

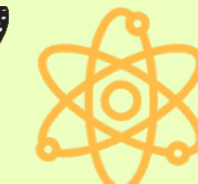


Energy and Wetland Research Group  
Center for Ecological Sciences  
Indian Institute of Science, Bengaluru

**ADAMYA CHETANA**  
Smt. Girija Shastry Memorial Trust (R)  
ANNA | AKSHARA | AAROGYA



# Nature Science Awareness Test



'Annapoorna', BBMP Samudaya Bhavan, Kempegowda Nagar, Gavipuram, Bengaluru - 19  
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To get regular updates please give a missed call to 080-39275548

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# ADAMYA CHETANA

Smt. Girija Shastry Memorial Trust (R)



## SASYAGRAHA

*"Let's become responsible environmental warriors. While using natural resources today, let's conserve those natural resources for the prosperity of our future generations."*

*- Shri Narendra Modi*

*"When we have the cutting-edge technology to conquer space, what stops us from making simple changes in our lifestyle to safeguard our only habitat – our mother earth! The prowess to land on moon, to orbit Mars by Mangalyaan and beyond and much more - the only crucible for blossoming of such human imagination and intellect is our mother Earth with all its flora, fauna, aqua and nature."*

*- AnanthKumar*

**We** are all acutely aware of ever increasing temperatures, falling water tables, decreasing green cover and bio-diversity, growing pollution and diseases. Answers to these issues are also known. We have to change our lifestyle. We have to be eco-sensitive and understand the underlying cause of these problems and adopt a Green Lifestyle.

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**Adamyachetana** ([www.adamyachetana.org](http://www.adamyachetana.org)) is a charitable organization set up in the memory of Shri AnanthKumar's mother Smt. Girija Shastry is working since 1997 in the field of education with Anna–Akshara–Arogya (Food–Education–Health) as its core intervention areas. Under the patronage of **Shri AnanthKumar**, honourable Member of Parliament [Bengaluru South] and central cabinet minister for Parliamentary Affairs and Chemicals & Fertilisers, over two lakh school children are being served hot, tasty and nutritious midday meals everyday through four Community Kitchens (over 43 Crore midday meals served till date).

### Green initiatives at Adamyachetana

**ZERO garbage kitchen:** Taking on the social responsibility of reducing the burden of waste in Bengaluru, Adamyachetana has successfully reduced its kitchen waste from 300 kg per day to ZERO.

**Fossil fuel free cooking with bio fuels:** Adamyachetana used to consume 60 LPG cylinders per day at its Bengaluru kitchen. We then switched to using 400 litres of Diesel for a few years. But, now we are proud to have switched completely to using bio-fuels including bio-gas produced from kitchen waste.

**Roof top Solar power generation:** Adamyachetana was one of the early adopters of roof-top Solar power generation. Power generated is being fed to the grid.

**Plate bank:** Over 10,000 steel plates, tumblers, spoons have been bought to create this unique plate-bank. Any event in the city can borrow these for their use. Reduce-Reuse is the mantra of Adamyachetana.

**Green Bengaluru 1:1:** Architect of Neem coated Urea in India and our Chief Patron, Shri AnanthKumar gave a clarion call of Green Bengaluru 1:1. This movement aims to have 1 crore trees in Bengaluru for its 1 crore citizens. Approximately 1 lakh saplings have already been distributed and we have planted and are nurturing more than 50,000 saplings.

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## Sasyagraha and Green Lifestyle

Green lifestyle tries to bring a balance between conservation and preservation of the Earth's natural resources, habitats, and biodiversity with human activity across all spheres of daily life. In layman's terms, living green means living sustainably, that is creating a lifestyle that works with Nature, instead of against it, and does no long-term or irreversible damage to any part of the environmental web.

Sasyagraha is Adama Chetana's movement to spread awareness and adoption of Green Lifestyle. It covers

Roti: The food and water we consume

Kapada: Clothes and all other daily consumables we use

Makaan: Buildings, energy usage, etc. that surround us

There are several products that we use regularly that are hazardous not only to environment, but also to us. Some of these products are plastic straws, plastic cups, Styrofoam cups and plates, papers cups, paper plates etc. Use of these products should be avoided by finding sustainable alternatives. The available alternatives are, switching over to steel plates, spoons and tumblers, metal water cans, small wipe towel, hand kerchief as alternative to tissue paper, drinking juice without straw (healthy approach) and also following the 4 R's: Refuse, Reduce, Reuse and Recycle so that we reduce the pollution burden on environment to a larger extent.



## Introduction

**Nature**, in the broadest sense, is the natural, physical, or material world or universe. "Nature" can refer to the phenomena of the physical world and to life in general. Within the various uses of the word today, "nature" often refers to geology, flora and fauna. It is often taken to mean the "natural environment" or wilderness—wild animals, rocks, forest, and in general those things that have not been substantially altered by human intervention, or which persist despite human intervention.

Science is everywhere around us, right from resources like water we consume, food we eat, air we breathe, the place we live, surroundings we interact and finally technologies we copy through inspiration from nature and the components. Every detailed study of nature will finally be conveyed through scientific thoughts so that students can correlate their subjects to the nature observed around them and analyse it scientifically to understand the topic better.



# Why take the Test?

We are quite dependent on our environment and surroundings along with the related species to such an extent that we are unable to survive without a healthy environment and related components. We even fail to relate the natural resources we utilise to the source we get them from. Finally, in the race to develop and advance, we fail to maintain our environment in a liveable manner which will be left to the future generation in much more degraded form. Environment literacy rate in cities is reducing to less than 5% when it comes to understanding daily consumption of natural resources. We believe that awareness about these issues drive the desire to participate in internship programmes and eventually call to act to make a difference.

## Who can take the test?

Any student of the class 8<sup>th</sup> or 9<sup>th</sup> interested in environment, nature, its conservation and protection can take the test as he/she would have studied the basics and are capable of knowing and sharing more in the student's community and surroundings.



# Waste Management

Waste management is all the activities and actions required to manage waste from its inception to its final disposal. This includes amongst other things, collection, transport, treatment and disposal of waste together with monitoring and regulation. Waste management is the process of treating solid wastes and offers variety of solutions for recycling items that don't belong to trash. It is about how garbage can be used as a valuable resource. Waste management is something that each and every household and business owner in the world needs. Waste management disposes off the products and substances that you have used in a safe and efficient manner. It also encompasses the legal and regulatory framework that relates to waste management including guidance on recycling, etc. The term normally relates to all kinds of waste, whether generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, or other human activities, including municipal (residential, institutional, commercial), agricultural, and social (health care, household hazardous waste, sewage sludge). Waste management is intended to reduce adverse effects of waste on health, the environment or aesthetics. Biodegradable waste, such as food items, animal waste or industrial waste from food packaging industries is sent to bio-degradation plants. In bio-degradation plants, they are converted to biogas by degradation with the help of bacteria, fungi, and other biological means. Here, the organic matter serves as food for the micro-organisms. The degradation can happen aerobically (with oxygen) or anaerobically (without oxygen). Biogas is generated as a result of this process which is used as fuel, and the residue is used as manure. All organic materials decompose with time. Food scraps, yard waste, etc. make up one of the major wastes we throw every day. Sometimes these are buried under beds of soil and left to decay under the action of micro-organisms such as bacteria and fungi. This results in the formation of nutrient rich manure. This process is termed as composting. By composting, the nutrients are replenished back to the soil. Composting also enriches the soil and increases the water retention capacity. In agriculture, it is the best alternative to chemical fertilizers. Vermicomposting is another method of managing bio waste by the process of using worms for the degradation of organic matter into nutrient-rich manure. Worms take the organic matter as feed and digest them. The excretory materials or the by-products of digestion that are given out by the worms makes the soil nutrient-rich, thus enhancing the growth of bacteria and fungi.



# Water Conservation

Water covers 71% of the Earth's surface. It is vital for all known forms of life. On Earth, 96.5% of the planet's crust water is found in seas and oceans, 1.7% in groundwater, 1.7% in glaciers and the ice caps of Antarctica and Greenland, a small fraction in other large water bodies, and 0.001% in the air as vapour, clouds (formed of ice and liquid water suspended in air), and precipitation. Only 2.5% of this water is freshwater, and 98.8% of that water is in ice (excepting ice in clouds) and groundwater. Less than 0.3% of all freshwater is in rivers, lakes, and the atmosphere, and an even smaller amount of the Earth's freshwater (0.003%) is contained within biological bodies and manufactured products. A greater quantity of water is found in the earth's interior. Water on Earth moves continually through the water cycle of evaporation and transpiration, condensation, precipitation, and runoff, usually reaching the sea. Evaporation and transpiration contribute to the precipitation over land. Large amounts of water are also chemically combined or adsorbed in hydrated minerals. Safe drinking water is essential to humans and other lifeforms even though it provides no calories or organic nutrients. Access to safe drinking water has improved over the last decades in almost every part of the world, but approximately one billion people still lack access to safe water and over 2.5 billion lack access to adequate sanitation. One strategy in water conservation is rain water harvesting. Digging ponds, lakes, canals, expanding the water reservoir, and installing rain water catching ducts and filtration systems on homes are different methods of harvesting rain water. Harvested and filtered rain water could be used for toilets, home gardening, lawn irrigation, and small scale agriculture. Another strategy in water conservation is protecting groundwater resources.



# How is the test conducted?

Adamyachetana will conduct a test based on this booklet.

The test questions will cover any or all of the following nine key topics in this booklet. The booklet itself is designed to give the concepts and brief details on each topic which will help the student to understand and finally attempt to answer the questions in the test.

Duration of the test will be one hour, Questions and answers are descriptive in nature

***We wish you all the best in the test!***



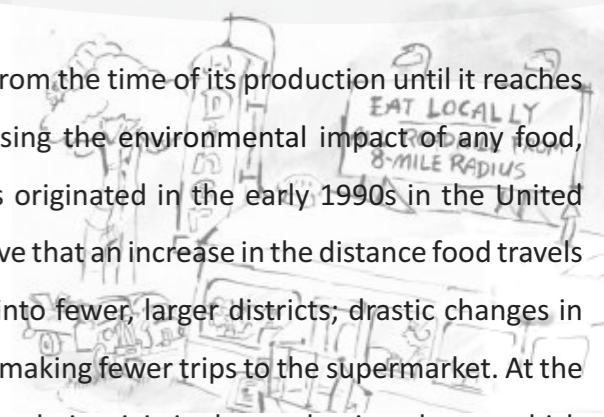
# Trees

A tree typically has many secondary branches supported clear of the ground by the trunk. This trunk typically contains woody tissue for strength, and vascular tissue to carry materials from one part of the tree to another. For most trees, it is surrounded by a layer of bark which serves as a protective barrier. Below the ground, the roots branch and spread out widely; they serve to anchor the tree and extract moisture and nutrients from the soil. Above ground, the branches divide into smaller branches and shoots. The shoots typically bear leaves, which capture light energy and convert it into sugars by photosynthesis, providing food for the tree's growth and development. Trees play a significant role in reducing soil erosion and moderating the climate. They remove carbon dioxide from the atmosphere and store large quantities of carbon in their tissues. Trees and forests provide a habitat for many species of animals and plants. The number of trees in the world, according to a 2015 estimate, is 3.04 trillion, of which 1.39 trillion (46%) are in the tropics or sub-tropics, 0.61 trillion (20%) in the temperate zones, and 0.74 trillion (24%) in the coniferous boreal forests. Trees release oxygen when they use energy from sunlight to make glucose from carbon dioxide and water. A human breathes about 9.5 tonnes of air in a year, but oxygen only makes up about 23 percent of that air, by mass, and we only extract a little over a third of the oxygen from each breath. That works out to a total of about 740kg of oxygen per year. Which is, very roughly, seven or eight trees worth. Carbon dioxide (CO<sub>2</sub>) in the atmosphere is necessary for plants and trees to grow. Forests play a specific and important role in the global carbon cycle by absorbing carbon dioxide during photosynthesis, storing carbon above and below ground.



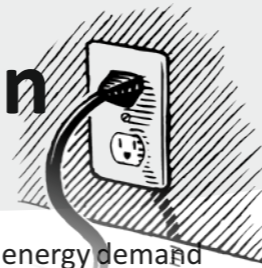
# Food Mile

Food miles is a term which refers to the distance food is transported from the time of its production until it reaches the consumer. Food miles are one of the factors used when assessing the environmental impact of any food, including the impact on global warming. The concept of food miles originated in the early 1990s in the United Kingdom. It was conceived by Professor Tim Lang. Some scholars believe that an increase in the distance food travels is due to the globalization of trade; the focus of food supply bases into fewer, larger districts; drastic changes in delivery patterns; the increase in processed and packaged foods; and making fewer trips to the supermarket. At the same time, most of the greenhouse gas emissions created by food have their origin in the production phases, which create 83% of overall emissions of CO<sub>2</sub>. A range of studies compare emissions over the entire food cycle, including production, consumption, and transport. These include estimates of food-related emissions of greenhouse gas 'up to the farm gate' versus 'beyond the farm gate'. One needs to take in to account the fact that each kilo of grains/fruits etc. that arrives to house would have travelled from a long distance from growers. By understanding the food mile, one might even decide not to waste food served on the plate.





# Energy Consumption

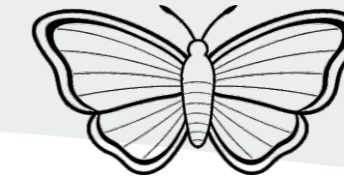


Electric energy is one major form of energy we consume. Electric energy consumption is the actual energy demand made on the electricity supply. Consumption of electric energy is measured in watt-time or multiples of watt-hours (say Kilowatt-hour or unit) which is the universal measure of Energy. About 17% of total electricity production is consumed by in-processes, such as self-consumption of power plants, grid losses and storage losses.

If we look at the % of energy consumed by the industry out of the total energy demand in that country, China is highest with 67.8%, South Korea is 51.0% (7th), Germany 46.1% (11th), Japan 31.5% (26th), USA 24.0% (28th). In energy consumption in Commercial and Public Service, Japan is highest with 36.4%, USA 35.6% (3rd), China 5.4% (29th). In energy consumption for Domestic usage, Saudi Arabia is the highest with 56.9%, USA 36.2% (8th), Japan 29.8% (16th), China 15.5% (29th), Korea 13.8% (30th). In any case, increasing efficiency of usage will result in less electricity needed for a given purpose.

Energy conservation refers to the reducing of energy consumption through using less of an energy service. Energy conservation is different from efficient energy use, which refers to using less energy for a constant service.

Electricity can be obtained from solar or wind power, but most electricity used in homes comes from the burning of fossil fuels such as oil or coal. These fuels are needed to power the turbines that produce electricity. These fossil-fuels resources are not unlimited or renewable; the faster they are used and the more electricity that is consumed, the quicker they will be depleted.



# Butterfly

Butterfly fossils date to the Paleocene, which was about 56 million years ago. Butterflies and moths belong to Kingdom Animalia, Phylum Arthropoda, Class Insecta, order Lepidoptera. There are over 18,000 species of butterflies in the world. India hosts 1504 species, Western Ghats 336 species and Karnataka alone 318 species.

In Greek, “lepis” mean scales, “pteron” means wings. They are the only insects with wings covered by scales that give them remarkable colours and patterns. Butterflies are more beautiful and attractive than any other insects and have fascinated the human imagination and creativity. They move from one flower to another flower in search of nectar and hence act as valuable pollinators. They are also one of the important components in the food chain, serving birds, reptiles, spiders and other predatory insects. About 70% of food we eat is pollinated by butterflies and honey bees. Butterflies have a special place in the insect world and are probably next to birds in their universal popularity.

Butterflies and moths have four different stages in their life cycle: Egg, Caterpillar, Pupa and Adult. At each and every stage, they look completely different and each stage of development takes different amounts of time. Caterpillar is the only growing stage and pupa is the developing stage. Virtually all butterflies are associated with plants and therefore their occurrence depends on the presence of plants.

Butterflies come in various sizes. World's largest butterfly is Queen Alexandra Birdwing and world's smallest butterfly is Grass Jewel. India's largest butterfly is Southern Birdwing which is recently declared as the state butterfly of Karnataka.



# Birds



Birds are warm blooded creatures evolved from dinosaurs around 100 million years ago. The first known transitional stage bird is the 'Archeopteryx' which shows the initial adaptations of birds started as far back as 170 million years ago. They have adapted to a wide range of habitats due to which they can be seen across all the seven continents, even in the remotest islands. They have wings that are modified forelimbs which has enabled them to survive through the years when majority of their reptile species became extinct. The main adaptation was their hollow pockets in their skeletal system called 'pneumatic bones' which gave them the ability to fly long distances by reducing their body weight. Today we can see a large diversity of species varying in size from the smallest, Bee Humming bird of 5 cm. to the largest, Ostrich of 9 feet. In some species like the Penguins, the wings are in the shape of flippers which help them to hunt, migrate and escape from predators. A varied type of special beak and foot adaptations can be observed in them depending on the type of habitat they live in and the food they consume.

Birds are also known as “friend of farmers” as they assist in controlling pests that destroy crops. They have also inspired us to fly and many of today's complex aircrafts are imitations of birds. Many painters and poets have used various birds in their creative work which are famous even today.



# Water Body (Lake, Pond)

Water bodies are areas of water (salt and fresh) - large and small. There are many distinct types of water bodies. The largest water bodies are oceans, while the smallest are brooks or streams. Smaller accumulations of water, such as puddles or swimming pools are not usually referred to as bodies of water in the geographical sense. A lake is a body of water completely surrounded by land. Rivers are large flowing water bodies that typically end in an ocean or sea. Rivers are freshwater bodies of water that usually originate in mountains or areas of high elevations, and are added to by smaller bodies of water such as creeks or streams, as well as by rainfall. Natural lakes are generally found in mountainous areas, rift zones, and areas with ongoing glaciation. Most of the lakes and tanks were manmade for purposes of drinking, irrigation and fishing needs and they also favourably influence micro-climate of the city. The lake waters sometimes also serve as “Dhobhi Ghats” or places where washer-men ('dhobis' is the local usage in India) have traditionally used them as a means of livelihood for washing clothes. The lakes also serve to replenish ground water resources in the vicinity, which are tapped through wells for drinking water.