

Module I

Two mark Questions

1. List four strategies for achieving sustainable development.
2. Match Set A and Set B: Set A: Brundtland Commission Report, Water Act, International Union for Conservation of Nature, Air Act. Set B: 1981, 1974, 1948, 1987.
3. Suggest a project under CDM that could be executed in a village in a developing nation.
4. What is the relevance of Kyoto Protocol.
5. Give an example of any activity where sustainability and technology go hand in hand.
6. Technology may affect sustainability in positive and negative ways. Give one example each for both cases.

Five mark Questions

1. What are the three levels with which you approach a sustainable issue? Explain with an example.
2. List any five multilateral environmental agreements.
3. CDM is a good tool that can be used by developing countries for boosting up their own development. How?
4. Enumerate the major indentations of the Air Act.

Ten Mark Questions

1. Stories/Cases/Data set

Environmental ethics considers the ethical relationship between people and the natural world and the kind of decisions people have to make about the environment. Most people recognise that our planet is in a bad way and we all seem to have an opinion on environmental issues, such as climate change or the use of four wheel drive cars in cities. There has been a rapid growth in knowledge and technology, so that humans now face choices we have never had to face before that affect the continuation of humanity and the world within which we live. Environmental ethics simply tries to answer the questions of how humans should relate to their environment, how we should use the earth's resources and how we should treat other species, both plant and animal.

a) How is people and nature related to each other?

b) "*Most people recognise that our planet is in a bad way...*". Give examples of any two problems that are present now, but not existed in the past.

c) Explain the significance of sustainable development with respect to the above passage.

2. Air pollution in Asia has worsened since 2000 and is responsible for deaths of thousands of people in Beijing, Jakarta, Seoul and Manila. The pollution is a result of the use of fossil fuels by the industry and transport sectors. The problem got aggravated in Asia due to the use of poor quality fuel, inefficient method of energy production, use of vehicles in poor condition and traffic congestion. This was revealed during a research conducted by World Bank and Stockholm Development Institute. The research states that air pollution in the continent has surpassed the combined emissions in Europe

and North America. The deaths caused by fine particulate matter far exceed those caused by sulphur dioxide, nitrogen oxide, ozone and lead. The health cost in major Asian cities now exceed for 15-18 percent of urban income expenditure, claims World Bank officials.

(a). Identify any one component that need to be addressed towards attaining social, economic and environmental sustainability in the case illustrated.

(b). Compare the given situation in the cities stated in the text with any major Indian city. Do you see any such catastrophe to happen/is happening here? Why?

(c). Which multilateral environmental agreement(s) in the past think was proposed to curb the growing impact of pollution on humanity specific to the nations discussed here? Also highlight the instrument of action that is applicable in this context.

(d). A project under Clean Development Mechanism is to be proposed to contain the growing air pollution in the countries discussed, at the same time tackling a development initiative. Could you propose a CDM initiative that might be used in all the regions discussed here? Focus your answer showing the impact on the populace and the activity.

Module II

Two mark Questions

1. Illustrate a typical sustainable waste water treatment system with block diagram.
2. What is meant by zero waste concept.
3. Give three examples of air pollution and their effects on human beings.
4. List out the various disposal methods of municipal solid waste.
5. Explain the phenomenon of ozone layer depletion.
6. List out any two methods by which carbon foot print can be reduced.

Five mark Questions

1. Apply 3R concept to mineral water bottles.
2. List and explain any three local and regional environmental issues.
3. Distinguish between carbon credits and carbon trading.
4. How would you take initiatives in conducting your college fest, so that it remains an environmentally sustainable one?
5. Discuss the ways to reduce carbon footprint.

Ten Mark Questions

1. Stories/Cases/Data set

In metro cities in India, an individual produces an average of 0.8 kg/ waste/ person daily. The total municipal solid waste (MSW) generated in urban India has been estimated at 68.8 million tons per year (TPY) (0.573 million metric tons per day (MMT/d) in the year 2008). The average collection efficiency of MSW ranges from 22% to 60%. MSW typically contains 51% organic waste, 17% recyclables, 11% hazardous and 21% inert waste. However, about 40% of all MSW is not collected at all and hence lies littered in the city/town and finds its way to nearby drains and water bodies, causing choking as well as pollution of surface water. Unsegregated waste collection and transportation leads to dumping in the open, which generates leachate and

gaseous emissions besides causing nuisance in the surrounding environment. Leachate contaminates the groundwater as well as surface water in the vicinity and gaseous emissions contribute to global warming.

- a) Do you think local environmental issues contribute to global warming?
- b) Suggest any three solutions to the issues, mentioned in the above data.
- c) List any three global impacts of issues mentioned in above information.
- d) Do you prefer 3R concept or zero waste concept to address above issue?

Module III

Two mark Questions

1. Discuss the benefits of doing an EIA study.
2. Differentiate between Screening and Scoping process in EIA.
3. What is biomimicry.

Five mark Questions

1. Write a short note on EMS.
2. Briefly indicate the steps involved in introducing EMS in an industry.
3. Demonstrate the basic concept of LCA with an example.
4. How can we use life cycle analysis (LCA) as a tool for profit making?
5. List any 5 products developed based on bio mimics.
6. List down any six impacts considered in EIA.
7. What are the different steps involved in conduct of EIA.

Ten Mark Questions

1. Conduct a sample life cycle analysis of any product given below - Plastic pet bottles, lead acid batteries or hollow bricks.
2. ***Stories/Cases/Data set***
The tardigrade (water bear) undergoes a process called anhydrobiosis: it can remove all water from its body and live in an arrested metabolic state for 150 yrs. Add a drop of water and it completely reanimates. Biomatrica, a San Diego based company, has figured out how to replicate this process and has applied it to DNA and RNA storage. Samples can be stored on shelves at room temperature. This is a significant energy saver when applied to DNA storage systems. This new technology can significantly reduce the energy and maintenance costs. It also decreases the amount of storage space needed to store DNA/RNA samples. Imagine the energy and money savings if all DNA/RNA storage was switched to this process.
 - a) Briefly describe the technology mentioned in the above passage.
 - b) Give any other (any two) examples of inventions developed based on this technology.
 - c) Discuss the advantages of this technology

Module IV

Two mark Questions

1. What is biomass energy.
2. What is a small hydro power plant.
3. Name any two first and second generation biofuel.

Five mark Questions

1. Differentiate between conventional and non conventional energy sources. Which will you support? Why?
2. Suggest two renewable energy sources for our state and validate your suggestion.
3. List the different types of renewable energy sources
4. What are the energy saving opportunities in a house?
5. Suggest two renewable energy sources that can be utilized in automobiles.
6. Explain the working of photovoltaic cell with a neat diagram.
7. Explain a typical wind energy system with block diagram.
8. Write a short note on fuel cells.
9. Explain different method using which we can utilize solar energy.
10. Explain hybrid power systems with examples.
11. Explain one method to to extract Geothermal energy.
12. Discuss the advantages and disadvantages of nuclear energy.
13. There is a remote village on top of a hill. Explain any two methods that can be adopted there to generate electricity.

Ten Mark Questions

Stories/Cases/Data set

Country A is a small land locked nation with a predominantly agricultural economy and having a tropical climate (warm dry winters and warm wet summers). At present the nation is self sufficient in food supply and food products are its major export. It has no native fossil fuel resources. It does have a number of rivers which are fast flowing during the wet season but prone to drying up during the dry season. These rivers are vital for irrigation of the agricultural land. Electricity generation presently accounts for 30% of the nation's primary energy consumption, transport accounts for 40% and the remaining 30% for other uses. In order to reduce dependence on fuel imports and to help comply with international treaties limiting carbon emissions, the government of country A is considering investing heavily in renewable energy.

- a) Which are the different forms of energy through which Carbon emissions can be reduced?
- b) Based on the information given above write a short report outlining the relative advantages and disadvantages of two forms of renewable energy for the country.
- c) Which form of energy is more appropriate for the country, write your recommendation.

Module V

Two mark Questions

1. What are the push and pull factors in urbanization.
2. How can sustainable urbanization and poverty reduction can be related.
3. What is meant by sustainable Habitat?
4. Define the term Green Building.
5. Note down the criteria used for selecting material for sustainable design.
6. Write a short note on LEED rated buildings.
7. Define sustainable transport system.

Five mark Questions

1. What qualities make a material sustainable.
2. Write a short note on Industrial ecology.
3. How can the industrial sector achieve a sustainable growth through the concept of industrial ecology?
4. Apply idea of industrial symbiosis to the coconut oil industry
5. Do you prefer an urban area living? Substantiate your answer.
6. What are reasons of poverty?
7. As an engineer suggest any 5 points to reduce pollution by an industry in your locality.
8. Discuss any three benefits of green engineering.
9. List specialities of a green building in your dream and suggest any five green building materials that you will suggest for the same.
10. Suggest any three suitable green transport systems for your travel from place of stay to college.
11. Introduction of metro service in Kochi is a major achievement for the transportation system of the city. Do you think this can be related to sustainable engineering? If so, explain.
12. A new commercial building is constructing in your city. Suggest some methods to the builder for getting a four star GRIHA rated building.
13. Enumerate the basic features of a sustainable city.

Ten Mark Questions

1. Stories/Cases/Data set 1

Industrial Ecology In Practice - Kalundborg, Denmark

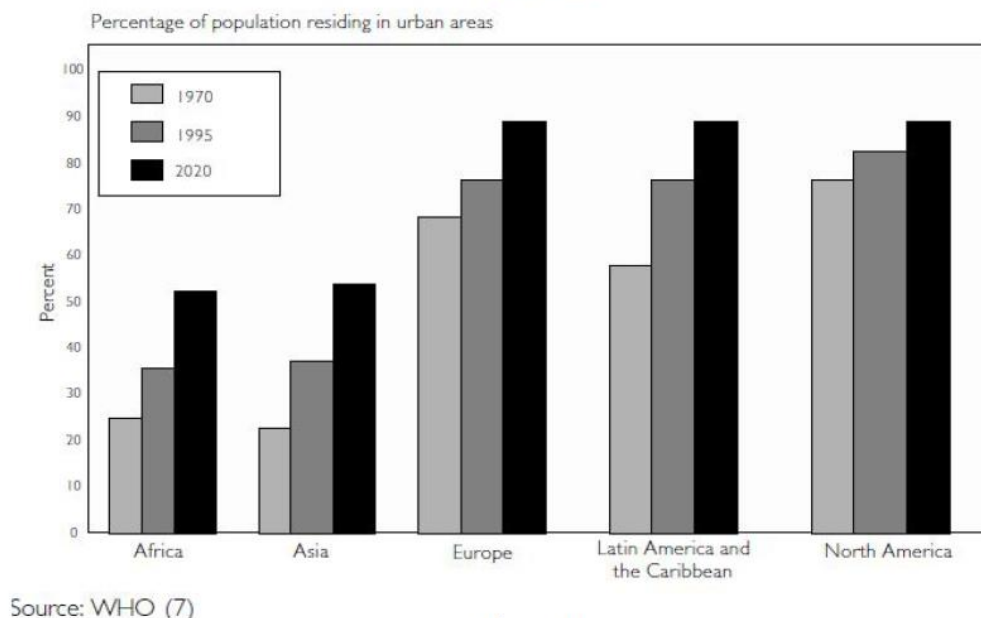
The exchange of 'wastes' between independent firms in some sectors has been taking place for over a century, simply because it makes good business sense. The establishment of 'industrial ecosystems,' however, is a relatively new phenomenon, with the best known example being located in Kalundborg, Denmark. There, an industrial ecosystem has been established which involves an oil refinery, a gyproc factory, a pharmaceutical firm, a fish farm, a coal-fired electrical power station and the municipality of Kalundborg, among others. At Kalundborg, steam and various raw materials such as sulfur, fly ash and sludge are exchanged in what is the

world's most elaborate industrial ecosystem. Participating firms each benefit economically from reduce costs for waste disposal, improved efficiencies of resource use and improved environmental performance. For example, gas captured from the oil refinery which had previously been flared off is now sent to the electrical power station which expects to save the equivalent of 30,000 tons of coal a year.

- Based on above story explain your ideas about industrial ecology.
- Can we implement industrial ecology in India? Substantiate your answer.
- Differentiate industrial ecology and industrial symbiosis with examples.
- List four set of industries where we can implement industrial symbiosis.

2. Stories/Cases/Data set 2

URBANIZATION LEVELS AND URBAN GROWTH RATES BY REGION 1970-2020



- Study the above graph and write a short note on the increasing intensity of urbanisation with respect to the above data.
- Explain the concept of sustainable urbanisation.
- Discuss some of the ill effects due to increasing urbanisation based on the above data.

Ten Mark Questions

- Prepare schematic representation of a residential building with minimum ten aspects that are applicable to green buildings.
- The CESE (Centre for Environmental Sciences and Engineering) building at IIT Kanpur has been awarded five star GRIHA rating by TERI. The CESE is a research facility at the IIT (Indian Institute of Technology), Kanpur on a plot area of 175000 square metre (approximately 4.5 acres). The evaluation committee has awarded a final score of 93 out of 100 to the building. The building has incorporated many green features following the GRIHA recommendations. The building is fully compliant with the ECBC. EPI (Energy

Performance Index) of the building is predicted to be 45.43 kWh/m²/annum, which is 41.3% less than the TERI GRIHA benchmark. In comparison to a conventional building, 59% energy savings are predicted in the CESE building. The centre has attempted to conserve and utilize resources efficiently; and recycle, reuse, and recharge the systems at every stage of design and construction.

- a) Suggest few measures that can be adopted for energy efficiency in green buildings.
- b) Write a short note on GRIHA rating.
- c) Discuss on green material selection with examples.