

MODULE I

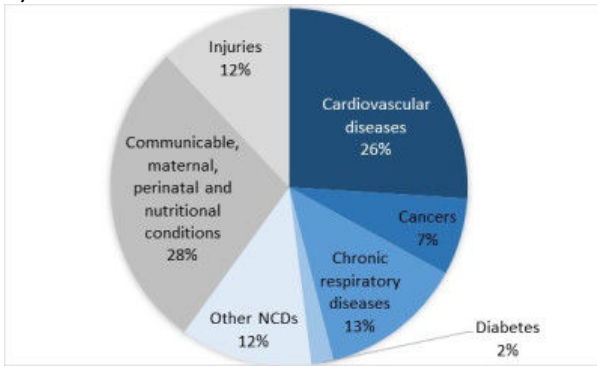
1) According to a recent study by WWF conservation group, wildlife populations of mammals, birds, fish, amphibians and reptiles have plunged by almost 60% since 1970 as human activities overwhelm the environment. An index compiled with the data from the Zoological Society of London to measure the abundance of biodiversity was down 58% from 1970 to 2012 and would fall 67% by 2020 based on current trends, the WWF said in a report. The decline is yet another sign that people have become the driving force for change on earth, ushering in the epoch of the Anthropocene. "Wild life is disappearing within our life time at an unprecedented rate", Director General of WWF International said in a statement of the group's Living Planet Report. The rising human population is threatening the wildlife by clearing land for farms and cities. Other factors include pollution, invasive species, hunting and climate change.

- a) Enumerate 2 ways to create awareness about wildlife conservation in India. (2)
- b) A campaign on conservation of wild life is to be conducted. Prepare a poster in connection with the theme 'wildlife conservation'. (5)
- c) What are the major threats faced by flora and fauna in 2016 and how it can be resolved? (3)

2) Our Common Future, also known as the Brundtland Report, from the United Nations World Commission on Environment and Development (WCED) was published in 1987. Its targets were multilateralism and interdependence of nations in the search for a sustainable development path. The report sought to recapture the spirit of the Stockholm Conference - which had introduced environmental concerns to the formal political development sphere. Our Common Future placed environmental issues firmly on the political agenda; it aimed to discuss the environment and development as one single issue. The document was the culmination of a "900-day" international-exercise which catalogued, analysed, and synthesised: written submissions and expert testimony from "senior government representatives, scientists and experts, research institutes, industrialists, representatives of non-governmental organizations, and the general public" held at public hearings throughout the world. The Commission focused its attention in the areas of population, food security, the loss of species and genetic resources, energy, industry, and human settlements - realizing that all of these are connected and cannot be treated in isolation one from another. An oft-quoted definition of sustainable development is defined in the report as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." In addition, key contributions of Our Common Future to the concept of sustainable development include the recognition that the many crises facing the planet are interlocking crises that are elements of a single crisis of the whole and of the vital need for the active participation of all sectors of society in consultation and decisions relating to sustainable development.

- a) What was the target of 'Our Common Future'? (1)
- b) List any five issues addressed in the Brundtland commission report. (5)
- c) Define Sustainable Development as per Brundtland Commission report. (2)
- d) What were the key contributions of 'our common future' to the concept of Sustainable development? (2)

3)

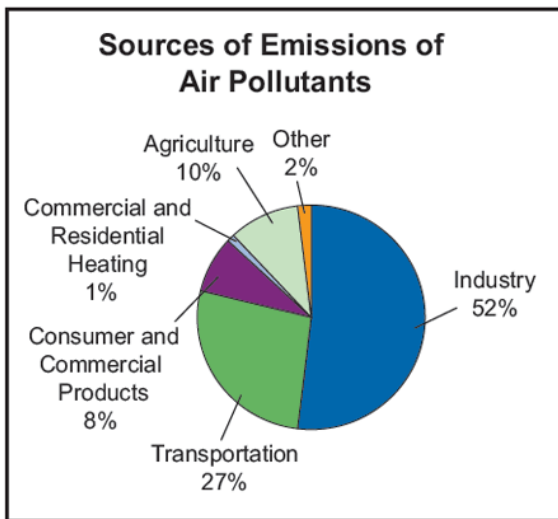


With respect to above figure answer the following questions,

- a) Point out any 3 reasons for such a poor health status prevalent in India. (3)
- b) What are the threats posed by this poor health level of people on achieving social sustainability? (2)
- c) Suggest any 2 possible future technologies that can change this present health scenario. (1)
- d) Write a brief article for a local newspaper suggesting some methods to improve health status at community level. (4)

MODULE II

1)



- a) Analyse the pie chart and prepare a report on sources of emissions of air pollutants. (3)
- b) Give any 5 examples of air pollutants and their effects on human health. (5)
- c) List out any 4 methods to prevent increase in air pollution. (2)

MODULE III

1) Biomimicry has existed for centuries, but Janine Benyus’s 1997 book Biomimicry: Innovation Inspired by Nature is credited with bringing the concept to prominence and generating a new field of study. A useful definition of biomimicry is “the design and production of materials, structures, and systems that are modelled on biological entities and processes” – essentially, a process for copying nature. Biomimicry asks, “What would nature do?” In his book Incognito, David Eagleman takes a stab at answering that question: “Biology never checks off a problem and calls it

quits. It reinvents solutions continually. The end product of that approach is a highly overlapping system of solutions – the necessary condition for a team-of-rivals architecture.

Read the passage carefully and answer the following questions

a) Give your suggestions on how biomimicry can be utilised to solve the various prevailing social issues. (3)

b) Discuss about the influence of biomimicry in Civil Engineering. (3)

c) Write a short note on the scope of biomimicry in future. (4)

2) Sustainability is not only a matter of technological innovations to overcome current challenges, but also it is found in the ability of organism to be innovative and adapt to an ever changing environment. The designs of nature's complex living systems provide us the possibilities, methods and tools to improve the resilience of organisations improving both performance and ability to adapt. There is a certain branch of science which deals with the imitation of the models, systems, and elements of nature for the purpose of solving complex human problems. Living organisms have evolved well-adapted structures and materials over geological time through natural selection. This particular new branch of science has given rise to new technologies inspired by biological solutions at macro and nanoscales. Humans have looked at nature for answers to problems throughout our existence. Nature has solved engineering problems such as self-healing abilities, environmental exposure tolerance and resistance, hydrophobicity, self-assembly, and harnessing solar energy.

a) What is this passage referring to? (2)

b) How does it benefit humanity? (2)

c) Briefly explain any three examples of this phenomenon in daily life. (6)

MODULE IV

1) A: “Yesterday I came across the word ‘sustainable city’. It was mentioned that Naya Raipur is the proposed sustainable city in India. What does ‘sustainable city’ mean?”

Assume you are A's friend.

a) Give details about Naya Raipur. (4)

b) Share your ideas of a sustainable city with your friend. (3)

c) What suggestions would you put forward to make your city sustainable? (3)

2) The report “the drive towards healthier Buildings 2016, highlights how design and construction is trending towards creating buildings that help in improving the mental and social wellbeing of a commercial building's occupants. Green buildings not only benefit the environment but also the people who occupy the building. This report provides perspectives of U.S. building owners, architects, interior designers and contractors about building healthier buildings, including the benefits achieved and metrics for measuring building impacts, owner goals for healthier buildings and interest in healthier building features, and top drivers, obstacles and key partnerships influencing wider adoption of healthier building practices. It also features insights from public health professionals highlighting research and policy trends in this area.

a) State any five criteria for a building to be considered as 'green'. (5)

b) How is environment benefited from such buildings. Briefly explain any two. (2+2)

c) Name the institutions that provide green building certifications in India. (1)

MODULE V

1)

Type of lamp Parameter	LED	CFL	INCANDESCENT
Average life span (hrs)	25000	8000	1200

Watts used (W)	12	15	60
Power consumption (Kwh/yr)	44	55	219

- a) Analyse the data given above and comment on it. (3)
- b) Prepare pie charts showing the graphical representation of each parameter. (6)
- 2) The soul of Arizona State University (Arizona, USA) is Memorial Union, a hulking brick-and-glass community centre that opens onto a sprawling pedestrian mall. Although the building sits at the heart of campus, its outdoor plaza was once virtually uninhabitable for four months each year, when summer temperatures in scorching heat often hover over 100 degrees. So in 2014, the University – Arizona's leading energy consumer - completed construction on a Power Parasol, a 25-foot-tall shade canopy, which composed of 1,380 photovoltaic solar panels capable of producing 397 kilowatts of electricity. The solar panels help cool down Arizona State's Memorial Union plaza during hot months.

The Memorial Unions Power Parasol is just one installation within Arizona State's expansive network of 88 solar systems, which now produces 41,000 megawatt hours annually — enough to power nearly 4,000 average U.S. homes. Arizona State's solar capacity stands second among American universities. The state's largest electric utility is building an off-site facility that will provide the campus with another 65,000 megawatt hours per year, knocking 10 percent from its carbon footprint. That will go a long way toward helping Arizona State create a carbon-neutral campus by 2025, a target it aims to reach not only by expanding its solar capacity, but also by improving its refrigeration and waste management practices, making its buildings more efficient, and purchasing carbon offsets.

a) APJ Abdul Kalam Technological University is immediately hoping to move on to a new campus spanning over an area of 100 acres. Suggest any five ways of employing renewable energy resources so that the University can outdo Arizona State University and supplement the power generation in the State of Kerala.

3) Preparations are on to establish nation's first geo-thermal power project in Tatapani, the newly-formed Balrampur-Ramanujanj district of Chhattisgarh. Dubbing it as a big achievement for the district, chief minister Raman Singh, said that India's first geo-thermal power project would use underground hot water springs at Tatapani to convert it into steam, and then generate electricity by using special technology. "Ramanuj-Balrampur district has been formed with the objective to bring people of this border area closer to the government and administration, and thereby ensure effective implementation of public welfare schemes," he said.

- a) Explain the principle of geothermal energy. (3)
- b) List two advantages and disadvantages of geothermal energy. (4)
- c) List out any three renewable energy resources that can be used by our state to supplement the power generation especially during the times of power crisis. (3)

4) According to Kannan Pashupathiraj of Muttukadu , the wastewater plant is designed on Sequencing Batch Reactor (SBR) method, where 98% of purification is achieved in just 6 hours without any chemical treatment. The water goes through a precise sequence of aeration, sedimentation and clear water removal all in a single tank and not in three. Aeration is the most important of all operations, creating a suitable environment for natural bacteria to digest waste in water.

Based on this paragraph, answer the following questions:

- (a) Suggest at least 4 similar methods as in the above case to introduce efficient waste water management in your household. (2)
- (b) Comment on the status of household waste water management in your city. (3)

(c) Compare the disposal based linear system of wastewater management to the sustainable, closed loop system of waste water management. (2)

(d) Site the importance of Artificial Wetlands in wastewater management. (3)

5) About 500,000 solar panels were installed every day last year all over the world as a record-shattering surge in green electricity. Two wind turbines went up every hour in countries such as China, according to International Energy Agency officials who have sharply upgraded their forecasts of how fast renewable energy sources will keep growing. "We are witnessing a transformation of global power markets led by renewables," said Fatih Birol, executive director of the global energy advisory agency. Renewables overtake coal as the world's largest source of installed power capacity. Although coal and other fossil fuels remain the largest source of electricity generation, many conventional power utilities and energy groups have been confounded by the speed at which renewables have grown and the rapid drop in costs for the technologies.

a) Why is there a recent hike in the use of renewable resources over coal? (3)

b) Suggest two ways to improve commercial development of renewable resources in India.

(3)

c) What are the challenges faced by common people in changing from non renewable to renewable sources of energy? (4)

MODULE VI

1) One problem that environmental campaigns against harmful industries such as nuclear power and weapons, fracking, arms, etc. often face is opposition from trade unions and local people concerned about the impact on jobs. But as an inspiring initiative by workers themselves in the 1970s showed, it doesn't have to be that way. 2016 is the 40th anniversary of the Lucas Plan. Lucas plan was a plan by workers at the Lucas Aerospace arms company (Birmingham, United Kingdom) to convert the company's production to socially useful products. Amongst their ahead-of-their-time ideas were wind turbines, heat pumps, and hybrid car engines, which are now in widespread use. The Lucas Plan came about not as the result of activism from the peace movement, but as a positive response by the Lucas workers themselves, to save their jobs, in the face of recession and planned government defence spending cuts.

The Combine Committee worked on the plan throughout 1975, when it circulated questionnaires to the workforce requesting product suggestions which answered a social need and could be produced using the workforce's existing skills and technology. Emphasis was also to be put on the way the products were to be made, making sure that workers were not to be deskilled in the process of producing them. 150 product ideas were put forward by the workforce. From them, products were selected to fall into six categories: medical equipment, transport vehicles, improved braking systems, energy conservation, oceanics, and telechiric machines. Although the plan was rejected by the company, which, rightly, realised that it was a threat to its own 'way to manage', the Plan became internationally famous and emulated around the world. The Combine was nominated for the Nobel Peace Prize in 1979, and Mike Cooley, a leading member, received the Right Livelihood prize in 1982. However it was abolished in by Margaret Thatcher 1986.

a) How can industrialisation and sustainable development be combined? Illustrate your answer with two real examples. (1+2)

b) Suggest any three modifications to the Lucas plan. (3)

c) Imagine yourself to be the leader of an environmentalist group and give your views to implement the Lucas plan in our state to improve our industrial scenario. (4)

2) Symbiosis in lichens is the mutually helpful symbiotic relationship of green algae and / or blue-green algae (cyanobacteria) living among filaments of a fungus. The fungus benefits from the algae or cyanobacteria because they produce food by photosynthesis. The algae or cyanobacteria benefit by being protected from the environment by the filaments of the fungus, which also gather moisture and nutrients from the environment, and (usually) provide an anchor to it. The lichen combination of fungus and/or algae and/or cyanobacteria has a very different form (morphology), physiology, and biochemistry than the parts growing by themselves. The properties of the "whole" combination are very different from the sum of the properties of the parts living by themselves.

a) Identify the above mentioned process employed in applying sustainability in the industrial field. (1)

b) Give an example of the same and explain the principle. (4)

(c) What is the necessity of this concept? (3)

(d) Write any two concepts of industrial ecology? (2)

3) The International Energy Agency says that energy efficiency drives are beginning to have a positive impact, saving \$540 last year, but more vigorous policies are required in order to meet climate goals. Hitting the climate targets laid out in the Paris Agreement requires a multi-pronged approach that involves decarbonization, a wider adoption of renewable energy sources, and better energy efficiency – and the world has become much cannier at using its energy in recent years, finds a new report from the International Energy Agency. In its latest paper, titled Energy Efficiency Market Report 2016, the IEA finds that energy intensity – the amount of energy used per unit of GDP – improved globally by 1.8% in 2015, which essentially means that economies now require less energy than previously in order to grow. These gains are more starkly apparent in emerging and less-developed economies, and especially profound in China, which has improved its energy intensity ratio by an encouraging 5.6% over the past year.

a) List out the policies which helped in attaining this positive impact. (5)

b) How did IEA play an important role in attaining the climatic goals? (5)