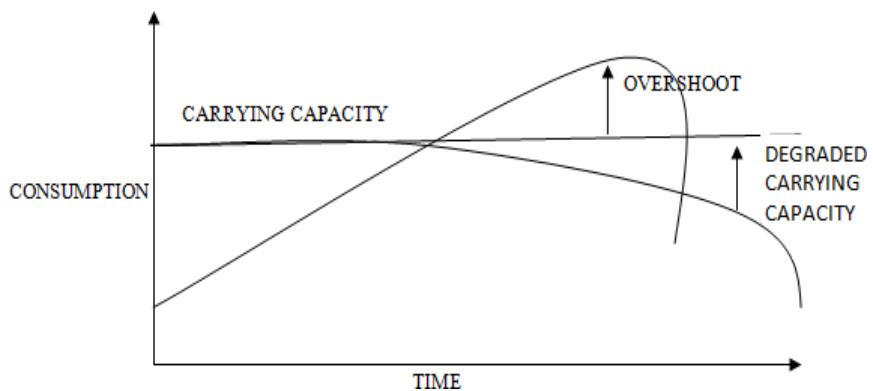
What are the some of the ways to reduce the spread of COVID-19 pandemic? [2]
Mention any **TWO** ways.

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d) Complete the following table. [2]

| Global Initiatives | Objectives | Action taken on climate change |
|--------------------|------------|--------------------------------|
| Earth Submit | | |
| Kyoto Protocol | | |

e) Study the graph below.



Interpret the graph.

[3]

Question 7

a) List down any **TWO** geophysical disasters.

[1]

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b) Suggest **TWO** ways to manage waste in your locality.

[2]

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c) Why is energy conservation important? Give **TWO** reasons.

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d) What are the factors affecting the productivity of an ecosystem? Mention **TWO**. [2]

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e) The Earth's climate is dynamic and changes through natural cycles. [3]
Explain pros or cons of climate change? Give **THREE** points.

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Question 8

a) Give the full form of the following abbreviations. [1]

- i. EIA
- ii. NEC

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b) ‘Traditional Bhutanese lifestyle is environment friendly.’ Support the statement with [2] **TWO** reasons.

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c) Suggest **TWO** ways to control the over extraction of timber.

[2]

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d) Write **TWO** differences between gaseous biogeochemical cycle and sedimentary biogeochemical cycle in terms of definition.

[2]

| Gaseous biogeochemical cycle | Sedimentary biogeochemical cycle |
|------------------------------|----------------------------------|
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e) The resilience and resistance abilities of an ecosystem may be influenced by either extrinsic or intrinsic factors. Analyze how these two factors affect the stability of an ecosystem? Mention **ONE** example each.

[3]

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Question 9

a) Define species richness.

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b) Write **TWO** differences between species dominance and species evenness.

[2]

| Species dominance | Species evenness |
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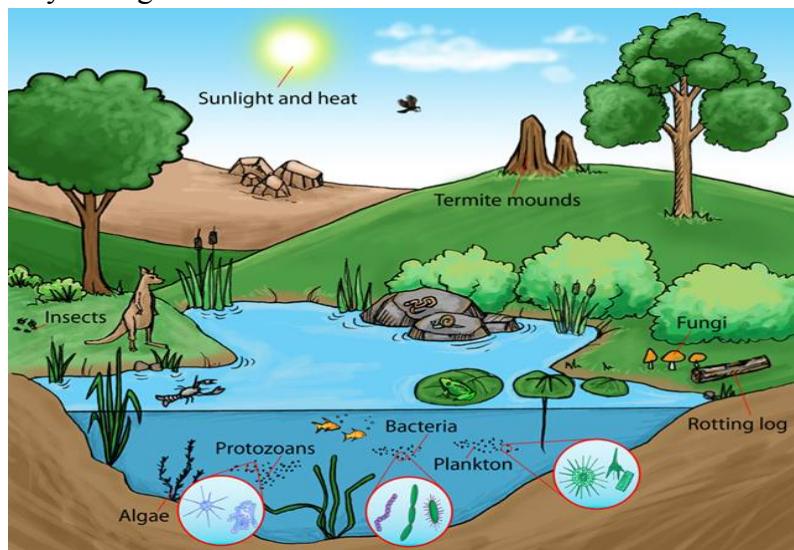
c) Suggest **TWO** strategies to conserve energy.

[2]

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d) Study the figure below.

[2]



In an ecosystem, the only available water source is a small pond and a number of bears, fishes, deers, foxes, squirrels and birds depend on it. The pond is drying up slowly.

What do you think will happen to the population of the different species of organisms in that ecosystem after sometime? Why? Give **TWO** reasons.

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e) GNH is considered as the development philosophy of Bhutan. Justify how it contributes in the sustainable development of our country. [3]