

ENVIRONMENTAL STUDIES (CIE -1052) *A Practical Manual*



Name: _____

Roll No.: _____

Section: _____

Batch: _____



Introduction

Practical's are an integral part of understanding and learning a particular subject. For the course in Environmental Science, practical's include field studies, laboratory exercises (analysis), and creative activities. These exercises are not only relevant to get a better understanding of environment but also provide hands-on experience at devising methods for preventing environmental degradation.

OBJECTIVES

- Appreciate the interrelationship between living and non-living components of our environment;
- Understand the impact of human activities on the local environment;
- Understand biodiversity and interdependence of plants and animals and their relationship with the environment;
- Understand pollution and its harmful effect on the environment and devise strategies for reducing pollution;
- Realize the importance of energy and relevance of energy audit for the conservation of energy;
- Learn about assessing the quality of air, water and soil.

THE FORMAT OF THIS MANUAL

- The exercises presented in this manual are in the form of self-instructional material. Each exercise in the manual has the following format.



Notes

ENVIRONMENTAL STUDIES PRACTICALS

- 1. Aim** : It defines the scope of the exercise.
- 2. Introduction** : It describes the purpose and relevance of the exercise.
- 3. Objectives** : The objectives give you an idea of what is to be learnt from the exercise.
- 4. What you should know** : It highlights the concepts and background knowledge pertaining to each specific exercise. You should familiarize yourself with the relevant concepts and information for doing the exercise successfully.
- 5. Materials** : Is a list of various materials, apparatus etc. required to carry out the exercise.
- 6. Method** : It includes the steps to perform the exercise in a sequential manner.
- 7. Precautions** : The relevant precautions to be taken in carrying out the exercises are listed. Specific precautions if any, are listed along with the relevant step of the exercise.
- 8. Observations/Results** : A detailed format of recording observations is provided. Draw diagrams, wherever necessary.
- 9. Conclusions/Discussion** : Justify the relationship between the aim of the exercise, the principle underlying it and the results obtained.

1. HOW TO USE THIS MANUAL

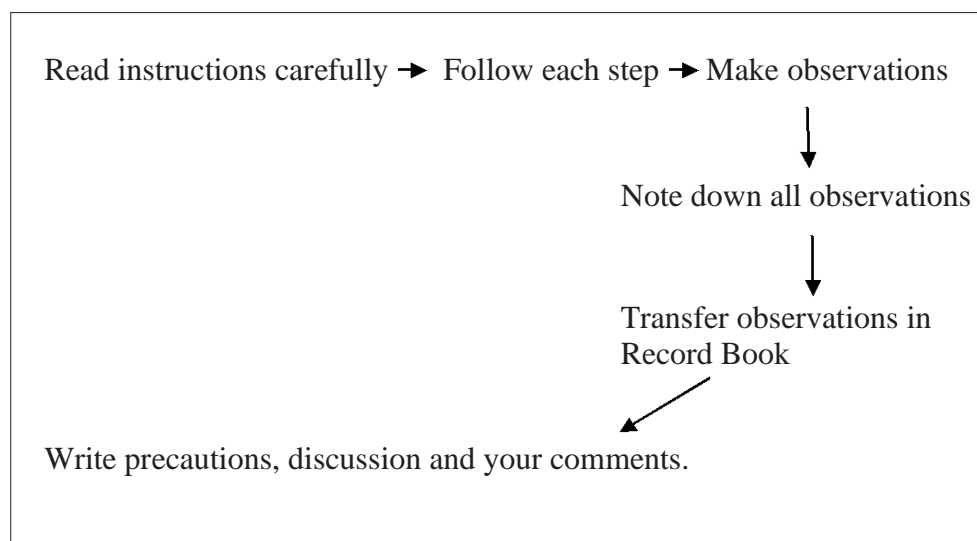
- a. Read the aim of the exercise carefully. Try to understand what is required to be done.
- b. Assemble all materials to carry out the exercise.
- c. Carefully read the methodology given in the procedure and the step by step instructions.



Notes

- d. Try noting down the observations then and there instead of doing it later. Draw the diagrams as you actually see them. Maintain a neat and completed record book. It carries 3 marks.
- e. Apart from the general precautions to be taken while working in a laboratory, also follow the precautions given either at the end or in between the instruction steps for each practical. Do not avoid these precautions if you want better results as they are very specific for the particular experiment.
- f. Do not forget to carry your manual with you when you go for the practical work.

Once again the steps involved in performing a practical are listed below in the chart to help you do the practical's.





2. MAINTENANCE OF MANUAL [Soft copy]

We hope you will follow the instructions listed in each exercise while performing it and record your observations.

- Aim of the exercise.
- Materials required.
- Method or procedure followed.
- Observations made.
- Record/tabulate your observations draw diagram wherever necessary.
- Conclusions / Discussion / Interpretation.
- Precautions taken during experimentation.



EXERCISE • 1

AIM: TO DESCRIBE THE ENVIRONMENTAL PROBLEMS OF YOUR LOCALITY AND SUGGEST A REMEDY.

Environmental problems differ from one area to another. Problems of pollution may be in the form of air pollution, water pollution or noise pollution. Garbage accumulation, soil erosion, loss of biodiversity are some other environmental problems that have reached an enormous proportion and need to be looked into find solutions.

OBJECTIVES

After performing this exercise, you will be able to:

- Identify specific environmental problems associated with a particular locality.
- Locate the cause of the environmental problem of a locality as an environmentalist.
- Suggest remedies which may be simple and less expensive.
- Harmful effects of the existing environmental problems.

WHAT YOU SHOULD KNOW

1. You should be able to identify the major environmental problem of your locality. Some environmental problems are mentioned below. One of them may be a problem of your locality or it may be one not mentioned here.

a. Noise and air pollution

- In case you live in a crowded urban area, you are certain to face air pollution and noise pollution.

b. Problems of drinking water and sanitation

- If you live in rural areas, you may face the crisis of clean drinking water and problems of smoke from burning coal as also sanitary problems.
- In semi-urban highly populated slum areas, one might face the scarcity of clean drinking water and open drains with sewage disposal problem and other sanitary problems.



c. Soil erosion and landslide

- In hilly areas one faces the problem of drinking water as well as cutting of trees leading to soil erosion, making the mountains exposed and vulnerable to landslides.

d. Garbage accumulation

- Can create problem in the cities, which can be dealt with by converting the garbage into manure.

MATERIAL REQUIRED

- (i) Your requirement will depend upon the type of problem you are handling.
 - (ii) Notebook and pen will be required.

METHOD

- Air pollution by dust and fuel smoke can be dealt with by contacting the authorities who are authorized to take steps to control it. Like for example, if the soil is dug by water, electricity, telephone or sewage departments creating dust problems, they can be asked to repair the dug up roads.
- Noise pollution can be controlled by contacting the appropriate authorities.
- Similarly industrial pollution can be handled by contacting the authorities.
- Clean drinking water must be made available to people, you may form an association and inform the authorities or bring it to their notice.
- Cutting of trees in the hills must be prevented and you must play your role in educating the people for the same. Trees may be used for various purposes but then lot of trees must be planted on a commercial scale to hold the soil in place on the hills.
- Accumulation of garbage in your locality might create health problems. You may make a group and help to separate out the biodegradable garbage and compost it to make manure which can be used in gardens and parks.

OBSERVATIONS

- (i) Make a detailed list of the environmental problems of your locality.

- (ii) Find the main or primary environmental problem and its cause.



(iii) Find out the names of people who can be contacted to rectify the problem.

(iv) Form a welfare association or in case there is already one, force them to take steps to check the environmental problem.

(v) Educate your neighbor in your locality to collect the biodegradable garbage and convert it by vermicomposting method into compost or manure. The manure can be sold to individuals for their kitchen gardens or may be used in the community parks and gardens.

DISCUSSION

- Discuss with respect to the source/ cause of the problem, its harmful impact and how it can be tackled to prevent further degradation.

PRECAUTIONS

1. Take help of your teacher in locating or identifying the real environmental problem.
2. You should know your limitation and not annoy anyone in order to solve your environmental problem.



EXERCISE • 2



Notes

AIM: TO PREPARE A LIST OF PLANTS AND ANIMALS WHICH ARE USED FOR MAKING MEALS AT YOUR HOME ON ANY ONE DAY AND TO COMMENT ON THE HABIT AND HABITAT OF EACH.

Humans are dependent on plants and animals for food. Though not all plants and animals are edible, there is still a wide variety which serves as food for humans. Similarly not all parts of the same plant may be used to prepare a delicious dish. This exercise deals with identification of habit and habitat of edible plants and animals.

OBJECTIVES

After performing this exercise, you will be able to: -

- Learn about the edible parts or products of plants and animals;
- Comment on the habit and habitat of these plants and animals.

WHAT YOU SHOULD KNOW

1. Names of parts of plants; modified roots and stems.
2. Skeletal and fiscal tissues of edible animals; edible animal products.

MATERIAL REQUIRED

- | |
|---|
| <ul style="list-style-type: none">(i) Record book(ii) Pen / pencil |
|---|



METHOD

- Prepare the list of items of food consumed by you at breakfast, lunch and dinner the previous day and also list the ingredients obtained from plants and animals which have been used for making them.
- Make sure that your list is complete and exhaustive.
- Include spices, pulses, grains used in cooking the food item.
- In case you are vegetarian, find out about non-vegetarian food form others and include in your list.

OBSERVATIONS

Tabulate your information about each item as given below. Make separate tables for plants and animal products.

Food item	Edible part of plant or animal	Name of the plant or animal	Habit of the plant/animal	Habitat of plant/animal
1				
2				
3				

For tabulation, the following points are suggested:

Plants:

Parts of plants – Root/leaf/stem/bud/flower/fruit/seed/grain.

Habit edible of the plant – Herb/shrub/fruit/seed/grain.

Habitat of the plant – Aquatic (fresh water, marine, pond, river etc.) or terrestrial

Animals:

Parts/Product eaten – milk /egg/muscles.

Habit of the animal –Omnivorous/ herbivore/carnivore/insectivore/bones.

Habitat of the animal – Aquatic/terrestrial/aerial.



DISCUSSION

- Discuss in your own words, the dependence of humans of plants and animals for food.

PRECAUTIONS

1. Let you list be exhaustive and not sketchy so that you can learn about the variety of habits and habitats of plants and animals.
2. Never feel shy to ask others about their food habits. It will not only increase your knowledge but have your communication skills.



EXERCISE • 3

AIM: TO DESCRIBE: A) CLIMATE OF YOUR AREA.

B) YEARLY VARIATION IN SUSPENDED PARTICULATE MATTER IN THE SAME AREA.

Weather is the state of the atmosphere at a particular place and time in terms of temperature, wind, rain, humidity etc. Climate of an area is an average pattern of weather conditions over a long period of time. The lives of all organisms are affected greatly by the changes to the weather conditions. Every organism requires optimal conditions of weather for its survival.

Pollution is the undesirable changes in the environment which makes it less suitable for the survival of the organisms. The change may be physical, chemical or biological. The agents that cause pollution are called pollutants.

Since weather conditions and pollution levels have direct impact on the lives of organisms, it is of great significance that we study the weather patterns and the air pollution levels and make the weather chart and pollution level chart. The two can be joined together to have a wholesome view. That pollution is influencing the climate on planet earth is obvious from global warming. Therefore, making a climate chart of an urban area along with yearly variation in suspended particulate matter is important.

Air pollution is a growing problem. Air pollutant may be gaseous or particulate. The particulate matter suspended in air with size less than $10\text{ }\mu\text{m}$ is called Respirable Suspended Particulate Matter (RSPM). The RSPM causes several respiratory system disorders.

OBJECTIVES

After performing this exercise, you will be able to:

- Enlist factors affecting climate;
- Enlist components of weather;
- Understand patterns of changes each component undergoes over the months in a year; interpret the weather chart;
- Present the data in the form of bar graph;
- Realize the significance of pollution control.



MATERIAL REQUIRED

- (i) Local daily newspaper
- (ii) TV news
- (iii) Internet

WHAT YOU SHOULD KNOW

1. Climate of an area is an average pattern of weather conditions over a long period of time.
2. Weather is the state of the atmosphere having taken into account all its components such as temperature, wind, rain, humidity etc.
3. Weather of a place may be different from that of some other place at the same point of time.
4. Weather of a place may also vary with the passage of time.
5. Study of climate cannot be done without the data of weather components.
6. Pollution is largely a consequence of human activities.
7. The biggest cause of the pollution is one the combustion of fossil fuels.

METHOD

1. For making a climate chart showing monthly values of climate variables and RSPM values. You need a maximum-minimum thermometer, rain-gauge, hygrometer etc. Else you can collect data from local daily newspaper, Central or State Pollution Control Board, television or internet on daily basis.
2. You have to make the entries as per the following table for each month of a year.

MONTH: _____

Date	Maximum Temp. (0°C)	Minimum Temp. (0°C)	Rainfall	Humidity (%)	Relative Humidity	RSPM* (ppm)
Average						

* RSPM stands for Respirable Suspended Particulate Matter.

Relative humidity: It measures water vapor (moisture) relative to the temperature of the air.



OBSERVATIONS

- (i) Calculate average value of each component for each month.

- (ii) Taking month on x-axis and a component (say Maximum temperature) on y-axis make bar charts for each component.

- (iii) Analyze your observations.

DISCUSSION

- Which month of the year shows the highest average maximum temperature and why?

- Which month of the year shows the lowest average minimum temperature and why?

- Which month of the year shows the highest average rainfall and why?

- Which month of the year shows the lowest average rainfall and why?

- Which month of the year shows the highest average humidity and why?

- Which month of the year shows the lowest average humidity and why?

- Which month of the year shows the highest average relative humidity and why?

- Which month of year shows the lowest average relative humidity and why?

- Which month of the year shows the highest average RSPM?



- Suggest some measures to control the amount of RSPM in air?

CONCLUSIONS

- Draw conclusions based on answers to above mentioned questions.

PRECAUTIONS

1. Collect the data carefully and accurately for arriving at correct results and conclusions.



EXERCISE • 4

AIM: TO MAKE AN AUDIT OF THE ELECTRICAL ENERGY CONSUMPTION BY VARIOUS HOUSEHOLD APPLIANCES AT YOUR HOME.

All living organisms rely on external sources of energy. In case of green plants, it is radiation from the sun; in case of animals – it is chemical energy. All this energy is required for the organisms to be able to grow, to reproduce and to work. In addition to this, humans also consume energy in many other ways such as electric bulbs, cars, fans, air conditioner, television, cooking ovens, machines etc.

Almost everything that makes our everyday life computable requires energy. So, it would be very significant to study the pattern of energy consumption at our home. To simplify, the study can be delimited to the electrical energy. To make an audit of electricity consumption means to quantify the electrical energy use and prepare its account to understand the pattern of electricity consumption at home or any other establishment.

OBJECTIVES

After performing this exercise, you will be able to:

- Enlist the sources of energy at your home;
- Calculate how much electrical energy your home consumes;
- Know whether your home follows any energy conservation practice;
- Find out the ways to minimize energy consumption at home.

MATERIAL REQUIRED

- | | |
|-------------|------------------|
| (i) Pen | (iii) Notebook |
| (ii) Pencil | (iv) Graph paper |



WHAT YOU SHOULD KNOW

1. Domestic electric supply in India is at 220 V.
2. Commercial unit of electrical energy is Kilowatt-hour. (1 Kwh = 1 Unit)
3. All electrical appliances bear on them the power in watt. (i.e. rate at which they consume energy)
4. Make a list of electrical energy consuming items (appliances) used at your home with their power rating in watts. The electrical appliances may be:
 - (i) Lighting appliances such as bulb, tube, CFL etc.
 - (ii) Heating appliances such as geyser, kitchen equipment's like microwave oven, heater etc.
 - (iii) Refrigerator
 - (iv) Fan and exhaust fan
 - (v) Air conditioner
 - (vi) Water pump
 - (vii) Office equipment's such as computer, printer, fax etc.
 - (viii) Miscellaneous items such as inverter, television etc.
5. Energy consumed can be calculated by using the formula :

$$\text{Energy} = \text{Power} \times \text{Time}$$

METHOD

Electrical Energy audit at home can be done in the following steps:

- Note the duration in hours for which an appliance is used at home on daily basis. Remember if three electric bulbs are used, the duration of their use must be noted separately and collectively as it is not necessary that all the bulbs are used for the same duration.
- The above data should be filled in the following observation table. (NOTE – The Column (b) of the table can be modified according to the number and types of electrical appliances used at your home).

OBSERVATIONS

- (i) Present your result in the form of a pie chart for the electricity energy consumption during a day by various electrical appliances at your home.



S.No.	Electrical appliance	Power of Electrical Appliance (in Watt)	Duration of which used (in hours)	Energy consume (in watthour) i.e. product of (c) and (d)
(a)	(b)	(c)	(d)	(f)
1.	Bulb No. 1	---	---	---
2.	Bulb No.2	---	---	---
3.	Bulb No.3	---	---	---
4.	Tube Light	---	---	---
5.	Fan	---	---	---
---	---	---	---	---
---	---	---	Total	---

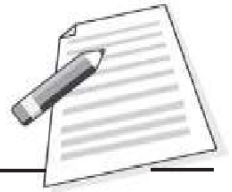
Making a Pie chart

Suppose electrical energy consumption by various appliances on any one day in a household is as given below.

S.No	Electrical Appliance	Electrical Energy consumption (Units)
1	Electrical bulb	0.36
2	Fan	1.26
3	Refrigerator	2.00
4	Cooler	1.80
5	Television	0.90
	Total	<u>6.32</u>

For the electrical consumption by each appliance, corresponding angle of pie chart can be obtained using the formula

$$\theta = \frac{\text{Electrical Energy Consumption by the appliance} \times 360^\circ}{\text{Total Energy consumption by all appliance}}$$



Notes

Thus, the following table is obtained for making a pie chart-

S.No	Electrical Appliance	Electrical Energy consumption
1	Electrical bulb	20.5°
2	Fan	71.8°
3	Refrigerator	113.9°
4	Cooler	102.5°
5	Television	51.3°
	Total	360°

Now draw a circle and a radius in it. Make corresponding angles for each appliance at the center of the circle.

- (ii) Similar tables are filled in date wise for a month.
- (iii) Total electrical energy consumed during a month is calculated adding the totals of column (e) of all the tables of different dates of a month.
- (iv) Modified according to the number and types of electrical appliances used at your home
- (v) Total electrical energy consumed during a month obtained in step 3 is in watt-hour. Therefore it is divided by 1000 to convert it into kilowatt-hour.

1 kilowatt-hour = 1Unit.

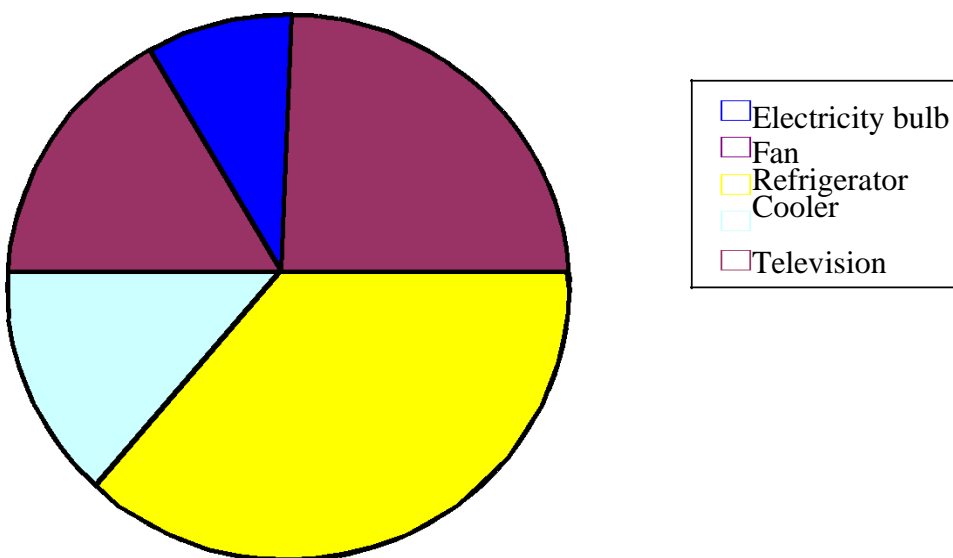


Fig. 17.1: Electrical Energy Consumption by Household Appliances Through Pie Chart



RESULT

Total electrical energy consumed in the month = _____ kilowatt-hour.

DISCUSSION

On the basis of observations and result analyze the following aspects –

- Which device (s) / appliance (s) consumes more electrical energy?

- Where do you find any wastage of energy that could be avoided?

- Is there any alternative appliance for any existing one that can reduce consumption of electrical energy? (e.g. C F L in place of bulb)

- What other measures could be taken to save energy.

- How is the energy economy level displayed on certain appliances?

PRECAUTIONS

1. Each and every electrical appliance used at home should be included in the list for the audit.
2. The duration of use varies from one appliance to other. Therefore, the duration for which an appliance is used should be recorded carefully.
3. Power rating of the appliances should be recorded in watts whereas duration of use in hours.
4. Certain appliances are used in particular period of the year depending upon the weather conditions such as geyser, cooler etc. Therefore, energy audit for a month should never be used to calculate average energy consumption for the whole year.