BASIC SCIENCE

JS ONE SECOND TERM NOTES

# INSTRUCTION: COPY THE FIRST TWO TOPICS

POLLUTION

Pollution can be defined as the release of toxic substances into the environment by human activities which have harmful or poisonous effects on living organism. Substances that cause pollution are called pollutants

Types of pollution

1. Air pollution
2. Water pollution
3. Land / Soil pollution
4. Noise pollution

Causes of Air Pollution

1. Overcrowding
2. Poor ventilation
3. Gases like carbon monoxide released from burning fuels in cars, generators etc
4. Smoke and soot from burning substances like wood, rubber etc
5. Exhaust from factories and industries
6. Dust and dirt particles
7. Foul smell from rubbish, heaps, dirty toilets, dirty gutters etc
8. Pollution from natural events

Causes of Water Pollution

1. Dumping of sewage and refuse into the water bodies like rivers and streams
2. Oil spillage from drilling, pipeline vandalization, leakages from storage tanks etc into the water bodies
3. Discharge of industrial waste into the water bodies by factories
4. Run off of agricultural chemicals like fertilizers, pesticides, insecticides etc into the water bodies

Causes of Land Pollution

1. Deforestation
2. Soil erosion
3. Agricultural activities
4. Mining activities
5. Construction activities

Causes of Noise Pollution

1. Noise from industrial machines
2. Noise from car horns, vehicles, motor bikes etc
3. Noise from social events
4. Noise from construction activities
5. Noise from electronic gadgets

Effects of Pollution

1. It can cause suffocation when carbon-monoxide is inhaled
2. It can cause respiratory diseases like Asthma, Bronchitis etc
3. Excessive noise ca cause damage to the eardrum
4. Pollution can cause irritation of the eyes, nose and throat, wheezing and coughing.
5. It can lead to death
6. It can lead top acid rain, smog effect etc
7. It can lead to deterioration in building materials
8. It can lead to extinction of animal species
9. It can cause climate change
10. It can cause global warming

Ways of Controlling pollution

1. Provision of adequate ventilation in the rooms to allow free air movement
2. Preventing of overcrowding
3. Generators should not be used in closed rooms
4. Indiscriminate burning should be avoided
5. Handkerchief should be used to cover the mouth when sneezing and coughing.
6. Industries should be built away from residential areas.
7. There should be proper and well-constructed sewage system
8. There should be efficient techniques to deal with or prevent oil spillage
9. Avoid dumping of refuse or sewage into the water bodies
10. Industrial waste should be recycled

**CLASSIFICATION OF FOOD**

 Food is any substance in solid, semi-solid or liquid from taken into the body to provide energy, build the body and protect the body against infections and diseases.

There are six classes of food nutrients. They are:

1. Carbohydrates
2. Proteins
3. Fats and oils
4. Vitamins
5. Mineral salts
6. Water

**Carbohydrate**

These are energy-giving food, they are made up of three elements; carbon, hydrogen and oxygen, sources of carbohydrates include: rice, yam, cassava, millet, table sugar etc. The end product of digestion in carbohydrates is Glucose

Lack of carbohydrates in diets, result to tiredness and fatigue while excess consumption of carbohydrates will result to obesity

Functions of carbohydrates

1. It provide energy
2. It generates heat during its oxidation used in maintenance of body temperature
3. It is the starting point for the synthesis of proteins and lipids functions

**Proteins**

Proteins are body-building foods. They are made up of six elements; carbon, hydrogen, oxygen, nitrogen, sulphur and phosphorus.

Sources of Proteins include: beans, eggs, fish, milk etc

The end-product of digestion in Proteins is Amino acid. Lack of Protein in diets will result to a disease condition called kwashiorkor or Marasmus

Functions of Proteins

1. For body building and growth
2. For the repairs of worn out tissues in the body
3. It can serve as source of energy in the absence of carbohydrates

**Fats and Oil**

They are also made up of three elements: Carbon, hydrogen and oxygen.

Sources of fats and oil include: melon, groundnut, coconut, palm oil, vegetable oil, castor oil, butter etc

Much fats and oil in the body also result to obesity. The end product of digestion of fats and oil is Fatty acid and glycerol

Functions of Fats and Oil

1. They serve as heat insulators for the body
2. They provide energy to the body
3. Stored as food reserve
4. It protects vital organs in the body

Differences between fats and oil

The main difference between fats and oil is fats are solid at room temperature while oil is liquid at room temperature

**Vitamins**

These are food nutrients that are required in small amounts by the body e.g. fruits, vegetables, liver etc.

Functions of Vitamins

1. They help to fight against infections and diseases in the body
2. They promote healthy growth and development of the body

Vitamin can be grouped into two:

1. Fats soluble vitamins
2. Water soluble vitamins

Fat soluble vitamins: These are vitamins that can dissolve in fats and oil but do not dissolve in water. Examples include: Vitamins A, D, E and K.

Water Soluble vitamins: These are vitamins that can dissolve in water but do not dissolve in fats and oil. Examples include: Vitamins B and C

|  |  |  |
| --- | --- | --- |
| Vitamins | Sources | Deficiency symptoms |
| Vitamin A (Retinol) | Red palm oil, green vegetables, carrots | 1. Night blinds
2. Flaky skin
 |
| Vitamin B | Yeast, green vegetables, liver, milk, chicken, yogurt etc | 1. Beriberi and pellagra
2. Stunted growth
 |
| Vitamin C (Ascorbic Acid) | Citrus fruits like orange, grape, lemon, green vegetables etc | Scurvy (bleeding of the gum) |
| Vitamin D (Calciferol) | Early morning sunlight, milk, egg, liver, fish etc | 1. Rickets (bone disorder) in children
2. Softening of bones in adult
 |
| Vitamin E (Tocopherol) | Green vegetables, spinach, cabbage, liver, meat etc | 1. Sterility
2. Reproductive failure
 |
| Vitamin K (Phylioquinone) | Green vegetables, egg yolk, liver, tomatoes etc | 1. Failure of blood to clot
2. Bleeding
 |

**Mineral Salts**

|  |  |  |
| --- | --- | --- |
| Mineral Salts | Sources | Deficiency symptoms |
| Calcium | Milk, cheese, egg, fish, meat etc | 1. Tooth decay
2. Ricket in children
3. Poor bone development
 |
| Iron | Plantain, egg, beans, kidney, vegetables etc | Anaemia |
| Iodine | Milk, sea food, fish etc | Goitre and cretinism in children |
| Sulphur | Beans, fish, egg etc | 1. Poor growth
2. Kidney failure
 |
| Sodium and Potassium | Table salt, fish, fruits, beef, chicken, Green vegetables, banana, apple, butter, milk,  | 1. Muscle paralysis

ii. Dehydration1. Kidney failure
 |
| Phosphorus | Milk, meat, fish, cheese, egg yolk, beans, Green vegetables etc | Rickets |
| Magnesium | Green vegetables, apple, bread etc | 1. Depression
2. Weakness
 |

They are also needed in small amounts for normal growth and development

Functions of Mineral Salts

1. They are important in the formation of tissues and organs in the body
2. They help in bone and teeth formation

**Water**

Water is a universal solvent, it is made up of two elements: Hydrogen and oxygen. It is the basis of all metabolic reaction.

Sources of water: Spring, tap, river, well, pipe borne, rain water etc

Importance of water

1. It quenches thirst
2. It is required for metabolic activities
3. It is necessary for the digestion of food
4. It helps to maintain the body temperature

Balanced Diet

A Balanced Diet is a diet that contains all the classes of food in the right proportion for proper growth and development of an organism.

Roughages

Roughages are also known as dietary fibre. It is the indigestion portion of food obtained from plants such as fruits, vegetables, grains and legumes,

Importance of Roughages

1. It helps in getting rid of undigested food
2. It helps in digestion and bowel movement, thereby preventing constipation
3. It helps us to resist diseases
4. It provides energy
5. For growth and normal development

**THE TEETH**

Teeth are hard, bony structures found in the mouth of an animal which is used for biting and chewing tearing and cutting.

Types of Teeth

There are four types of teeth. They are:

1. Incisor: They are flat, chisel-shaped teeth used for cutting food. They are 8 in number.
2. Canine: They are shaped-pointed and conical-shaped teeth used for tearing flesh. They are 4 in number
3. Premolar: They are large and flat, used for chewing and grinding. They are 8 in number.
4. Molar: They are also used for chewing, grinding and crushing. They are 12 in number.

Sets of Teeth

There are two sets of teeth. They are:

1. Milk or temporary teeth: the milk teeth are the first sets of teeth and are possessed by children. It last for a short period of time. It later falls off to be replaced by the permanent teeth. This consists of 4 incisors, 2 canines and 4 premolar in each jaw totaling 20
2. Permanent Teeth: They are final sets of teeth that replaces the milk teeth. This consists of 4 incisors, 2 canines and 4 premolar and 6 molar in each jaw totaling 32.

**Dentition**

Dentition is defined as the number and arrangement of teeth present in the mouth of an animal. There are two (2) types of dentition.

1. Homodont dentition: This is a type of dentition where all the teeth in the mouth of an animal are of the same shape and size. This is found in fishes and reptiles.
2. Heterodont dentition: This is a type of dentition where all the teeth in the mouth of an animal are of different shape and size. This is found in mammals like man, dog, cow, rabbit etc

Dental formula

This represents the number, type and arrangement of teeth in the mouth of an animal.

Man: i $\frac{2}{2}$ , c $\frac{1}{1}$ , pm$\frac{2}{2}$ , m $\frac{3}{3}$ = 16 X 2 = 32

Dog: i $\frac{3}{3}$ , c $\frac{1}{1}$ , pm$\frac{4}{4}$ , m $\frac{2}{3}$ = 21 X 2 = 42

Cow: i $\frac{0}{3}$ , c $\frac{0}{1}$ , pm$\frac{3}{2}$ , m $\frac{3}{3}$ = 15 X 2 = 30

Rabbit: i $\frac{2}{1}$ , c $\frac{0}{0}$ , pm$\frac{3}{2}$ , m $\frac{3}{3}$ = 14 X 2 = 28

Parts of tooth

The teeth is made up of the following main parts

1. Enamel: This is the hard and shiny covering of the crown of the teeth. The enamel protects the dentine.
2. Dentine: This is the largest part of the teeth
3. Pulp cavity: This is the hollow central part of the tooth containing blood vessels and nerves
4. Cement: This is the part which fixes the tooth to its socket

**Diagram (10 lines)**

Care of the teeth

1. The teeth should be brushed twice daily with a good tooth paste
2. The teeth should be rinsed with clean water after each meal to remove food particles
3. Avoid taking sugary foods/drinks
4. Visit the dentist regularly for teeth inspection
5. Avoid too hot or too cold food
6. Eat a balanced diet
7. The teeth should be exercised by chewing hard fibrous food like carrot, coconut, biscuit bone etc

**MATTER**

Matter is anything that has weight and occupies space. Matter can be classified into living and non-living things. All matter is made up of tiny particles called atoms or molecules. Matter can exist in three different states:

1. Solid
2. Liquid
3. Gas

Properties of Solids

1. They are dense (heavy)
2. They have definite shape
3. They have definite volume
4. The force holding the particles together is very strong so the particles are closely packaged

Properties of Liquids

1. They can flow because the force holding the particles together is not strong
2. They move randomly
3. They don’t have a definite shape
4. They cannot be compressed
5. They have a definite volume

Properties of Gases

1. They are involved in constant random motion because the force holding the molecules together is very small
2. They can be compressed
3. They do not have a definite shape
4. They do not have a definite volume
5. They do not have a definite size

Changes of state of matter

When matter changes from one state to another, it is called a phase transition.

Solid to liquid $\rightarrow $ Melting

Melting occurs when something that is solid turns back into a liquid.

Example: Ice melts back into water when it is left at a temperature above the freezing point of 32 degrees, rock to lava. Rocks in volcanoes can be heated until they are molten lava.

Liquid to solid $\rightarrow $ Freezing

Water becomes cold enough that it turns into ice. If water is frozen it changes to solid.

Liquid to gas$\rightarrow $ Evaporation

Water to steam. Example: Water evaporates when it is boiled on the stove. Water evaporates from a puddle or pool during a hot summer dat.

Gas to Liquid$\rightarrow $ Condensation

Water vapour to dew, Example: water vapour turns froma a gas into a liquid, such as dew on the morning grass. Water vapour forms water droplets on a glass of a cold beverage.

Solid to Gas$\rightarrow $ Sublimation: This is a process by which a solid changes directly into gaseous state without passing through the liquid state. Dry ice sublimates at atmospheric pressure.

Gas to solid$\rightarrow $ Deposition

Water vapour to ice. Water vapour transforms directly into ice without becoming a liquid. This occurs on windows during winter.

**PARTICULATE THEORY OF MATTER**

The particulate theory of matter states that matter is composed of tiny particles which are in constant motion. Particles in motion have kinetic energy and are well spaced-out in any substance. For example the spreading of perfume and the smell of camphor shows that matter is made up of particles.

VARIOUS PHENOMENON EXPLAINED BY THE PARTICULATE THEORY OF MATTER

1. EVAPORATION: This is when some particles closer to the liquid surface with greatest kinetic energy escape outside and becomes particles of vapour or gas.
2. COMPRESIBILITY: In gases, the particles are very far apart so no repulsive forces occur between air particles. Solid cannot be compressed because the particles are very close together so repulsive forces occur.
3. CLOUD FORMATION: When the hot damp air particles gets so cool that they cannot hold so much water as they did before the extra water is squeezed out of the air in the form of tiny drop which forms clouds
4. WATER CYCLE: The continuous movement of water particles from land, rivers and oceans and form the temperature to lands, rivers and oceans is known as, water cycle.
5. EXPANSION: When solids such as metals are heated, the vibration of the particles increases and so their distant apart
6. PRESSURE: The particles of gas collide with the walls of their containers exerting a force. The force is known as pressure. Pressure is the force per unit area.

Pressure =$\frac{Force}{Area}$

1. BOILING: This is when a liquid is head and bubbles of vapour can flow freely in the liquid and to the surface.

**CLASSIFICATION OF LIVING THINGS**

Classification is a method of placing together or grouping of living organism into various groups according to the different features they have in common.

Living things are broadly classified into two main group or kingdom. These are:

1. Plant kingdom also called kingdom plantae
2. Animal kingdom also called kingdom animalia

Kingdom can be broken down into groups of classification such as phylum (or division of plant), class, order, family, genus and species.

Classification of Animals

The animal kingdom is further divided into two based on the presence or absence of back bones.

1. Vertebrate: These are animals with back bone or vertebral column. They include lion, cow, man, snake, lizard, eagle etc
2. Invertebrate: They are animals which do not have back bone. They include: spider, earthworm, millipedes, snail and all insect. Etc

Vertebrate

Vertebrate can be divided into five classes, they are

1. Pisces
2. Amphibian
3. Reptilian
4. Aves
5. Mammalian

PISCES:

They are fishes, they are aquatic meaning: they live in water. Fishes breathe with their gills and use their fins for movement of locomotion. Most fishes have scales covering their body, the scales are used for protection. Some other fishes have smooth slimy bodies which do not have scales. Fishes are cold blooded animals that is why they cannot regulate their body temperature, hence the temperature of their body fluctuates or changes according to that of their surroundings. Fishes can further be divided into:

1. Bony fish: are fishes whose skeleton is made up of bones, e.g. tilapia fish, mackerel, mud fish.
2. Cartilaginous fishes: are fishes whose skeleton is made up of cartilage e.g. shark, dog fish, skates and rays

AMPHIBIAN

Animals in this class are called amphibians. They are animals that live on both land and in water that is, they are aquatic and terrestrial. They have smooth and scale less body and are cold blooded animals. Examples are toad, frog, salamander, etc

Difference between toads and frogs

|  |  |  |
| --- | --- | --- |
|  | Toads | Frogs |
| 1 | Has dry, rough warty skin | Has smooth moist skin |
| 2 | Has short hind legs | Has long hind legs adapted for jumping |
| 3 | Has poison gland | Do not have poison gland |
| 4 | Toads are usually bigger than frog | Frogs are usually small than toads |

REPTILIAN

Reptilian animals in this class of vertebrates are called reptiles and they include animals like snakes, alligators, crocodiles etc. some are aquatic e.g. turtles, crocodiles, they have dry, horny hardened scales on their bodies, and are also cold blooded animals.

MAMMALIAN

They are called mammals. They are terrestrial animals, they give birth to their young ones alive and feed them with milk from their mammary gland. They have hair on their body for which covers their bodies and possess an external car or pinna. Mammals are warm blooded animals. Examples include: donkey, man, cow, bats, goats, rats etc. The blue whale is the largest mammal or earth.

AVES

These are birds with feathers on their bodies which help to keep them warm. They have wings for flight and beaks for feeding. They are warm blooded animals, meaning they are able to regulate and maintain a constant body temperature of their surrounding examples of aves include: duck, domestic fowl, ostrich, turkey, vulture etc. The ostrich is the largest bird on earth.

**INVERTEBRATES**

The division of animal kingdom is further divided into the following:

1. Protozoa: animals here are called protozoan. They are small microscopic organisms and re-produce by binary fission. They are mainly aquatic e.g. amoeba, euglena, paramecium, plasmodium.
2. Coelentrata: They are called coelenterate and they include animals like hydra, jelly fish, sea anemones. They have soft bodies and are aquatic. They also have tentacles for capturing preys.
3. Platyheminthes: They are mostly called flatworm. They are hermaphrodites, meaning they possess both male and female reproductive organ. Most of them are endoparasite e.g. tapeworm, planarian, liver flukes.
4. Nematoda: These are called roundworm. They are mostly endoparasite e.g. roundwowrm, hookworm, threadworm, guinea worm etc
5. Annelida: Animals in this group are called annelids. They have long cylindrical segmental bodies, they are hermaphrodites and many of them are aquatic e.g. earthworm, leeches
6. Mollusca: These are non-segmented soft bodies animals. Some of them have shells e.g. snail, oyster while other do not have e.g. octopus, slogs and squids
7. Echinodermata: Animals in this group are star shaped. They are aquatic and possess spiny skin. Examples include; starfish and sea urchin.
8. Arthropoda: arthropoda is the largest phylum in the animal kingdom. Arthropoda is further divided into four classes which are:
9. Class crustacean: Include animals like prawn, crabs, crayfish, lobsters etc
10. Class myriapoda: this include millipedes, centipedes
11. Class arahnids: It includes animals like spider, scorpions, ticks and flea
12. Class insecta: All insect belong here e.g. cockroaches, housefly, dragonfly, mosquito, ant, termites etc

**CLASSIFICATION OF PLANT**

Plants are classified on the following bases: classification based on lifecycle

1. Annuals: These are plants that have a life span of one or plants that complete their life cycle in one growing season e.g. maize, millet, rice, wheat, beans.
2. Biennials: These are plants that complete their life cycle in two years e.g. cabbage, onions and carrot etc
3. Perennials: These are plants that continue to grow from year to year (for many years) e.g. rubber, cocoa, oil palm, coconut, mango etc

Agricultural classification

1. Forage crops e.g. grasses grown to feed animals
2. Latex e.g rubber
3. Fibers e.g cotton and jutes
4. Spices e.g. pepper, ginger, cinnamon
5. Oils e.g. oil palm. Shea butter, coconut oil
6. Legumes e.g. beans, cowpea, soya beans, oil beans etc
7. Roots crops e.g. cassava, yam, sweat potato, cocoyam etc
8. Vegetables e.g pepper, spinach, lettuce, tomato etc
9. Fruits e.g mango, plantain, pawpaw, banana, pineapples etc
10. Beverage e.g. cocoa, coffee

Botanical Classification

1. Schizophyta: They are not green plants e.g. bacteria and the blue-green algae.
2. Thallophyta: They are simple body structure. They have no true roots, stems and leaves. They are divided into two:
3. Algae: They are green in colour e.g. spirogyra, clamydomonas, euglena, diatoms etc
4. Fungi: They are non-green plants. They feed on decaying organic matter and bring out their decomposition e.g. mushroom, rhizopus, mucor, bread mold and yeast etc
5. Bryophyte: They are non-flowering plants e.g. mosses and liverworts
6. Pteridophyta: They are non-flowering plants and do not produce seeds e.g. ferns and horsetails
7. Spermatophyta: They are green flowering plants which produce seeds. They have tree roots, stem and leaves. They are divided into two classes namely

(a) Gymnosperms: They produce naked seeds that are carried on cones e.g. conifers, ginkgo, cycads etc

(b) Angiosperm: They are green flowering plants with their seeds enclosed in a fruit. They are:

1. Monocotyledons: They have one seed leaf e.g. maize, rice, oil palm, coconut etc

(11) Dicotyledon:They have two seed leaves e.g. bears, melon, mango, orange, cashew.

**Differences between Monocotyledonous and dicotyledonous plants**

|  |  |  |
| --- | --- | --- |
|  | Monocotyledonous | Dicotyledonous |
| 1 | They possess one seed leaf or cotyledon | They possess two seed leaves or cotyledon |
| 2 | They have fibrous root system | They have tap root system |
| 3 | They have parallel venation | They have net venation |
| 4 | Flowers are arranged in groups of three | Flowers are arranged in groups of four |

**THERMOMETRY AND MEASUREMENT**

Thermometry means measurement of temperature and various calculations based on conversion of temperatures from one scale to another. there are three major scales for measuring temperature. They are:

1. Degree Celsius or centigrade oC
2. Degree Fahrenheit oF
3. Kelvin or absolute temperature scale

|  |  |  |  |
| --- | --- | --- | --- |
| Scale | Upper fixed point | Lower fixed point  | Fundamental interval |
| Celsius | 100oC | 0oC | 100oC |
| Fahrenheit | 212oF | 32oF | 180oF |
| Kelvin | 373k | 273k | 100k |

The distance between the upper fixed point (boiling point and the lowerfixed point (melting point) of a temperature is called the fundamental interval

**STANDARD MEASUREMENT**

This is an act of determining a targets size, length or other aspects.

Length: This is a measure of distance. Length is measured in meter of distance

Mass: This is a measure of the amount of meter and centimeter of matter in an object. Mass is usually measured in grams (g) or kilograms (kg).

Time: This is the duration of an event and it is measured in seconds, other units like minutes, hours are also used.

Measuring devices

1. Meter rule: This is used for measuring length
2. Chemical balance: This is used for measuring mass
3. Spring balance: This is used for measuring weight
4. Clock/watch: This is used for measuring time
5. Calorimeter: This is used for measuring quantity of heat
6. Measuring cylinder/pipette/burette/measuring flask: This is used for measuring volume of a liquid
7. Hydrometer: This is used for measuring relative density of liquid.
8. Thermometer: This is used for measuring temperature
9. Rainguage: This is used for measuring the amount of rainfall
10. Hygrometer: This is used for measuring relative humidity
11. Anemometer: This is used for measuring the speed of wind
12. Wind vane: This is used to show the direction of the wind
13. Barometer: This is used for measuring air pressure

Relationship between centigrade and Fahrenheit scale of temperature

The centigrade (Celsius) and Fahrenheit temperature can be interconverted by using the following relationships:

Conversion from Fahrenheit to centigrade

Conversion from centigrade to Fahrenheit

Conversion from Kelvin to Celsius

Conversion from Celsius to kelvin

Examples

1. To convert a temperature from Celsius to Fahrenheit, the formula to use is

F= (C X $\frac{180}{100}$) + 32

Convert 100 Celsius to Fahrenheit

F= (100 X $\frac{180}{100}$) + 32

180 + 32 = 212oF

1. To convert a Fahrenheit to Celsius, the formula to use is

C= (F-32) X $\frac{100}{180}$

Example: Convert 32oF to Celsius

C= (32-32) X $\frac{100}{180}$

C=0 X $\frac{100}{180}$

C= 0oC

1. To convert from Celsius to Kelvin, the formula to use is

K=C +273

Example: Convert 32oC to kelvin

K=32+273

C=305k

1. To convert from kelvin to Celsius, the formula to use is

C= K-273

Example: Convert 300k to Celsius

C=300-273

C=27oC

There are two types of thermometric liquids

1. Mercury
2. Alcohol

Advantages of mercury as a thermometric liquids

1. It is opaque
2. Its expansion is uniform
3. It is a good conductor of heat
4. It does not wet the glass
5. The liquid does not vaporize easily

Disadvantages of mercury as a thermometric liquids

1. It is expensive
2. It has high melting point, so it cannot be used to the artic region

Advantages of alcoholas a thermometric liquids

1. Alcohol is less expensive than mercury
2. Alcohol has larger expansion on heating than mercury. It expands six times more than mercury
3. It can be used to measure very low temperature

Disadvantages of alcoholas a thermometric liquids

1. It vaporize easily
2. It wets glass
3. It has an irregular expansion
4. Alcohol has a low boiling point of 78oC

Types of thermometer

1. Liquid in glass thermometer examples are mercury in glass and alcohol in glass thermometer
2. Gas thermometer
3. Resistance thermometer
4. Thermocouple
5. Bimetallic thermometer

Examples

Convert 10oF to Celsius

C= (F-32) X $\frac{100}{180}$

C= (10-32) X $\frac{100}{180}$

C=-22 X $\frac{100}{180}$

C= -12.2oC

**AIR, WATER AND SOLUTION**

Air is a mixture of gases that make up the earth’s atmosphere. Air is made up of 2 parts:

1. Active part contains oxygen
2. Inactive part contains Nitrogen, carbon (iv) oxide, water vapour and the noble gases

Wind is air in motion

Composition of Air

The main constituents of air are:

1. Oxygen
2. Carbon (iv) oxide
3. Nitrogen
4. Water vapour
5. Noble gases

These gases are found in the following percentages by volume and weight

|  |  |  |
| --- | --- | --- |
| Gases | % by volume | % by weight |
| Oxygen | 21 | 23 |
| Nitrogen | 78 | 75.5 |
| Carbon (iv) oxide | 0.03 | 0.05 |
| Noble gases | 1 | - |
| Water vapour | Variation | variation |

Examples of noble gases are Helium, Argon, Neon, Xenon and Krypton

Properties of Air

1. It has weight
2. It exert pressure
3. It is a mixture of gases
4. It moves and expand
5. It supports burning (combustion)
6. It can be compressed

Importance of Air to living Things

1. Man, plants and other animals need air to breath
2. Air is needed for burning
3. Nitrogen in air is used by plants to make protein
4. The oxygen taken by organisms burns up our food to provide energy for our daily activities
5. Noble gases are used for making electric bulb, lighting, decorations etc

**WATER**

Water is a transparent, tasteless and odourless liquid. It is useful to man, plants and animals. Water is found in the soil as moisture and in the atmosphere as vapour. The chemical formular for water is H2O; it is made up of hydrogen and oxygen combined in the ratio of 2:1 respectively.

Sources of water

1. Well
2. Rain
3. Spring
4. Tap
5. Oceans
6. Rivers etc

Water can neither be hard or soft

A hard water is the water which does not lather easily with soap

A soft water is the water which lather easily with soap

Causes of water hardness

Hardness of water can be caused by the presence of the following chemicals in water:

1. Hydrogen trioxoxarbonate (iv)
2. Calcium tetraoxosulphate (vi)
3. Magnesium tetraoxosulphate (vi)

The positive ions present in hard water are:

1. Calcium ions (Ca2+)
2. Magnesium ions (Mg2+)

Types of water hardness

1. Temporary hardness
2. Permanent hardness

Temporary hardness can be removed using the following methods:

1. Boiling
2. Adding slaked lime
3. Adding sodium trioxocarbonate (iv)

Permanent hardness can be removed by adding

Adding sodium trioxocarbonate (iv)

Uses of water

1. It is used for domestic purposes
2. It is a universal solvent because almost all things dissolve in water
3. All chemical reaction occurs in water
4. It helps in the digestion and assimilation of food
5. It regulates the body temperature
6. Plants need water to grow
7. It is a medium for transportation of food and other substances

Purification of water

Water can be purified through the following method

1. Filtration: This is the use of a filter to remove large particles
2. Distillation: It is a method of purifying water/liquid by a process of heating and cooling
3. Addition of alum: This allows the tiny particles in water to settle at the bottom then the water can be filtered.
4. Addition of chlorine: Chlorine is a chemical that kills bacteria and other germs in water.

**THE WATER CYCLE**

Water cycle is the continuous movement of water within the earth and atmosphere.

Processes involved in the water cycle

1. Condensation: Water condenses to form clouds which fall as rain or other forms of precipitation.
2. Evaporation from water bodies, soil/ground
3. Drinking of water by animals and thus gives off the water back to the atmosphere by sweating, respiration and excretion.
4. Absorption of water by the roots and the water returns to the atmosphere by transpiration and respiration from plants
5. Erosion from soil takes water into the water bodies and this water evaporates back into the atmosphere by the heating action of the sun.

**SOLUTION**

A solution is formed when a solute dissolves in solvent

Example: Salt + Water dissolved $\rightarrow $ Salt solution

 Solute Solvent Solution

Other examples of solutions are:

1. Vinegar: combination of water and acetic acid
2. Liquid soap: solution of various compounds in water
3. Sweetened tea or coffee – when sugar is dissolved into the tea or coffee
4. Mouth wash: Some chemicals dissolved in water
5. Ethanol in water etc

**COLLOIDAL SOLUTION**

These are formed when solution are partially dissolved in a solvent. This is a solution where the particles are so small that they do not settle at the bottom of the container e.g. butter, milk, paint etc dissolve in water

**SUSPENSION**

This is formed when a part of the solute is partially dissolved in a liquids. It is a heterogeneous mixture of undissolved particles in a given medium e.g sand in water solution, mercury shaken in oil, powdered chalk in water, oil shaken in water etc.

Properties of a solution

1. The particles are so small that they will pass through a fine filter paper
2. The particles are evenly distributed throughout
3. The solution is clear and transparent
4. It is a homogeneous mixture

Properties of colloids (Colloidal solution)

1. They cannot be filtered
2. They cannot be seen with naked eye
3. When light is passed through it the beam of light is scattered
4. Their particles are very small
5. It is an heterogeneous mixture

Properties of Suspension

1. They are suspended in liquid (solvent)
2. Their particles are large
3. They cannot pass through a filter paper
4. They can be seen with naked eyes
5. It is an heterogeneous mixture

**SPACE TRAVEL**

A space ia an area beyond the atmosphere of planets that consists of a vacuum. Space travel is a journey to the heavenly bodies. Rockets and space shuttles are used for this journey. The earth atmosphere can be divided into 5 layers namely:

1. The Troposphere: It is the lowest layer of the atmosphere where most cloud and weather is found
2. The Stratosphere: It is usually cold and consist of thin air. It is free of dust, smoke and water vapour. The ozone layer is found in the stratosphere.
3. The Mesosphere: Meteors or rocks burn up in the atmosphere
4. The Thermosphere: This is where space shuttle or orbits are found
5. The Exosphere: This is the upper limit of the atmosphere

The earth is one of the planets in the universe. The rotation of the earth about its axis causes day and night

The revolution of the earth round the sun causes seasons and climate

The moon is the natural satellite of the earth which revolves round the earth in 29 days. The moon is called the satellite of the earth because it revolves round the earth and travels with the earth round the sun.

**SATELLITE**

A satellite is a body that revolves round a planet. They are natural e.g. (Moon) and artificial satellite e.g. (International space station) orbiting the earth.

Uses of satellite

1. Communication
2. Photography
3. Mapping (digital mapping)
4. Geographical Information System (GIS)

**THE STAR**

The stars are made up of large spheres of glowing gases which radiates heat at very high temperature. The sun is the largest star. The stars are divided into easily recognizable star groups known as constellations.

Constellations are groups of stars that appear at different times of the year. The stars in the sky are divided in 88 constellations.

There are 4 main constellations:

1. Onion: This is seen in January, February, March, April, December
2. Plough: This is seen in April, May, June, July
3. Scorpius: This is seen in June, July, August, September, October
4. Pegasus: This is seen in September, October, November, December

The sun is one of the stars in our galaxy and it is the primary sources of all energy.

Comets: These are lumps of rock like materials which evapourize easily and they move round the sun.

Meteors: These are small lumps of rocks and metal shooting through the atmosphere from the outer space. They are commonly called shooting stars.

**THE SOLAR SYSTEM**

The solar system is a gravitationally bound system that consists of the sun, the planets and other heavenly bodies revolving round the sun. other objects in the solar system include; the moon, Asteroids, Meteors and comets. There are eight planets in the solar system. The names of the planets in order of their distance from the sun are: Mercury, Venus, Earths, Mars, Jupiter, Saturn, Uranus and Neptune.

The closest planet to the sun is Mercury

The hottest planet is Venus

The largest planet is Jupiter

**ECLIPSE**

This is when an object in the sky moves into the shadow of another such object. An eclipse occurs when the shadow of a heavenly is cast on another heavenly body. Eclipse are caused by the revolution of the earth and the moon.

There are two types of eclipse. These are:

1. Eclipse of the moon or lunar eclipse
2. Eclipse of the sun or solar eclipse

Eclipse of the moon or lunar eclipse occurs when the earth comes between the sun and the moon

**Leave 5 lines for diagram**

Eclipse of the sun or solar eclipse occurs when the moon comes between the sun and the earth

**Leave 5 lines for diagram**

A partial eclipse occurs when only a part of the sun is blocked by the moon.

A total eclipseoccus when the sun is entirely covered by the moon. The earth is much bigger than the moon. So region of total shadow and partial shadow may fall on the earth.

A large source of light causes the formation of a region of partial shadow called penumbra and a region of total shadow is called umbra.

**TOOLS FOR WORK**

Tools are implements or instruments used for doing work. The purpose for using tools is to enable us to apply a small force or effort to overcome a large resistance or load. Tools can be grouped into modern tools and local tools.

Modern tools: These tools save time and human energy. Work is done more efficiently and more yield is realized with modern tools. Examples are tractor, harvester, planter, plough, drilling machine.

Local tools: These tools require much application of manual efforts. Examples are hoe, cutlass, rake, shovel, spade, axe etc.

Differences between Modern and Local tools

|  |  |  |
| --- | --- | --- |
|  | Modern tools | Local tools |
| 1. | It requires less manual effort | It requires much application of manual effort |
| 2.  | It saves time and energy | It is time consuming |
| 3. | It is more efficient | It is less efficient |
| 4. | It is expensive | It is cheap |
| 5. | It is more convenient  | It is less convenient |

Various occupation and the tools they use

Fishing: Tools include: Fishing line, net, boat, fishing hook, bait spear etc

Farming: Tools include: Cutlass, tractor, hoe, rake, harvester, spade, planter, shovel, plough, axe etc

Carpentry: Tools include: harmer, chisel, screw driver, saw, wood planers etc

Engineering: tools include: tester, jack, plier, spanner, chisel, vernier caliper, screw driver etc

Medicine: Tools include: stethoscope, clinical thermometer, sphygmomanometer, forceps, scissors, surgical blade, syringe and needle etc

Duties of farmer

1. Cultivate, harvest and store agricultural products
2. They rear animals for food consumption, milk for consumption and other milk product like cheese etc

Duties of Doctors, Nurses, Midwives and pharmacists

1. Doctor take care of the sick and together with midwives care for expectant mothers until delivery.
2. Nurses assist doctors
3. Pharmacists administer drugs

Duties of Carpenters

1. They produce furniture, doors and windows, chairs, table, wardrobe etc
2. They roof buildings and hang doors and windows

Duties of Engineering

Duties of chemical engineers

1. They design machines for industrial processes
2. They manufacture various chemicals and industrial product such as soap, plastic, cement, beer etc