

**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 are more than one circled, NO score will be awarded.** [15]
- i. The repetition of important life processes at regular intervals in a year is
- A diversity.
  - B periodicity.
  - C interspecific association.
  - D community productivity.
- ii. Which one of the following is the objective of environmental audit?
- A Verify compliance with the environmental laws and regulations.
  - B Provide information for decision-makers on environmental consequences.
  - C Find ways to reduce the adverse impacts on environment at an early stage.
  - D Help in reducing environmental pollutions and conserving natural resources.
- iii. In ecological succession, an initiating cause is
- A migration, aggregation and competition.
  - B the factor that stabilizes the community composition.
  - C the factor responsible for the destruction of the existing ecosystem.
  - D the process that bring constant changes in the structure and composition of the community.
- iv. Maximum percentage of fresh water on earth is in the form of
- A snow.
  - B streams.
  - C glaciers.
  - D ground water.
- v. During the dry winter seasons, the fire department, police and De-suungs are involved to combat the forest fires.  
Which phase of the disaster management is described above?
- A Preparedness
  - B Response
  - C Recovery
  - D Mitigation

- vi. 'Once released, the new living organisms made by genetic engineering are able to interact with other forms of life, reproduce, transfer their characteristics and mutate in response to environmental influences.'

Which of the following is a disadvantage of this technique?

- A increased shelf life
- B increased crop diversity
- C eliminates food allergies
- D invasion of wild species

- vii. 'Bhutan has remained the biggest beneficiary by amount and share of Indian foreign aid for 17 years.'

The above excerpt is

- A a philosophy of Gross National Happiness.
- B an agenda for sustainable development at the national level.
- C a challenge for Bhutan in achieving the Sustainable Development Goals.
- D a hindrance in strategy formulation and capacity development at a regional level.

- viii. The people in some parts of Bhutan are not permitted to collect firewood during certain time of the year.

This traditional practice of promoting conservation of biodiversity happens at the

- A community level.
- B regional level.
- C national level.
- D district level.

- ix. Study the table below:

Components (gha/capita)	Carbon footprint
World	1.72
Bhutan	0.81
Australia	5.01
Singapore	5.22
Canada	5.28
Luxembourg	10.37

Why is the carbon footprint of Bhutan lesser than the other countries?

- A limited forest cover
- B rising vehicle imports
- C growing number of industries
- D hydropower as the main source of electricity

- x. 'This body strives to contribute towards the national goal of food self-sufficiency by safe guarding the farming system of the country from exotic pests, diseases and ensuring quality farming inputs through effective enforcement of standards and regulations.'
- Identify the body which best fits the above description.
- A DRC
  - B NEC
  - C MTI
  - D BAFRA
- xi. Light Emitting Plasma (LEP) is preferred over Light Emitting Diode (LED) in street lights because it
- A is portable.
  - B is readily available.
  - C has high luminary efficiency.
  - D has high overall system price.
- xii. The real-time air quality index of city 'Y' showed PM 2.5 is 209. It means that
- A senior citizens can go for a walk in the park.
  - B people with asthma can go for shopping.
  - C the city marathon has to be cancelled.
  - D children can play in the park.
- xiii. Read the following statements related to investigative science:
- I Develop hypothesis.
  - II Design and investigate.
  - III Make conclusions.
  - IV Go through reference materials.
- Pema noticed mildew on the stem of his azalea plant. What should be his first few steps to find out the cause of mildew?
- A I, II and III
  - B I, II and IV
  - C I, III and IV
  - D II, III and IV
- xiv. To water plants, PET bottle caps are pierced to make holes. These are filled with water and inverted at the base of the plant. Which irrigation method is described above?
- A drip irrigation
  - B pitcher irrigation
  - C surface irrigation
  - D sprinkler irrigation

xv. Bhutan should prioritize the following global goals in the conservation of biodiversity **EXCEPT**

- A good health and wellbeing.
- B affordable and clean energy.
- C sustainable cities and communities.
- D responsible consumption and production.

b) **Write TRUE or FALSE for the following statements. Rewrite the false statements in the correct forms in the space provided.** [5]

- i. Retreating glaciers is one of the evidence of climate change.
- ii. A thermal oxidizer oxidises halocarbons to carbon dioxide and water at a high temperature.
- iii. Jigme Dorji National Park serves as a site for scientific research.
- iv. Lower the concentration of dissolved minerals in the soil sample, higher the electrical conductivity.
- v. Bhutan's Five Year Plans for development is aligned with the philosophy of Gross National Product and Sustainable Development Goals.


- c) **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.** [5]

Column A		Column B
i.	Lichens, mosses, liverwort and other lower plants.	a. CITES
ii.	Biologically productive area.	b. COD
iii.	Gradual settling of the land due to excessive extraction of ground water.	c. pioneer species
iv.	Non-threshold chemical.	d. ESIA
v.	Safe amenity locations and infrastructures.	e. carcinogen
vi.	Protect endangered plants and animals.	f. pathogen
vii.	Assess all the impacts on biodiversity and impart mitigation measures.	g. biocapacity
viii.	Determine the standard of water quality.	h. carrying capacity
ix.	Enable economic growth, elevate environmental quality and social inclusiveness.	i. SDG 2
x.	Eradicate all forms of malnutrition and build inclusive and sustainable food systems.	j. adaptation
		k. land subsidence
		l. green economy
Column A		Column B
i.		
ii.		
iii.		
iv.		
v.		
vi.		
vii.		
viii.		
ix.		
x.		

**d) Fill in the blanks with appropriate word/s.**

**[5]**

i.	_____support ensures that the skills held in the UN development system are disseminated on time.	
ii.	A person walking to and from his work place is an example of green _____.	
iii.	People believe that littering at spiritual sites will bring misfortune. The study of how people's belief help in conserving the ecosystem is called_____.	
iv.	Ludlow's Bhutan Swallowtail is one of the _____ species of Bhutan.	
v.	Killing of Tokay gecko for medicine is _____.	
vi.	Using living organisms to remove pollutants from contaminated sites is called_____.	
vii.	_____ is any action carried out to eliminate or reduce the risks and consequences of climate change.	
viii.	Gypsum mining in Pema Gatshel is an ecological disturbance of _____ origin.	
ix.	Bhutan Telecom provides communication services. It is an example of _____industry.	
x.	The leaching of nitrates into the soil from farms leads to_____.	

**e) Answer the following questions briefly.**

i. What is Ecological Footprint?

**[1]**


- ii. Give any **TWO** examples of green manufacturing. [1]


- iii. Differentiate bequest value from altruistic value with an example each. [2]


- iv. According to PHCB 2017, the percentage of households using electricity as the main source of energy for lighting increased to over 97 in 2017 from 57 in 2005. It also mentions that a very few households today use kerosene and solar energy. [2]

Source: www.bbs.bt, July 4, 2018

Do you think that the Bhutanese are making the right choice? Justify with **TWO** points.


- v. Scientific and technological advancements worsen land degradation. Do you agree? Give **TWO** Justifications. [1]




- vi. As a policy maker, how would you use the knowledge of ecosystem service valuation in making laws? [1]


- vii. Imagine there is a major landslide near your school. As a member of search and rescue team, what steps would you take to help the casualties? [2]


**SECTION B (60 MARKS)**  
**ANSWER ANY SIX QUESTIONS**

**Question 2**

a) Define the following terms:

i. Realised niche

**[1]**


ii. Carbon sequestration

**[1]**


b) Read the following information.

“As per the directives of the Government, every year the World Environment Day is observed as the Pedestrians’ Day in Bhutan. Therefore, this is to notify all concerned that tomorrow 5 June, 2018 is Pedestrians’ Day, when the vehicle traffic is limited in the city centres. The exception is given to public transport.”

*Source: www.moaf.gov.bt*

i. Name the technology used for the reduction of greenhouse gas emission implied in the above notice.

[1]


ii. Give **TWO** examples of technology used in question (i).

[2]



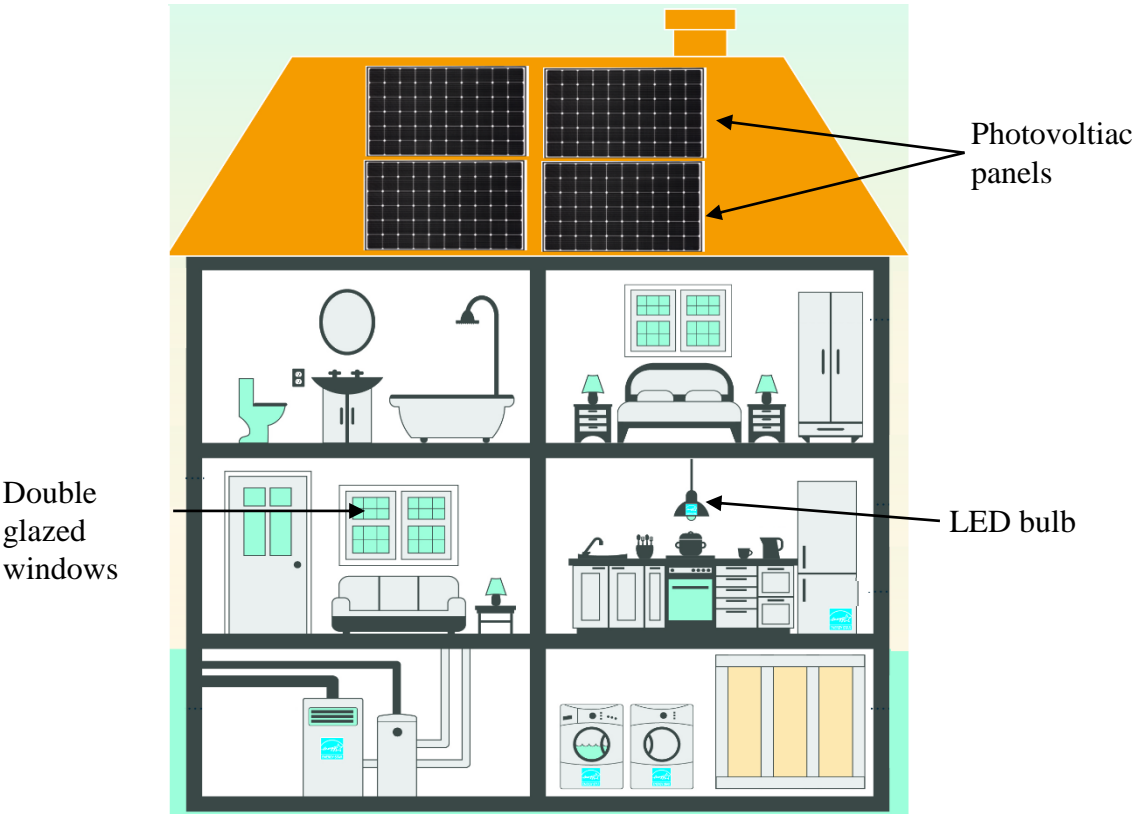

- d) 'Ecotourism is a boon for the local communities'. Do you think so? Justify with **TWO** points. [2]


**Question 3**

- a) Describe **TWO** characteristics of seral community. [2]



b) Study the picture given below.



How do the parts labelled in the above diagram contribute in saving energy? [3]



c)      ‘Phrumsengla National Park in central Bhutan covers Bumthang, Lhuntse, Mongar and Zhemgang where the villages and the protected areas tend to be interlinked. The protected areas can alleviate poverty of the rural areas.’ [3]

Which **THREE** fundamental dimensions of wellbeing would you suggest to reduce poverty in those rural communities?



d) Give **FOUR** examples of alternative energy devices. [2]


**Question 4**

a) Describe any **TWO** sources of groundwater contamination. [2]





- b) A farmer produces  $156 \text{ m}^3$  of nitrous oxide from application of chemical fertilizers annually. The national average yield for the absorption of nitrous oxide is  $4.32 \text{ m}^3/\text{ha}$ . The yield factor and equivalence factor for emission of nitrous oxide is 1.28 and 1.01 respectively.

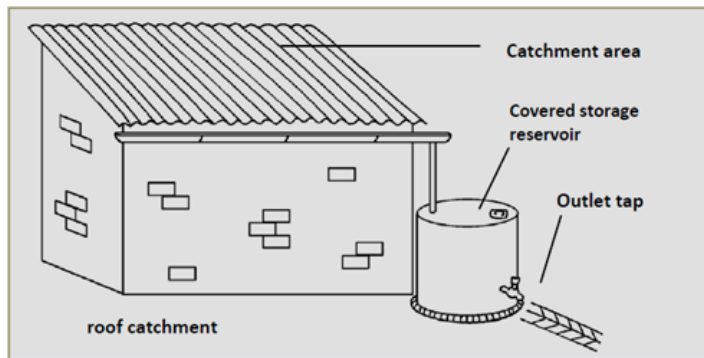
- i. Calculate the Ecological Footprint.

[2]


ii. What can you infer from the value?

[1]


c) Study the picture given below.



i. What does the above picture represent?

[0.5]


ii. What is the purpose of the method mentioned in i.?

[0.5]


iii. How does this method fulfil its purpose?

[2]


d) As a youth, what kind of development programmes can be carried out to achieve sustainable developmental goals of our country?

[2]


### Question 5

- a) Write **ONE** challenge in biodiversity management.

[1]


- b) 'Solar energy is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaic and solar architecture.'

[2]

Is solar energy a solution to the energy concern? Justify with **TWO** reasons.


- c) ‘Soyabean A 27Ø4-12 is herbicide tolerant.’ ([www.fao.org](http://www.fao.org))

[3]

What are some of the ways to ensure prevention of genetic pollution if such genetically modified crops are introduced?

[illegible]

- d) Lhamo carried out water quality test of a stream near her school. She recorded the observations as given below.

**OBSERVATION TABLE**

Parameter	Observation	Inference
Electrical conductivity	9.75	
pH	7.5	
Turbidity	2.5 NTU	
Temperature	12 <sup>0</sup> C	

- i. Complete the table by writing the inference against each observation. [2]
- ii. What is the basis of your inference for turbidity? [1]


- e) A school is situated close to a river. [1]
- Suggest any **TWO** measures to mitigate the risk of a flash flood.


**Question 6**

a) What do you mean by keystone species? List **TWO** examples.

**[2]**


- b) Study the figure given below.



- i. What does the above figure represent?

[1]


- ii. Explain **TWO** strategies to avoid such a situation.

[2]




- c) Will industrialization improve the living standard of people? Why? Give **TWO** reasons [2]


- d) 'In a world that is threatened with climate change, we are a carbon neutral country'. [2]  
*Prime Minister of Bhutan, TED 2016*

In your opinion, what are some of the measures Bhutan can take to remain as a carbon neutral country for all times to come?


e) Why do we need to recycle wastes? [1]


**Question 7**

a) Name the Global Goal 14. What is its target? [2]


b) Explain the main purpose of Environmental Impact Assessment (EIA). [3]


[illegible]

- c) Riverbed mining in Punakha-Wangdue stretch of Punatsangchhu is carried out to extract sand, gravel and stones for the construction of roads and buildings. [3]

Source: [www.nssc.gov.bt](http://www.nssc.gov.bt)

What can be some of the impacts caused by such actions? Mention any **SIX** impacts.



d)            Name a strategy to ensure food security in Bhutan. [1]


- e) The following are some examples of mitigation and adaptation to climate change: **[1]**
- |   |
|---|
| electric vehicles, mixed farming, hydropower, Disaster Management Plans |
|---|

Identify and write them under each heading mitigation and adaptation.

Mitigation	Adaptation	

### Question 8

- a) Briefly explain **TWO** disaster management practices in Bhutan. **[2]**


- b) Study the pictures given below and explain what they represent.

[2]



A



B


- c) Organisms inhabiting an ecosystem tend to change the environment. Do you agree? Mention **TWO** justifications to support your answer.

[2]



d) Does urbanization contradict the philosophy of sustainable development? Why? [2]


e) Read the excerpt given below:

‘Diverse life forms can help mitigate a natural disaster like flood by creating soil texture and structures.’

i. How can you mitigate the impacts of earthquake by maintaining the protected areas?

[1]


ii. How would you relate the action mentioned in i. to prevent drought and desertification?

[1]
