ICSE Syllabus



2024

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Syllabus

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ENVIRONMENTAL SCIENCE (82)

Candidates offering Environmental Applications (Group III) are not eligible to offer Environmental Science (Group II).

The subject deals with the interdependence of living things within their environment and provides an insight into the orderly interplay of factors influencing environmental change. The impact of human demands on renewable and non-renewable resources and the limited availability of these resources in nature, have been linked to correlate with patterns of human behaviour necessary to evolve a sustainable environmental paradigm.

Aims:

1. To acquire knowledge of the origin and functioning of the natural system and its correlation with the living world.
2. To develop an understanding that human beings, plants and animals are part of a natural phenomenon and are interdependent.
3. To appreciate the influence of human activity on natural processes.
4. To develop an awareness of the need and responsibility to keep the natural system in a condition that it sustains life.
5. To develop sensitivity in personal attitudes to environmental issues.
6. To develop an understanding of how local environments, contribute to the global environment.
7. To develop a sense of responsibility and concern for welfare of the environment and all life forms which share this planet.
8. To develop a keen civic sense.
9. To develop a sound basis for further study, personal development and participation in local and global environmental concerns.

CLASS IX

*There will be one paper of **two hours** duration carrying 80 marks and Internal Assessment of 20 marks.*

*The paper will have **two** Sections:*

***Section A** (**Compulsory**) will contain short answer questions covering the entire syllabus.*

***Section B** will contain **six** questions. Candidates will be required to answer any **four** questions from this section.*

1. Understanding our Environment

(a) Environmental Science.

What do we understand by 'Environment'? What does the study of Environmental Science involve?

(b) Our main environmental problems.

Environmental problems to be studied in terms of resource depletion, pollution and extinction of species.

(c) A global perspective of environmental problems.

To be studied with reference to the developed and developing countries.

(d) The root of environmental problems.

Population crisis and consumption crisis should be covered.

(e) *A* sustainable world.

Concept of sustainability to be explained; sustainable societies to be discussed.

2. Living things in Ecosystems

(a) Ecosystem.

Concept of ecosystems to be explained; biotic and abiotic structures, organisms and species; populations, communities.

(b) Habitat and ecological niche.

To be discussed in terms of address and function.

(c) How species interact with each other.

Interaction of species should be covered in terms of - predation, competition, parasitism, mutualism and commensalism. Law of Limiting Factors; synergisms.

(d) Adapting to the environment.

Evolution by natural selection; co-evolution, extinction.

3. How Ecosystems work

(a) Energy flow in ecosystems.

An explanation of how life depends on the sun; who eats what; respiration: burning the fuel. Energy transfer: food chains, food webs and trophic levels.

(b) The cycling of materials.

The water cycle, the carbon cycle (how humans are affecting the carbon cycle) and the nitrogen cycle; ***Not to be tested, for knowledge and understanding only.***

Interdependence of natural cycles.

(c) How ecosystems change.

Succession- secondary and primary.

4. Kinds of Ecosystems

(a) Forests.

Tropical rainforests and threats to rainforests; temperate rainforests; temperate deciduous forests; Taiga.

(b) Grasslands, Deserts and Tundra.

Tropical savannas; temperate grasslands: prairies, steppes and pampas; deserts; Tundra. Threats to the temperate grasslands, deserts and Tundra.

(c) Freshwater ecosystems.

The study to cover - lakes and ponds; wetlands - marshes and swamps; rivers. Threats to wetlands and rivers must also be highlighted.

(d) Marine ecosystems.

Estuaries, coral reefs, oceans and how each is threatened should be discussed. Polar ecosystems of the Arctic and the Antarctic and the threats to them must also be covered.

Only threats to the specifically mentioned ecosystems will be tested for the purpose of the examination. The rest are for knowledge and understanding.

(e) Biogeographic zones of India.

The different biogeographic zones/ regions of India and predominant wildlife in these zones/ regions.

5. Water

(a) Our water resources.

Water resource in the form of frozen solid in polar ice caps, surface water (rivers of controversy, dams), groundwater (aquifers running low). Solutions to water shortages must be covered in terms of desalting the sea, towing water, water conservation and water harvesting.

(b) Freshwater pollution.

Point pollution and non-point pollution; wastewater treatment plants, pathogens. The manner in which water pollution affects ecosystems; artificial eutrophication, thermal pollution. Cleaning up water pollution. The special problem of groundwater pollution; bottled water.

(c) Ocean pollution.

How pollutants get into oceans; preventing ocean pollution; who owns the oceans?

6. Air

(a) Causes of air pollution.

Air pollution due to - natural disasters; domestic combustion; air pollution on wheels; industrial air pollution.

Major air pollutants - carbon monoxide, oxides of nitrogen, oxides of sulphur, ozone, lead, hydrocarbons, benzene and particulates -their sources, health effects and the environmental effects must be studied.

Classification of air pollutants based on composition - gaseous pollutants and particulate matter (grit, dust, smoke and lead oxide); broader classification - primary and secondary pollutants.

Aerosols (smog), sources – natural (continental, oceanic and anthropogenic); their effect on our lives.

Air pollution episode - the Bhopal gas tragedy.

(b) Thermal inversions, photochemical smog and acid precipitation.

Thermal inversions (Los Angeles), Photochemical Smog (Mexico City) and Acid Precipitation (Mumbai) - how acid precipitation affects ecosystems.

(c) Impact of air pollution.

Impact of air pollution should be covered in terms of economic losses, lowered agricultural productivity and health problems.

7. Atmosphere and Climate

(a) The atmosphere.

Balance between photosynthesis and respiration; layers of the atmosphere. ***Not to be tested, for knowledge and understanding only.***

(b) Climate.

What determines climate (latitude, atmospheric circulation patterns, ocean circulation patterns, local geography, seasonal changes in climate). ***Not to be tested, for knowledge and understanding only.***

(c) Greenhouse earth.

The Greenhouse Effect, rising carbon dioxide levels, GHGs and the earth's temperature (global warming); effect on weather, agriculture and sea-levels; slowing the temperature change.

(d) The Ozone layer.

Ozone in the troposphere, ozone in the stratosphere; detection of the damage to the ozone layer; causes and consequences of ozone thinning; alternatives to CFCs.

8. Soil and Land

(a) Deforestation.

Causes and consequences of rapid and progressive deforestation in the developing world - fuel crisis, competition for land, land exploited for cash and food crops, population pressures, increasing demand for timber to meet the needs of the developed world, grazing and its link with desertification.

Effects of deforestation on climate, atmosphere and soil process.

(b) Soil erosion and desertification.

Causes and consequences of soil erosion and desertification - removal of vegetation, overgrazing, overculture, clearance of slopes, drought, heavy rainfall, bad farming practices.

(c) Land pollution.

Causes and consequences of land pollution - salinization, fertilizers, pesticides, toxic wastes, nuclear wastes, domestic wastes, ground water contamination.

9. People

(a) World poverty and gap between developed and developing countries.

Dimensions of world poverty and gap between developed and developing countries using development indicators such as per-capita incomes, housing, levels of disease and nutrition.

(b) Poverty in developed countries, poverty in developing countries.

Rural poverty and urban poverty.

(c) The implications of poverty trap for the environment in developing countries.

Self-explanatory.

10. Urbanisation

(a) Causes of urbanisation.

The push-pull factors to be discussed.

(b) Manifestations of urbanisation.

Growth of slums, growth of informal sector, pressure on civic amenities; degradation of human resources; growing sense of despair.

(c) Social, economic and environmental problems.

Problems of housing, congestion, pollution, loss of agricultural land and provision of services to be covered.

11. Agriculture

(a) Unsustainable patterns of modern industrialised agriculture.

Monocultures, disappearance of traditional crop varieties, pollution risk due to use of pesticides and inorganic fertilizers; problems of irrigation – surface and ground water.

(b) Environmental damage due to large farm units.

Self-explanatory.

(c) Food mountains in developed countries.

Surplus and waste.

(d) The Green Revolution.

Discussion on whether Green Revolution is a success or a failure.

INTERNAL ASSESSMENT

Any **one** project/assignment from the prescribed syllabus.

Suggested Assignments

1. Make a survey of any one threat to the local environment with suggestions as to how the impact of the threat could be gradually reduced.
2. Make a functional model of an apparatus/equipment that could be used to alleviate the impact of any pollutant and, make a survey to study the effectiveness of this apparatus/equipment. (The report of the study is to form a part of the Project Work.)

CLASS X

*There will be **one** paper of **two hours** duration carrying 80 marks and Internal Assessment of 20 marks.*

*The paper will have **two** Sections:*

***Section A** (**Compulsory**) will contain short answer questions covering the entire syllabus.*

***Section B** will contain **six** questions. Candidates will be required to answer any **four** questions from this section.*

1. Controlling Air Pollution

(a) From domestic combustion.

Reducing pollution from domestic cooking; clean cooking - kerosene as a desirable cooking fuel in rural areas.

(b) From industries.

Measures for controlling industrial air pollution - technological measures (energy efficient devices, clean technologies), meteorological controls; zoning strategy; penalties and subsidies;

Case Study: the Taj Trapezium.

(c) From vehicles.

Vehicle emission control - modify engine design (catalytic converters, four stroke engines), clean fuels, public transport options, traffic management, economic policy measures.

2. Addressing Population

(a) The link between growing population and environmental degradation.

UN's population projections for 2050, the climate link, the choice of alternative futures. Growing population in the developing countries and rising consumption in the developed countries.

(b) The demographic transition.

Stages of transition, transition stages of certain developed nations and developing nations (such as India, China, Korea, Malaysia). ***Not to be tested, for knowledge and understanding only.***

(c) Strategies for controlling growth of population.

Strategies to include family planning and birth control, health care, education, economic development; women-centered human development.

(d) Development framework for poverty alleviation.

Social mobilisation, agricultural development, small-scale industries, human development. ***Not to be tested, for knowledge and understanding only.***

3. Managing the Urban environment

(a) Urbanisation - a challenge to the future.

Sustainable cities: the need of the hour.

(b) Planning environmental improvement.

Efficient land use, planning energy, shelter and transport; water supply management, wastewater and sanitary waste management, construction activities.

(c) Rural development to counter migration.

Self-explanatory.

(d) Development of secondary cities to counter migration.

Self-explanatory.

(e) Community participation and contribution of private enterprises.

Community participation in keeping surroundings clean, participation of private enterprises in city improvement, measures to increase private enterprise participation.

4. Managing Soil and Land

(a) Conserving soil.

Erosion control techniques - terracing, contour ploughing, dry farming, tree planting, bunds, gullies, wind-breaks, use of organic fertilisers.

Soil conservation techniques - land-use management, vegetative and mechanical

practices, conserving soil and water together; appropriate cropping systems – cropping patterns (strip cropping), tree crops, and foliage crops.

(b) Land reforms.

Meaning, measures enforced in India to give land to the landless.

(c) Integrated rural development.

Objectives, self-help schemes like social and community forestry.

(d) Role of women and community in conservation.

Self-explanatory.

(e) Combating deforestation.

Reforestation, energy plantations, forest harvesting of non-timber forest products, exploring alternative sources of livelihood, change in consumption patterns.

(f) Managing forest grazing.

Causes and consequences of overgrazing, controlled forest grazing as in National Forest Policy, 1988.

(g) Alternatives to timber.

Recycling of timber and paper.

5. Food

(a) Sustainable agriculture.

Integrated pest management – understanding the term, aims, advantages, disadvantages.

Genetically modified organisms, application in plants and animals and environmental risks.

New crop strains – high yielding varieties and their viability, hybrid varieties.

Mixed cropping – advantages and disadvantages; regenerative farming techniques - intercropping, crop rotation, agroforestry, polyvarietal cultivation and polyculture.

Conservation tillage farming - meaning of conservation tillage, advantages and disadvantages.

Trickle drip irrigation – need for a trickle drip irrigation system; operation of a drip irrigation system; advantages and disadvantages.

New organic fertilizers – integrated nutrient supply programme, organic fertilizers - bulky organic manures, green manures, bio-fertilizers, and sewage sludge.

Gene banks – what are gene banks; objectives of maintaining gene banks.

(b) Problem of global food security, food aid.

Global food imbalance, distributional inequality; role of food aid in achieving global food security.

6. Biodiversity

(a) Biodiversity at risk due to human actions.

Reasons for loss of biodiversity; Man - the super consumer: impact of his actions on the earth's resources; reasons for concern: economic, ecological and aesthetic.

(b) Conserving our genetic resource: in-situ and ex-situ; harvesting wildlife.

In-situ - wildlife sanctuaries, national parks and biosphere reserves.

Ex-situ – zoological parks, botanical gardens, gene banks in agricultural research centres and forestry institutions.

Harvesting wildlife to meet commercial needs.

(c) Conservation strategies at national and international levels.

*Wildlife (Protection) Act 1972, Project Tiger 1973, IUCN, the Ramsar Convention on Wetlands, 1971, CITES, The Convention on Biolog*ical Diversity.

7. Energy

(a) Fossil fuels used to produce electricity.

Electricity: energy on demand; dwindling supplies of fossil fuels; renewable and non-renewable energy resources. ***Not to be tested, for knowledge and understanding only.***

(b) Nuclear energy.

Nuclear fission, advantages and disadvantages of nuclear energy; safety concerns (the Chernobyl disaster); nuclear fusion.

(c) A sustainable energy future.

Energy conservation; alternative energy sources - solar energy, wind energy, hydroelectricity, geothermal energy, biomass, liquid fuels from biomass- methanol, ethanol, gasohol, CNG, hydrogen.

8. Waste

(a) Solid waste: the throwaway society.

Solid waste, biodegradable and non-biodegradable materials; where does the trash go - landfills and incinerators.

(b) Solid waste: options for the future.

Producing less waste, reusing, recycling, composting, vermiculture, biotechnology; finding alternatives to materials we use.

9. Environment and Development

(a) Global environmental pollution.

Who is responsible - developed or developing countries? Need for mutual cooperation.

(b) Economic development and environmental degradation.

Role of developed and developing countries; contrasting views of developed and developing countries; debt trap.

(c) International trade.

Its link to environmental deterioration – unfair trade practices.

(d) Role of multinational corporations.

Definition of MNCs, their contribution to development and debatable contribution to environment; case study - Bhopal gas tragedy; measures to regulate activities of MNCs in developing countries.

10. Towards a Sustainable Future

(a) Global interdependence – economic and environmental.

Concept of economic and environmental global interdependence; global environmental health – the shared responsibility of nations; trade and aid as ways of reducing world inequalities.

(b) International cooperation.

The Montreal Protocol; the Global Environmental Facility (GEF) support; the Earth Summit, UN's International Conference on Population and Development (Cairo); the Kyoto Treaty.

(c) Sustainable development.

The concept of sustainable development, sustainable development and developed countries; sustainable development and developing countries.

(d) Role of non-governmental organisations.

Self-explanatory.

(e) Technology that sustains.

Satellite imagery as a means of monitoring the global environment: satellite remote sensing, advantages in collecting environmental data, applying data in areas of environmental damage as deforestation, desertification, land degradation, wastelands, mining, ozone layer depletion and predicting droughts and floods.

The concept of alternate technology, adopting alternate technology to create self-sustaining societies in the developed and developing world.

Role of biotechnology in achieving global food security.

INTERNAL ASSESSMENT

A minimum of three assignments as prescribed by the teacher, need to be completed.

Suggested Assignments

1. Make a field study of the effect of human interaction on the natural environment and write a project report (1500 words) on the likely impact of the interaction on the global environment.
2. Prepare an original study/essay (2000 words) on an area of the prescribed curriculum that is indicative of his/her appreciation/concern for environmental issues and make a functional model to support the above.

EVALUATION

The assignments/project work are to be evaluated by the subject teacher and by an External Examiner. (The External Examiner may be a teacher nominated by the Head of the school, who could be from the faculty, **but not teaching the subject in the section/class**. For example, a teacher of Environmental Science of Class XI may be deputed to be an External Examiner for Class X, Environmental Science projects.)

The Internal Examiner and the External Examiner will assess the assignments independently.

Award of Marks	**(20 Marks)**
Subject Teacher (Internal Examiner)	10 marks
External Examiner	10 marks

The total marks obtained out of 20 are to be sent to the Council by the Head of the school.

The Head of the school will be responsible for the online entry of marks on the Council's CAREERS portal by the due date.

INTERNAL ASSESSMENT IN ENVIRONMENTAL SCIENCE - GUIDELINES FOR MARKING WITH GRADES

Criteria	Preparation	Investigation/ Gathering Data	Analysis/Inference	Solutions Alternatives/ Innovations	Presentation	Marks
Grade I	Follows instructions with understanding, modifies if needed. Background information correct. Level of awareness high.	Is able to ask right questions. Knows whom to ask, when and how. Can deal with more than one variable.	Analyses systematically. Can see sequences or correlation. Can segregate fact from opinion.	Innovative ideas presented. Alternatives suggested.	Accurate. Feasible, neat, well labelled diagrams. Index and references given.	4 marks
Grade II	Follows instructions step-by-step. Awareness is good. Background information correct.	Is able to ask questions and identify whom to ask when and how. Can handle two variables only.	Makes observations correctly. Analysis fair.	Alternatives presented. Innovative but not practical.	Accurate. Neat, well labelled diagrams, index and references given.	3 marks
Grade III	Follows simple instructions only. Awareness basic. Background information sketchy.	Needs help with the investigations. Has suggestions but cannot decide.	Observation - help needed. Needs guidance to see correlations or sequence.	Obvious solutions presented. Not innovative.	A bit disorganised, but neat and accurate. Either index or references missing.	2 marks
Grade IV	Follows some instructions but confused. Has to be made aware. Background information incorrect in places.	Needs to be told what questions to be asked, whom to ask or where to gather the data from.	Detailed instructions required to draw inferences. Charts have to be made.	Thinks of solutions under guidance.	Poorly organised. Some things missing. Index and references missing.	1 mark
Grade V	Confused about instructions. Has to be made aware. Needs help with background information.	Gets stuck at every step. Questionnaire has to be formulated.	Even with help, analysis is not clear. Takes teacher's word for it.	Solutions not forthcoming.	Overall impression very poor. Not very accurate.	0 mark