BIBLIOGRAPHY

- Books
- Journals
- Dissertations
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Books


**Journals**


The Scientific Encyclopaedia. 1976.


**Dissertations**


Kazerni, E.J. (1977). In-service education- Modular system compared to Professor/Lecturer, *Dissertation Abstracts International*. (January) 1978: 4126 A.


APPENDICES
APPENDIX I

MAHATMA GANDHI UNIVERSITY
SCHOOL OF PEDAGOGICAL SCIENCES

Questionnaire on the identification of facilities available and activities conducted in the higher secondary schools for environmental education

Dear student,

This is a questionnaire on the identification of facilities available and activities conducted in the higher secondary schools for the environmental education.

I request you to read the questionnaire carefully and answer it. Please put a tick (✓) make only wherever it is needed. I wish to remind you that the successful completion of my research work depends entirely on your sincere co-operation.

I assure you that the information that you give will be kept strictly confidential and will be used only for the research work.

Yours faithfully,

K.K. John
Research scholar
QUESTIONNAIRE

Part A

Personal Information sheet

Name : 
Sex : Male/ Female
Name of the school : 
Class : 
Division : 

Part B

1. Do the text books prepared for higher secondary school students help in understanding environmental issues.
   a) Very much helpful.
   b) Helping to some extend
   c) Not at all helping

2. Does the discussion of the environmental issues in classes while teaching help to develop environmental awareness
   a) Always
   b) Sometimes
   c) Not at all helping

3. Do you respond to the issues that affect local environment adversely?
   a) Always
   b) Sometimes
   c) Not at all

4. Does your school library have enough books and journals related to environment and ecology?
   a) Enough
b) Satisfactory  
c) Not enough  

5. Have you the habit of reading books and articles of ecological importance?  
   a) Very much  
   b) Average  
   c) Not enough  

6. Which are the teaching strategies adopted by the teachers in the classroom?  

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<th>Frequently</th>
<th>Sometimes</th>
<th>Never</th>
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<td>Activity method</td>
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<td>4</td>
<td>Project method</td>
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<td>5</td>
<td>Problem solving method</td>
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</table>

7. What are the environmental programme organized in your school?  
   (Put a tick mark (✓) in the box)  
   a) Talk by experts  
   b) Seminar  
   c) Discussion  
   d) Quiz competition  
   e) Essay competition  
   f) Experiments with participation of students  
   g) Science projects relating to topics in the syllabus  
   h) If anything more, please specify
8. Does your school arrange field trips to ecologically important locations?  
   Yes/No

9. Does your school arrange nature camps?  
   Yes/No

10. Does your school arrange 'campus-cleaning' programme?  
    Yes/No

11. Are you interested in participating the activities of the school science club/nature club

   a) Very much
   b) Average
   c) Least

12. Give suggestions to improve the environmental awareness of students at higher secondary level

   1) 
   2) 
   3) 
   4) 
   5)
APPENDIX II

Interview Schedule for Teachers

Part A
Personal Information Sheet

1. Name : 
2. Sex : 
3. Name of the school : 
4. Location of the school : Rural/urban 
5. Management : Govt./Aided/unaided 
6. Educational Qualification : 
7. Teaching experience : --------- Yrs,------Month Subject. :

Part B

Interview to Teachers

1. Is it necessary to make environmental education more effective? Why?
2. Does the text books prepared for higher secondary school students sufficient for understanding environmental issues and for enhancing environmental awareness?
3. Are there sufficient books and journals on environmental education in your school?
4. Do you get enough time to conduct the activities of the science club?
5. Do you encourage students to participate in science club activities?

6. Do you encourage students to participate in seminars and discussions on environmental issues?

7. Are you in the habit of taking part in programmes on environmental education?

8. What are the AV aids you use while teaching environmental topics?

9. Do you react to issues that affect local environment adversely?

10. What is your opinion whether the teachers should raise voices towards the protection of nature?

11. Give your suggestions to improve the environmental awareness among higher secondary students-

   1)
   2)
   3)
   4)
   5)
Appendix III
MAHATMA GANDHI UNIVERSITY
SCHOOL OF PEDAGOGICAL SCIENCES

Environmental Awareness Test (Draft)

Instructions

The questions given below are based on environmental awareness. Each question is given four distractors A, B, C and D. Only one among the four is correct. Answers are to be marked on the response sheet.

A, B, C and D are marked against each question number on the response sheet. Find out the correct answer for each question. Then put the mark ‘X’ on the letter indicating the correct answer. If you feel that you have not put the mark ‘X’ on the letter indicating correct answer, you may draw a circle round the wrongly marked ‘X’ and place the mark on the correct answer. If you have any doubt with regard to this test you can seek clarifications from the invigilator.

Questions

1. Renewable source of energy is
   a) Biomass  b) Coal  c) Petroleum  d) Kerosene

2. Which one of the following represents a renewable source of energy
   a) Petroleum  b) Coal  c) Nuclear fuel  d) Trees

3. Which permissible noise level at day and night in the residential area:
   a) 35 dB-30 dB  b) 55dB-40 dB  c) 50dB-40 dB  d) 55 dB-45 dB

4. Renewable source of energy is
   a) Biomass  b) Coal  c) Petroleum  d) Kerosene

5. Mild grazing is grass land by herbivores
   a) Retards growth of grasses  b) Arrests growth of grasses  
     c) Stimulates growth of grasses  d) Destroys vegetables
6. Soil fertility is reduced by
   a) Crop rotation  b) Nitrogen fixing bacteria
   c) Decaying organic matter  d) Intensive agriculture
7. Why do agriculturists leave the roots of pea plants in the soil after harvest?
   a) Because they contain large amount of CO₂
   b) Because they contain large amount of Nitrogen
   c) Because they contain large amount of Magnesium
   d) Because they contain large amount of Urea
8. Forest area in India is about
   a) 9 percent of geographical area  b) 19 percent of geographical area
   c) 29 percent of geographical area  d) 37 percent of geographical area
9. Which of the following is the most important natural resource of energy?
   a) Electricity  b) Biogas  c) Fossil fuel  d) Atomic fission
10. Geothermal energy is:
    a) Non-renewable, conventional source of energy
    b) Non-renewable, non-conventional source of energy
    c) Renewable, non-conventional source of energy
    d) Renewable, conventional source of energy
11. Deforestation generally decreases:
    a) Rainfall  b) Soil erosion  c) Drought  d) Global warming
12. Gobar gas is produced from:
    a) Agricultural waste  b) Animal waste
    c) Industrial waste  d) Sea weeds
13. Freshwater wetlands where trees and shrubs dominate is called:
    a) Swamps  b) Reverire
    c) Marshes  d) None of the above
14. The creature that survives on a special type of bamboo is:
    a) Lion-tailed macaque  b) Seal  c) Chinese Panda  d) Chetah
15. What do you mean by Green movement?
   a) Propagation against deforestation
   b) Protection of wild life
   c) Protection of forest
   d) International movement against desertification by planting trees

16. The peak concentrations of ozone above the surface of earth is present at a height of:
   a) 10 kms  b) 15 kms  c) 20 kms  d) 25 kms

17. Who among the following is the most famous environmental activist of Narmada Bachavo Andolan movement?
   a) Menaka Gandhi  b) Sister Niveditha
   c) Medha Patkar  d) Sugathakumari

18. Ozone hole is largest over
   a) Antartica  b) Europe
   c) Africa  d) India

19. Desertification is due to:
   a) Deforestation
   b) Soil erosion due to water
   c) Soil erosion due to wind
   d) Very high temperature and low rainfall

20. The near annual temperature of earth is about:
   a) 25°C  b) 18°C  c) 15°C  d) 35°C

21. Air pollution causes
   a) Lung Cancer  b) Jaundice
   c) Malaria  d) Cholera

22. The estimated level of CO₂ in the atmosphere in 2000 AD:
   a) 242 ppm  b) 368 ppm
   c) 382 ppm  d) 484 ppm

23. Aerosols are released by:
   a) Industries  b) Aeroplanes
24. The atmosphere of big cities is polluted most by:
a) House hold waste  
b) Aeroplane  
c) Automobile exhaust  
d) Pesticides

25. Why do farmers put lime in the soil occasionally?
a) To destroy weeds in the soil  
b) To balance acidity in the soil  
c) To balance alkali in the soil  
d) To destroy insects

26. What happen if leafy vegetables is boiled in uncovered vessels?
a) It loses colour  
b) It loses vitamins  
c) It loses water  
d) It loses protein

27. In Bhopal tragedy, the lethal gas leaked from the Union Carbide Factory was:
a) Carbon dioxide  
b) Sulphurdioxide  
c) Nitrous oxide  
d) Methyl isocyanate

28. Green plants are called
a) Decomposers  
b) Producers  
c) Consumers  
d) None of the above

29. Carbon monoxide gets into the blood and produces:
a) Haemoglobin  
b) Carboxy hydrate  
c) Carboxy haemoglobin  
d) Carbon dioxide

30. Which of the following is an example for biodiversity?
a) Eucalyptus and acacia trees  
b) Rubber trees  
c) Andaman Nicobar rain forests  
d) Teak trees

31. Which of the following is a secondary pollution:
a) Carbon monoxide  
b) Sulphur dioxide  
c) Hydrocarbon  
d) Photochemical smog

32. Which of the following is an example for an extinct bird?
a) Dado  
b) Pelican  
c) Wood pecker  
d) King fisher

33. Brown air in traffic congested city is caused by:
a) CH₄  
b) Sulphur dioxide
c) Hydrocarbon          d) Nitrogen Oxide

34. Patent law has helped America to possess exclusively an anticancer plant, which is that?
a) Vinca rosea   b) Cinchona
c) Deodar           d) Brahmi

35. The fading and eroding of the marble stones of the Taj Mahal is due to:
a) CO$_2$ is the air   b) Acid rain
c) Automobile exhausts d) Overcrowding of people

36. Which of the following vegetables help to reduce breast cancer?
a) Bitter guard   b) Snake guard
c) Tomato          d) Ladies finger

37. Eutrophication results in the reduction of:
a) Mineral salts   b) Dissolved oxygen
c) Dissolved nitrate d) Dissolved hydrogen

38. Give the full form of UNEP
   a) United nations Environment Project
   b) United nations Environment Programme
   c) United nations Environment Package
   d) United nations Environment Planning

39. Oil is supposed to coat the gills of fish and can affect:
a) Digestion    b) Circulation
c) Respiration  d) Excretion

40. Maximum petroleum is used in
   a) Mechanized agriculture  b) Shipping
c) Industries           d) Transport

41. The Ganga Action Plan launched by late Prime Minister Rajeev Gandhi was for:
a) Increasing the width of the river
b) Constructing a dam for irrigation
c) Keeping the river clean
d) None of the above

42. Forest Research Institute is situated in
   a) Patnagar b) Kerala
c) Shimla d) Dehradun

43. Rain water is
   a) slightly acidic b) strongly acidic
c) neutral d) slightly alkaline

44. What caused a large scale dying of fish in the river Periyar
   a) Ammonia b) CO2
c) Nitrogen d) Carbon monoxide

45. Largest prawn producing country
   a) Antarctica b) India
c) Japan d) Sweden

46. What caused the disease minameta through food poisoning
   a) Nitrogen b) Cadmium
c) Mercury d) Ammonia

47. The excessive presence of fluorine in drinking water causes:
   a) Chlorosin b) Fluorosis
c) Typhoid d) Amoebiasis

48. World Environment Day is observed in:
   a) June 15th b) June 5th
c) December 5th d) September 15th

49. The red data book is:
   a) List of endangered species
   b) List of eminent environmentalists
c) List of polluted rivers
d) List of big oceans

50. Which type of pollution creates disorder in the digestive system and causes a higher rate of acidity
   a) Air pollution b) Sound pollution
c) Water pollution d) Oil pollution

51. Which among the following is a radio active substance:
   a) Potassium b) Pottassium40
   c) Carbon d) Hydrogen

52. Soil erosion can be prevented by:
   a) Overgrazing b) Afforestation
   c) Removal of Vegetation d) Deforestation

53. What caused the destruction of the environment and the surroundings of Doon School and the Doon Valley?
   a) Mining of limestone b) Mining of iron ore
   c) Mining of Aluminium ore d) Mining of petroleum

54. Soil fertility is reduced by:
   a) Crop rotation b) Nitrogen fixing bacteria
   c) Decaying organic matter d) Intensive agriculture

55. Why do people engaged in painting get asthma?
   a) Because paint contains pollutant b) Because paint contains cynates
   c) Because paint contains oxides d) Because paint contains nitrate

56. Which of the following fruits absorb the largest amount of DDT?
   a) Banana b) Apple
   c) Orange d) Pineapple

57. Why do we say that excessive use of pesticides affect pollination?
   a) Helps cross pollination b) Destroys insects helping pollination
   c) Destroys pollen grains d) Helps self-polllination

58. “Project Tiger” means:
   a) A project to increase the varieties of tigers
   b) A project to make census of tiger of Indian forests
   c) A project to ensure the maintenance of a viable population of tigers
d) A project to protect the tigers in cages

59. Accumulation of non-biodegradable pollutants like DDT along the various trophic levels is called:
   a) Bio-magnification  b) Eutrophication
   c) Chemical oxygen demand  d) Biological oxygen demand

60. One of the following is an endangered species, which is that?
   a) Lion-tailed monkey  b) Lion
   c) Giraffe  d) Tiger

61. Why do we say that plastic should not be heaped up and burnt?
   a) Because it causes loss of oxygen
   b) Release large amount of CO₂ into the atmosphere
   c) Produces large amount of CO
   d) Rises atmospheric temperature

62. Who among the following scientists gave importance to bird-watching?
   a) M.S. Swaminathan  b) Anna Hasam
   c) Vinoba Bhava  d) Salim Ali

63. Many animals die, but they don't get accumulated, why?
   a) Because they are buried in the soil
   b) Because carnivorous animals eat them up
   c) Because of the functioning of the decomposers
   d) Because they get destroyed on their own

64. Who led the first 'environmental march on foot' in India?
   a) Vinoba Bhava  b) Sunderlal Bahuguna
   c) M.S. Swaminathan  d) Medha Patkar

65. Which of the following is a degradable pollutant?
   a) Plastic  b) DDT
   c) Polythene  d) Remains of animals

66. People living in the vicinity of Mavoor Rayons in the district of Calicut suffer from a particular type of skin disease, what is the cause of it?
   a) Increased number of mosquitoes
b) Inhalation of the gas emitted from the factory

c) Use of polluted water discharged from the factory for bathing

d) Increased amount of dust in air.

67. Which instrument is used to burn solid waste?
   a) Injection wells  
   b) Incinerator
   c) Incubator  
   d) None of the above

68. The most important aim of waste management is:
   a) To prevent environmental pollution  
   b) To prevent deforestation
   c) To prevent destruction of wild life  
   d) To prevent air pollution

69. Major source of methane in India is:
   a) Sugar cane fields  
   b) Rice fields
   c) Wheat fields  
   d) Fruit orchards.

70. The smaller contributions to global warming is made by:
   a) CO$_2$  
   b) CH$_4$
   c) CFC$_3$  
   d) N$_2$O

71. Green house effect is:
   a) Production of green plants in the ecosystem
   b) Increase of temperature due to the presence of some gases in the atmosphere
   c) Increase of primary producers
   d) Process of absorption of large quantity of sunlight

72. The concentration of green house gases causes
   a) Global warming  
   b) Extinction plants
   c) Acid rain  
   d) Extinction of animal species

73. International Day for the preservation of Ozone layer is celebrated on:
   a) Sept 16  
   b) June 5
   c) April 22  
   d) December 3

74. Ozone depletion is due to man-made chemical called
   a) Peroxy Acetyl Nitrate  
   b) Chlorofluoro carbon
   c) Sulphur dioxide  
   d) Carbon monoxide
75. Depletion of Ozone layer:
   a) Causes depletion in the path of ultra violet rays
   b) Accelerates the production of O₂
   c) Effects changes in the movement of Ozone layer
   d) Makes it impossible to prevent ultra violet rays.

76. Concentration of Ozone is lowest during:
   a) February-April   b) June-July
   c) July-October     d) December-February

77. The ultraviolet radiation in the stratosphere are absorbed by:
   a) Oxygen          b) Ozone
   c) Sulphur dioxide d) Argon

78. Ozone saves the biosphere by absorbing the high energy radiation called
   a) Infra Red (IR)    b) Ultra Violet Ray (UV)
   c) X-ray             d) Gamma ray

79. An example for proto co-operation:
   a) Sea-anemone and hermit crab
   b) Algae and fungi in Lichen
   c) Coelenterata and algae in coral reefs.
   d) Root nodules and Rhizobium

80. An interaction that probably keeps a check of population
   a) Commensalism      b) Mutualism
   c) Predation         d) Proto co-operation

81. Which is the most suitable method to control pests in cultivation
   a) Use of Pesticides  b) Biological control
   c) Use of weedicides  d) Use of Chemicals

82. The ultimate environmental hazard to mankind is
   a) Noise pollution    b) Water pollution
   c) Air pollution      d) Nuclear pollution
APPENDIX IV
MAHATMA GANDHI UNIVERSITY
SCHOOL OF PEDAGOGICAL SCIENCES

Environmental Awareness Test (Final)

Instructions

The questions given below are based on environmental awareness. Each question is given four distractors A, B, C and D. Only one among the four is correct. Answers are to be marked on the response sheet.

A, B, C and D are marked against each question number on the response sheet. Find out the correct answer for each question. Then put the mark 'X' on the letter indicating the correct answer. If you feel that you have not put the mark 'X' on the letter indicating correct answer, you may draw a circle round the wrongly marked 'X' and place the mark on the correct answer. If you have any doubt with regard to this test you can seek clarifications from the invigilator.

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   c) X-ray                d) Gamma ray

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   a) Use of Pesticides   b) Biological control
   c) Use of weedicides  d) Use of chemicals
## APPENDIX V

**ENVIRONMENTAL AWARENESS TEST**

**RESPONSE SHEET**

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# APPENDIX VI

## ENVIRONMENTAL AWARENESS TEST

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### APPENDIX VII

RAVEN'S STANDARD PROGRESSIVE MATRICES TEST-SCORE CARD

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### LESSON PLAN - I

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<th>Name of the Teacher</th>
<th>John K.K</th>
<th>Subject</th>
<th>Botany</th>
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<tbody>
<tr>
<td>Name of the School</td>
<td>Kannassa Smaraka Govt. HSS, Kadapra</td>
<td>Unit</td>
<td>Natural resources and conservation</td>
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<tr>
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#### Content Overview

Soil resources, soil erosion, depletion of soil fertility, soil conservation techniques like organic farming, crop rotation, contour ploughing, conservation tillage.

#### Content Analysis

<table>
<thead>
<tr>
<th>Terms</th>
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<tbody>
<tr>
<td>Soil resources, soil erosion, soil fertility, sediments, organic farming, crop rotation, contour ploughing, conservation tillage.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Facts</th>
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<tbody>
<tr>
<td>1. Soil is composed of inorganic particles, organic matter, air, water, and a variety of organisms.</td>
</tr>
<tr>
<td>2. Human activities often lead to world wide problems like soil erosion and depletion of soil fertility.</td>
</tr>
<tr>
<td>3. Soil erosion causes loss of the fertile top soil, and also, loss of soil fertility by carrying away organic matter and nutrients that are an essential part of the soil.</td>
</tr>
<tr>
<td>4. abundant plant cover reduces soil erosion</td>
</tr>
</tbody>
</table>
5. Crop management and soil management practices are commonly used to reduce soil erosion and nutrient depletion of agricultural soil.

6. The erosion-affected soil can be improved by stabilizing the soil to prevent further erosion and restoring the soil fertility.

The process by which the topsoil is removed from the land by the movement of water and air is called soil erosion.

Crop management and soil management practice are commonly used to reduce soil erosion and nutrient depletion of agricultural soil.

The pupil:

a) acquires knowledge of the terms facts, concepts mentioned above

b) understands how soil erosion happens in places of agricultural lands, how soil erosion can be controlled by crop management and soil management practices.

c) applies knowledge in the improvement of erosion affected soils by stabilizing the soil and restoring the soil fertility.

d) develops skill in practicing crop management and soil management

e) develops interest in studying the soil management practices

f) develops attitude towards the improvement of the erosion affected soil

g) appreciates the works done by agricultural departments in reducing soil erosion.

Previous Knowledge

Pupil knows that soil erosion is caused mainly by heavy rain and flood. Pupil also knows that grass on the soil reduces soil erosion to some extent.

Teaching aids

Pictures of eroded land, pictures or photographs of contour ploughing pictures of soil.
<table>
<thead>
<tr>
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<th>Specification</th>
<th>Learning Experience</th>
<th>Evaluation</th>
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<tbody>
<tr>
<td>Preparation</td>
<td></td>
<td>Teacher shows pictures of land with good plant cover and other with barran land.</td>
<td>What is soil?</td>
</tr>
<tr>
<td></td>
<td>recalls</td>
<td>Teachers asks the pupils to observe the pictures carefully and describe on the characteristics of these lands.</td>
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<tr>
<td></td>
<td>recognizes</td>
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<tr>
<td>Presentation</td>
<td>identifies</td>
<td>Pupil identifies that the surface layer of the land is called soil. Teacher shows a picture of the structure of soil, pupil recognizes that the soil is composed of inorganic particles, organic matter, air, water and a variety of organisms</td>
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<td>recognizes</td>
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<td>identifies</td>
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<td></td>
<td>notices</td>
<td>Pupil observes the land with plant cover and land without any without any plant. Pupil says that the land without plant cover is due to the activities of human beings</td>
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<td>discriminates</td>
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<td>Defines</td>
<td>Pupil defines soil erosion as the process by which topsoil is removed from the land by the movement of water and air.</td>
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<td></td>
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<td>Soil erosion (BB)</td>
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<tr>
<td>Content</td>
<td>Specification</td>
<td>Learning Activities</td>
<td>Evaluation</td>
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<tr>
<td>Human activities accelerate soil erosion by removing plant cover, and soil erosion leads to reduce productivity of land.</td>
<td>assumes identifies suggests</td>
<td>Pupil assumes the reasons for soil erosion and identifies the after effect of soil erosion. Pupil suggests the ways to reduce the soil erosion. Teacher discusses with the pupil the important soil conservation techniques adopted. Soil conservation (BB) Pupil defines soil erosion. Pupil identifies the reasons for soil erosion and suggests the soil conservation techniques adopted.</td>
<td>What is the after effect of soil erosion? How soil erosion can be reduced? Which are the common soil conservation technique?</td>
</tr>
<tr>
<td>Crop management and soil management practices are commonly used to reduce soil erosion and nutrient depletion of agricultural soils. The important soil conservation techniques are (1) organic farming (2) crop rotation (3) contour ploughing (4)strip-cropping terraces (5) conservation tillage.</td>
<td>discusses explains defines</td>
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<tr>
<td>Conclusion</td>
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**Review**

1) What is soil erosion?
2) What are the reasons for soil erosion?
3) How the soil erosion prevented?
4) Mention the important soil conservation technique.

**Assignment**

Discuss the means by which the soil erosion can be prevented.
## Appendix VIII (b)

### LESSON PLAN – 2

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**Content Overview**

Pollution, pollutants, biodegradable pollutants, non-biodegradable pollutants, air pollution, water pollution, soil pollution.

**Content Analysis**

**Terms**

Pollution, pollutants, biodegradable pollutants, non-biodegradable pollutants, air pollution, water pollution, soil pollution, gaseous pollution, dust pollution, thermal pollution, noise pollution and radioactive pollution.

**Facts**

1. Pollution is the unfavourable alteration of our environment
2. Pollutants can be classified into two, namely biodegradable and non-biodegradable.
3. There are mainly three types of pollution namely air pollution, water pollution and soil pollution.
4. On the basis of origin, pollution in divided into 2 types. They are natural pollution and anthropogenic pollution.

**Concepts:**

Pollution is an undesirable change in physical, chemical or biological characteristics of our air land or water that will harmfully affect human life and the lives of all other species on earth.

The substances or factors which cause pollution are called pollutants.
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<tr>
<td>a)</td>
<td>acquires knowledge of the terms facts, concepts of the pollution, pollutants, different kind of pollution and pollutants.</td>
</tr>
<tr>
<td>b)</td>
<td>understands various pollutants that are responsible for pollution</td>
</tr>
<tr>
<td>c)</td>
<td>applies knowledge in minimizing the emission of various pollutants into the environment.</td>
</tr>
<tr>
<td>d)</td>
<td>develops skill in using pollution free machines, vehicles, etc. and also in identifying the pollutants that are degradable and biodegradable.</td>
</tr>
<tr>
<td>e)</td>
<td>develops interest in studying how the environment can be made pollution free.</td>
</tr>
<tr>
<td>f)</td>
<td>develops an attitude towards an ecofriendly life styles.</td>
</tr>
<tr>
<td>g)</td>
<td>appreciates the works done by nature club and other ecofriendly associations.</td>
</tr>
</tbody>
</table>

| Previous Knowledge | Pupil knows that the industries and automobiles release large amount of pollutants in the atmosphere which causes serious hazards to human beings. |

| Teaching aids | Photographs of (1) big cities with thick traffic (2) industries emitting smoke and gases. |
### Content

**Preparation**

Pollution is an undesirable change in the physical, chemical or biological characteristics of our air, land or water that will harmfully affect human life and the lives of all other species on earth.

### Specification

- recalls
- recognizes
- identifies
- defines

### Learning Experience

Teachers asks the pupils about their hobbies and interests. Some of them are interested in music, seeing cinema, sports, games, visiting tourist places etc. Teachers enquires whether they had been in big cities like Mumbai, Chennai, Kolkatha etc. Some pupils answered that they were in these cities. Teacher asks whether the atmosphere of these big cities is pure or bad. Pupil answers that the air of the cities are not good for breathing. Teacher asks why the air in the big cities are bad. Pupil answers that smoke from automobiles and factories may pollute the air. The teacher says that this process is known as pollution.

Teacher says that there is change in the physical, chemical, or biological characteristics of air.

Pupil recognizes that these gases may harmfully affect human health. Pupil defines pollution.

Pollution (BB)

### Evaluation

What is pollution?
### Content

The substances or factors which cause pollution are called pollutants.

Pollutants can be classified into two types. They are biodegradable and non-biodegradable.

Substances which are decompressed by microorganisms are called biodegradable pollutants eg. market garbage, livestock waste, municipal sewage.

Non-biodegradable pollutants which are not degradable by any organisms eg. DDT, BHC, Plastics etc.

### Specification

- Suggests
- Notices
- Discrimination
- Gives examples
- Identifies
- Distinguishes
- Defines
- Gives examples

### Learning Experience

Teacher asks the students to suggest the substances that are responsible for pollution. Pupils suggest the examples as smoke from vehicles, smoke from factories etc. Teacher says that these substances are called pollutants. Pupil gives examples for pollutants.

**Pollutants (BB)**

Pupil identifies that some pollutants are degradable and some are non-degradable.

- Degradable (BB)
- Non-biodegradable (BB)

Pupil distinguishes between biodegradable and non-biodegradable pollutants. Pupil suggests examples for the biodegradable and non-biodegradable pollutants.

### Evaluation

- What are pollutants?
- Which are the two types of pollutants?
- What is biodegradable pollutant? Give examples
- What are non-biodegradable pollutants? Give examples.
<table>
<thead>
<tr>
<th>Content</th>
<th>Specification</th>
<th>Learning Experience</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>On the basis of the part of environment where it occurs, pollution is divided into 3 types: They are, 1. Air pollution 2. Water pollution 3. Soil pollution</td>
<td>identifies classifies</td>
<td>Teachers asks the pupils to divide the pollution based on the part of the environment where it occurs.</td>
<td>Name the different kinds of pollution.</td>
</tr>
<tr>
<td>On the basis of origin pollution may be classified into two types: They are, 1. Natural pollution 2. Anthropogenic pollution</td>
<td>assumes classifies recognizes</td>
<td>Pupil assumes that on the basis of the origin the pollution is divided into 2 types. Pupil recognizes that man-made pollution are anthropogenic pollution.</td>
<td>Which are the two types of pollution based on origin?</td>
</tr>
<tr>
<td>According to the physical nature of pollutants, pollution is classified into 5 types.</td>
<td>identifies classifies</td>
<td>Teacher says that according to the physical nature of pollutants, they can be classified into five types.</td>
<td>Classify the pollution based on the physical nature of pollutants.</td>
</tr>
</tbody>
</table>
They are;
1. Gaseous pollution
2. Dust pollution
3. Thermal pollution
4. Noise pollution
5. Radioactive pollution

Conclusion

Learning Experience
Pupil defines pollution, and classifies pollutants. Pupil also classifies pollution based on the part of environment where it occurs.

Review

1) What is pollution?
2) What are pollutants? Classify pollutants
3) Which are the kinds of pollution on the basis of the part of environment where it occurs?
4) What is anthropogenic pollution?
5) Classify pollution according to the physical nature of pollutants.

Assignment
Define pollution and give examples for pollutants of different types.
Appendix IX

MAHATMA GANDHI UNIVERSITY
SCHOOL OF PEDAGOGICAL SCIENCES
ACHIEVEMENT TEST IN ENVIRONMENTAL SCIENCE

Class XII

Marks: 50
Time: 1 hr

Directions

1. Attempt all questions
2. Write on the separate answer sheet provided
3. 32 questions are given below

Questions 1-20, four choices are given for each question
Choose the appropriate answer. Each question carries 1 mark

Questions 21-30, short answer, each carries 2 marks

Questions 31 and 32. Write the answer with minimum ten sentences, each carries 5 marks.

I. Choose the correct answer

1. Soil erosion can be prevented by:
   a) Over grazing  
   b) Removal of vegetation
   c) Afforestation  
   d) Deforestation

2. Which of the following is the most important natural resources of energy?
   a) Electricity  
   b) Biogas
   c) Fossil fuels  
   d) Atomic fusion

3. Desertification is due to:
   a) Deforestation  
   b) Soil erosion due to water
c) Soil erosion due to wind  d) Very high temperature and low rainfall

4. Planting trees and shrubs on an unused and fallow land to provide fuel, wood, fodder etc is called:
   a) Social forestry  b) Agroforestry
   c) Vanamahotsava  d) Demersal

5. Permissible voice level at day and night in the Residential area
   a) 35 dB - 30 dB  b) 55 dB - 40 dB
   c) 50 dB - 40 dB  d) 55 dB - 45 dB

6. Which of the following plant functions is directly affected when insecticides are used in crop fields?
   a) Transpiration  b) Pollution
   c) Flowering  d) Water absorption

7. Which one of the following is not a greenhouse gas?
   a) CO\textsubscript{2}  b) CH\textsubscript{4}
   c) O\textsubscript{2}  d) CFCs

8. Major sources of methane in India is:
   a) Sugar cane fields  b) Rice fields
   c) Wheat fields  d) Fruit orchards

9. Parasite can be explained as an organism which depends on others
   a) for food  b) for shelter
   c) for both food and shelter  d) for reproduction

10. An interaction that probably keeps a check on population is:
   a) Commensalism  b) Mutualism
   c) Predation  d) Photo co-operation

11. Gobar gas is produced from
   a) Agricultural waste  b) Animal waste
   c) Industrial waste  d) Sea - waste

12. Eutrophication results in the reduction of:
a) Mineral salts  b) Dissolved oxygen
c) Hydrocarbon  d) Dissolved hydrogen

13. Brown air in traffic congested city is caused by:
a) CH₄  b) Sulphur dioxide
c) Hydrocarbon  d) Nitrogen oxides

14. The ultraviolet radiation in the stratospheres are absorbed by:
a) Chromium  b) Ozone
c) Sulphur dioxide  d) Argon

15. The 'mina mata' disease is caused by:
a) Chromium  b) Mercury
c) Sunlight  d) Cadmium

16. Which one of the following is most effective in controlling floods?
a) Digging deep canals  b) Reforestation
c) Deforestation  d) Constructing dams

17. Deforestation has an alarming effect on:
a) Soil erosion  b) Weed control
c) Sunlight  d) Increasing grazing area

18. The smaller contribution to global warming is made by:
a) CO₂  b) CH₄
c) CFCs  d) N₂O

19. Rhizobium bacteria in the root nodules of a pea plant is an example for:
a) Symbiosis  b) Commensalism
c) Parasitism  d) Predation

20. Soil fertility is reduced by:
a) Crop rotation  b) Nitrogen fixing bacteria
c) Decaying organic matter  d) Intensive agriculture

(20x1=20 marks)
II. Write the answer in two or three sentences

21. What is photochemical smog? How does smog affect the biological world?

22. Define Biological oxygen Demand?

23. What is nuclear fall out?

24. What is soil erosion?

25. How can pollution by domestic sewage be controlled?

26. Write the source of CFCs

27. Define pollution. Compare the biodegradable and non-biodegradable pollutants.

28. Enlist the measures for controlling soil pollution

29. What is acid rain? What are its effects on plants?

30. Distinguish between deforestation and desertification.

(10x2=20 marks)

III Essay

31. What is meant by ozone shield? How does the CFCs and ozone depleting substances affect ozone shield?

32. Give a diagrammatic illustration of 'green house effect”.

(2x5=10 marks)
Appendix X

Scoring key and Marking Scheme

**Scoring key**

<table>
<thead>
<tr>
<th>Question Number</th>
<th>1</th>
<th>2</th>
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<td>a</td>
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<th>8</th>
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<th>14</th>
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<td>c</td>
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<td>b</td>
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<td>b</td>
<td>b</td>
<td>b</td>
<td>a</td>
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**Marking Scheme**

<table>
<thead>
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<th>Qu. No.</th>
<th>Value points</th>
<th>Score for each point</th>
<th>Total score</th>
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<tbody>
<tr>
<td>21</td>
<td>1. Example for secondary pollutant. Combination of smoke and fog.</td>
<td>½</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>2. Composed of O3, PAN and NO2.</td>
<td>½</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. In plants it damage leaves</td>
<td>½</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Animals, cause lung disease.</td>
<td>½</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Measure of oxygen required by aerobic decomposers for the biochemical degradation of organic materials in water. Higher the BOD, lower would be dissolved oxygen</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>23</td>
<td>1. Radioactive dusts, explosion of nuclear weapons.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>2. It poisons soil, air and water.</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
24. The process by which the top soil is removed from the land by the movement of water and air is called soil erosion.
   1. It causes loss of the fertile top soil.
   2. Loss of fertility by carrying away organic matter and nutrients.

25. Liquid waste from kitchens, toilets and other household waste waters.
   1. The sewage can be controlled by sewage treatment through effluent treatment plant.

26. Major sources of CFCs are
   1. leaking air conditioners
   2. refrigeration units
   3. evaporation of plastic foams and
   4. propellants in aerosol spray cans etc.

27. Pollution is an undesirable change in physical, chemical or biological characteristics of air land or water that will harmfully affect human life and the lives of all other species as earth.
   1. Pollutants that are decomposed by microorganisms are biodegradable.
   2. Pollutants which are not decomposed by any organisms are non-biodegradable.
28. 1. Safer land are
2. Planned urbanization
3. Controlled developmental activities
4. Safe disposal and management of solid wastes from industries and human habitations.

29. 1. The process of deposition of acid or earth from the atmosphere is called acid rain.
2. It adversely affects terrestrial and aquatic vegetation.

30. 1. Destruction of forests is known as deforestation.
2. In drier areas, deforestation can lead to the formation of deserts. This is called desertification.

31. 1. The stratospheric ozone plays a vital role by protecting living organism from the harmful effects of ultraviolet radiation. This is called ozone shield.
2. Thinning of spring-time stratospheric ozone layer is called ozone hole.
3. CFCs, CH4, N2O cause destruction of ozone. CFCs produce "active chlorine" in the presence of UV radiation. So CFCs are most damaging.
Identifying the causes
Appendix XI
RETENTION TEST
MAHATMA GANDHI UNIVERSITY
School of Pedagogical Sciences
ACHIEVEMENT TEST IN ENVIRONMENTAL SCIENCE

Class XII

Directions

1. Attempt all questions
2. Write on the separate answer sheet provided
3. 32 questions are given below

Questions 1-20, four choices are given for each question
Choose the appropriate answer. Each question carries 1 mark

Questions 21-30 short answer, each carries 2 marks

Questions 31 and 32. Write the answer with minimum ten sentences, each carries 5 marks.

I. Choose the correct answer

1. The smaller contribution to global warming is made by:
   a) CO₂  
   b) CH₄
   c) CFCs  
   d) N₂O

2. Rhizobium bacteria in the root nodules of a pea plant is an example for:
   a) Symbiosis  
   b) Commensalism
   c) Parasitism  
   d) Predation

3. Soil fertility is reduced by:
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   a) 35 dB - 30 dB
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   a) Transpiration
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11. Major sources of methane in India is:
    a) Sugar cane fields
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    c) for both food and shelter
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   c) Hydrocarbon  d) Dissolved hydrogen
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   a) CH₄  b) Sulphur dioxide
   c) Hydrocarbon  d) Nitrogen oxides
20. Deforestation has an alarming effect on:
   a) Soil erosion  b) Weed control
   c) Sunlight  d) Increasing grazing area

(20x1=20 marks)
II. Write the answer in two or three sentences

21. How can pollution by domestic sewage be controlled?
22. Write the source of CFCs
24. Enlist the measures for controlling soil pollution
25. What is acid rain? What are its effects on plants?
26. Distinguish between deforestation and desertification.
27. What is photochemical smog? How does smog affect the biological world?
28. Define Biological oxygen Demand?
29. What is nuclear fall out?
30. What is soil erosion?

(10x2=20 marks)

III Essay

31. Give a diagrammatic illustration of ‘green house effect”.
32. What is meant by ozone shield? How does the CFCs and ozone depleting substances affect ozone shield?

(2x5=10 marks)
# APPENDIX XII

Lists of Schools and Sample Selected for the Survey

<table>
<thead>
<tr>
<th>Name of the School</th>
<th>Sample</th>
</tr>
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<tbody>
<tr>
<td>Marthoma Higher Secondary School, Pathanamthitta</td>
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<tr>
<td>St. Thomas Higher Secondary School, Kozhencherry</td>
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<td>MGM Higher Secondary School, Thiruvalla</td>
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<td>St. Thomas Higher Secondary School, Eruvellipra</td>
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<td>SC Higher Secondary School, Ranni</td>
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<tr>
<td>Govt. Higher Secondary School, Thottakanam</td>
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