

GK-1 : (PHYSICAL SCIENCE & FOOD SCIENCE)

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Q: NO: 01

A) What is balanced diet? What are the consequences of unbalanced diet?

Balanced Diet:

It is a diet which contains the right and equal amount of essential nutrients.

OR

A balanced diet is one that provides the body with all the essential nutrients, in the right proportions, required for optimal health and well-being.

It ensures that an individual receives the necessary energy and nutrients to support growth, repair and overall bodily functions.

• Essential Nutrients or Components:

- Carbohydrates
- Vitamins
- Fibre
- Water etc

Consequences of Unbalanced Diet:

Unbalanced diet can have a wide range of negative impacts on health and well-being.

1 - Nutritional Deficiencies:

- Inadequate intake of essential nutrients lead to deficiencies.
- can result in conditions like Scurvy (vitamin C deficiency) or Anemia (Iron deficiency).

2 - Chronic Diseases:

- Poor dietary choices are linked to chronic conditions like heart diseases, diabetes, and hypertension.
- High sugar and fat consumption can lead to metabolic syndrome and other health problems.

3- Gastrointestinal Problems:

- Low fiber intake can cause constipation and digestive issues.
- High intake of Processed food may lead to gastrointestinal disorders.

4- Mental Health impacts:

- Nutritional imbalances can affect mood, cognition and mental well-being.
- Links between diet and mental health issues like depression and anxiety.

5- Weakened Immune System:

- Inadequate nutrients can compromise the body's immune defense.
- Increases susceptibility (sensitivity) to infections and illnesses.

B- What are the fats? Differentiate between good fats and bad fats? Give importance of fats?

Fats:

Fats, also known as Lipids, are a group of organic molecules that serve several important functions in the human body.

Fats are made up of carbon, hydrogen, and oxygen atoms and are concentrated source of energy, providing 9 cal/gram.

Aspects	Good Fats	Bad Fats
Primary Types	Monounsaturated & Polyunsaturated fats.	Saturated and Trans fats.
Impact on Heart Health	May reduce bad LDL (low density lipoprotein) cholesterol levels and lower the risk of heart disease.	Can raise bad LDL cholesterol levels and increase the risk of heart disease.
Sources	Olive oil, avocados, nuts, seeds, fish etc.	Red meat, butter, cheese, tropical oil, etc.

Aspects	Good Fats	Bad Fats
Impact on Inflamm.	May have anti-inflammatory properties, particularly Omega-3 fatty acids.	May contribute to inflammation in the body.
Benefits	May improve cardiovascular health, brain function and overall well-being.	Linked to higher risk of heart disease, obesity, and other health problems.

Importance of Fats

Fats play several roles in the body. These are:

1- Energy Source:

Fats are highly efficient energy source, especially for prolonged activities or endurance exercises.

2- Nutrient Absorption:

Fat-soluble vitamins (A, D, E, and K) require fats for absorption in the digestive systems.

3- Cell Structure:

Fats are important component of cell membranes, contributing to the cell structure and function.

4- Insulation and Protection:

Adipose tissue (body fat) provides insulation and protection for vital organs.

5- Hormone Production:

Fats are essential for the production of hormones, including hormones that regulate appetite and metabolism.

C- What is food preservation? Does it impact the quality of food? If yes, then how? And give 5- food preservation methods.

Food Preservation

The process of extending shelf life of food products while maintaining their safety and quality.

Main goal of food preservation: is to prevent or slow down the growth of spoilage micro-organisms, such as bacteria, yeasts, and molds, as well as pathogens that can cause foodborne illnesses.

Proper food preservation methods can help retain the nutritional value, flavor, and texture of foods, making them safe and palatable for longer periods.

Food preservation impacts the quality of food in various ways, both positively and negatively;

Positive Impact on Food

- 1- Extended shelf life.
- 2- Retained Nutritional value
- 3- Flavor and Texture
- 4- Convenience.

1- **Extended shelf life:** Prevent spoilage and deterioration, allowing food to remain edible for an extended period.

2- **Retained Nutritional value:** Freezing and drying, can help preserve the nutritional contents of food by minimizing nutrient loss.

3- **Flavor and Texture:** Properly preserved food often maintain their original flavor and texture, providing consumers with a familiar and enjoyable eating experience.

4- **Convenience:** More convenient for consumers.

Negative Impact on Food

- 1- Texture changes.
- 2- Flavor alteration
- 3- Nutrient loss.

1- Texture changes: Some methods may cause changes in the texture of food.

E.g. Canned food may become softer.

2- Flavor Alteration: Canned food, in particular, may develop a slightly diff. taste over time, due to heating process.

3- Nutrient loss: some result in nutrient degradation.

Common Food Preservation Methods

- 1- Refrigeration
- 2- Freezing
- 3- Canning
- 4- Drying or Dehydration
- 5- Fermentation.

1- Refrigeration: A short time preservation method that slows down the growth of microorganisms and helps maintain the quality of perishable foods, such as dairy products, meats and vegetables. It is suitable for preserving foods for several days to weeks.

2- Freezing: An effective long-term preservation method that involves lowering the temperature of food to below freezing to inhibit the growth of microorganisms.

It is suitable for preserving a wide range of food, fruits...

3- Canning: It involves food in airtight containers and heating them to high temperatures to destroy harmful microorganisms.

A long term preservation method used for fruits, vegetables etc.

4- Drying or Dehydration: Drying removes moisture from food, inhibiting the growth of microorganisms and preventing spoilage.

Dried foods, such as jerky, and herbs, have a long shelf life.

5- Fermentation: It is a Preservation method, that relies on the activity of beneficial microorganism to transform food.

It is commonly used to preserve items like yogurt, and Kimchi.

D- Give two functions of each of the following:

i- Iron:

a- oxygen transport: Iron a crucial component of hemoglobin, a protein in red blood cells that binds to oxygen in the lungs and carries it to the body tissues.

Function essential for overall oxygen transport and energy production in the body.

b- Red Blood cell formation: Necessary for the production of red blood cells (erythropoiesis). A deficiency in iron can lead to anemia, which results in fatigue, weakness, and reduced oxygen-carrying capacity for the blood.

ii- Vitamin B-Complex:

a- Energy Metabolism: B vitamins (such as B1, B2, B3, B5, B6, B7, B9 & B12)

Play a crucial role in converting the carbohydrates, fats, and proteins in the food we eat into energy that the body can use for various metabolic processes.

b- Nervous System Function: Several B-Vitamins, including B1 (thiamine), B6 (Pyridoxine), and B12 (Cobalamin), are essential for the proper functioning of the Nervous system. They help in the synthesis of neurotransmitters and support nerve cell health.

iii- Vitamin - A:

a- Vision Support: Vit-A is essential for maintaining good vision. It is a component of the visual pigments in the retina of the eye and is required for the proper functioning of photoreceptor cells.

Deficiency can lead to night blindness and other vision problems.

b- Immune System Function: Vit A plays a role in supporting the immune system by helping maintain the integrity of mucous membrane, skin, and other barriers against pathogens.

It is involved in the production of immune cells.

iv- Calcium:

a- Bone Health: Calcium is a major component of bones and (healthy) teeth. It provides strength and structure to the skeletal system.

Adequate calcium intake is essential for building and maintaining healthy bones throughout life.

b- Muscle contraction and Nerve Function: Calcium is involved in muscle contraction, including beating of the heart, and it plays a role in nerve transmission.

It helps regulate muscle and nerve impulses.

V- Zinc:

a- Immune System Support: Zinc is important for the normal development and function of immune cells, such as T cells, which play a key role in immune responses. It helps the body defend against infections and illnesses.

b- Wound Healing: Zinc is involved in the process of wound healing and tissue repair.

It supports production of collagen, a protein necessary for the formation of new skin and connective tissues.

Q: NO: 02

A- What are volcanoes? Give its types? Effects and possible measures?

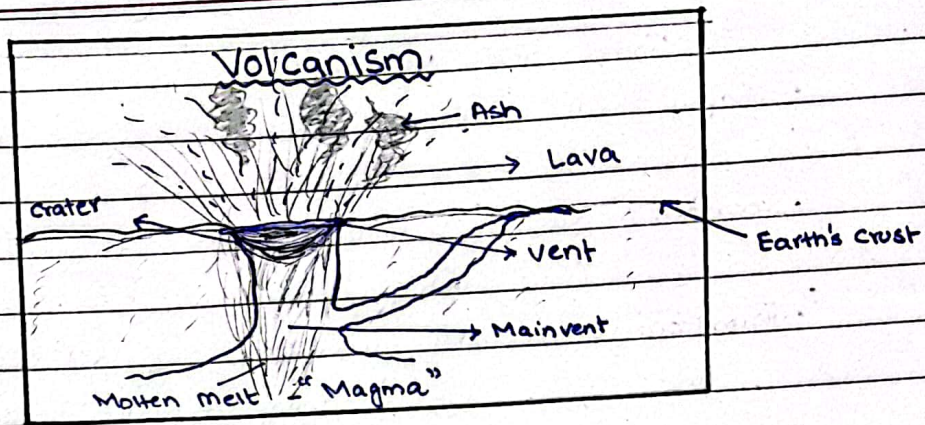
Volcanoes

Volcanoes are geological features that result from the eruption of molten rock, ash, and gases from the Earth's mantle to the surface.

- The molten melts results in the form of Magma and lava.

- Overall on average 8 volcanoes erupt after every 24hrs around the world, that make around 50-70% volcanoes erupt every year. Mostly in oceanic plates due to softness.

- Ring of Fire is a tectonic belt, path along the Pacific ocean - contains between 750-915 volcanoes, around 2/3 of the world's total.



Types of volcanoes

- 1- Shield volcanoes
- 2- Strato volcanoes (Composite volcanoes)
- 3- Cinder Cone volcanoes
- 4- Lava dome volcanoes

1- Shield volcanoes: ^{• Shape:} They are large, and broad gently sloping sides, resembling a warrior's shield.

• Location: Typically found in hotspot regions such as Hawaii.

• Formation: Formed by a low viscosity basaltic lava eruption, resulting in the accumulation of many layers of lava flow.

• Example: Mauna Loa in Hawaii.

2- Strato volcanoes (Composite volcanoes):

• Shape: Tall, steep-sided with a conical shape, resembling a classic volcano.

• Location: Found at 'convergent plate' boundaries.

• Formation: Erupt a combination of lava flows and volcanic debris, leading to the buildup of layers of lava, ash, and volcanic rocks.

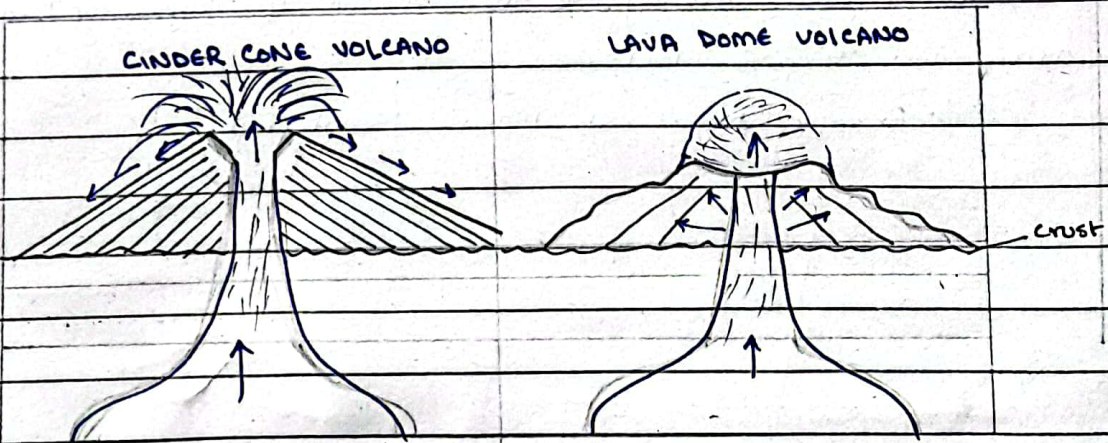
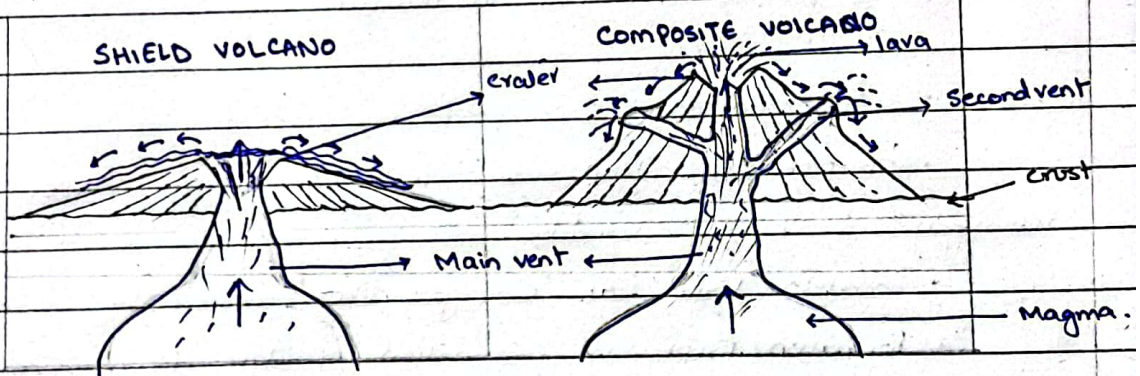
• Example: Mount St. Helens, Mount Fuji.

3- Cinder Cone Volcanoes:

- Shape: Small, steep sided mounds near the vent, with a conical shape.
- Location: In various tectonic settings, including both subduction zones and intraplate region.
- Formation: Formed by accumulation of volcanic ash, cinders and debris ejected during explosive eruptions.
- Example: Paricutin in Mexico.

4- Lava Dome volcanoes:

- Shape: characterized by the slow extrusion of highly viscous lava, leading to the formation of steep-sided, dome shaped mounds near the vent.
- Location: In various tectonic environments, including both subduction zones and intraplate regions.
- Formation: Results from slow extrusion of thick lava, which can accumulate over time.
- Example: Mount St. Helens, Mount Unzen.



Effects of Eruption of volcano;

- 1- Lava flows: Eruption can lead to the flow of molten rock (lava), which can destroy everything in its path, including buildings and vegetations.
- 2- Ashfall: Volcanic ash and rock fragments ejected during eruptions, can cover large areas, disrupting transportation, agriculture, and posing respiratory hazards.
- 3- Pyroclastic Flows: Highly destructive, fast moving clouds of hot gas, ash and volcanic debris can race down the slopes of a volcano, incinerating everything in their path.
- 4- Volcanic Gas Emission: Volcanoes releases gas like Sulfur dioxide, carbon dioxide, and water vapor, which can have adverse effects on the environment and human health.
- 5- Climate Effect: Large volcanic eruptions can eject sulfur dioxide into the stratosphere, leading to the temporary cooling of the earth's climate due to the formation of sulphuric acid aerosols.

Possible Measures

- 1- Early warning system:
Monitoring system / equipment and geological surveys can provide early warnings of volcanic activity, allowing for the evacuation of at risk populations.
- 2- Land-use plans:
Zoning laws and land use regulations can help prevent the construction of critical infrastructure and housing in high risk volcanic areas.
- 3- Public education:
Public awareness campaigns can educate people about the risks associated with living near volcanoes and how to respond in case of an eruption.

4- Volcanic Hazard Maps:

creating hazard maps can help communities identify high risk areas and plan accordingly.

5- Building Resilience:

Constructing buildings and infrastructure that are resistant to volcanic hazards, such as using reinforced materials and designing roofs to shed ash.

6- Volcanic Research:

Continued research into volcanic activity and monitoring technologies can improve our understanding of volcanic behavior and help mitigate future hazards.

C- Explain

- Solar
- Geothermal
- and
- Wind Energy

• Solar Energy

The energy produced from sun.

• Types: It has two types:

- i- Passive technique
- ii- Active technique.

i- Passive Technique:

a- It produces less energy.

b- No use of photovoltaic cells.

Criteria to produce Passive Technique:

a- selection of material: e.g metal, solar geezers etc.

b- Good absorber: Dull black color is good absorber.

c- orientation: Place in such a direction that it can face "Sun" for maximum time.

ii- Active Technique:

a- Photovoltaic cells are used to produce more energy.

b- Material - 3 types i- conductor ii- insulator iii- semiconductor

Active Techniq, Material

• Conductor

Allow heat & current to pass

• Insulator

Do not conduct heat and current

• Semi conductor

Partially conduct/ allow current or heat at certain conditions

P-type

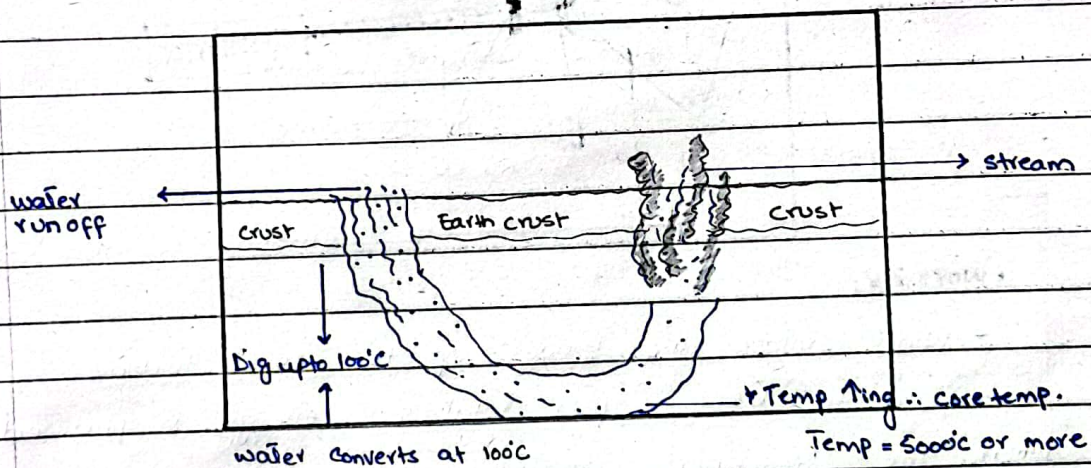
Maj of Protons/ Holes

N-type

Maj of Electrons

• Geo-Thermal Energy

The energy which is being produced by the heat of the Earth.



• Working:

- As water runoff from Earth's crust into core, due to high temperature water will convert into steam.
- The steam will rise.
- At the end install insulator or ~~temp~~ poles to not change stream temperature.

• Geothermal Energy Producer countries:

- Only 02 countries are producing considerable amount of energy from Geothermal Energy.

- countries include

i- Iceland and

ii- Germany

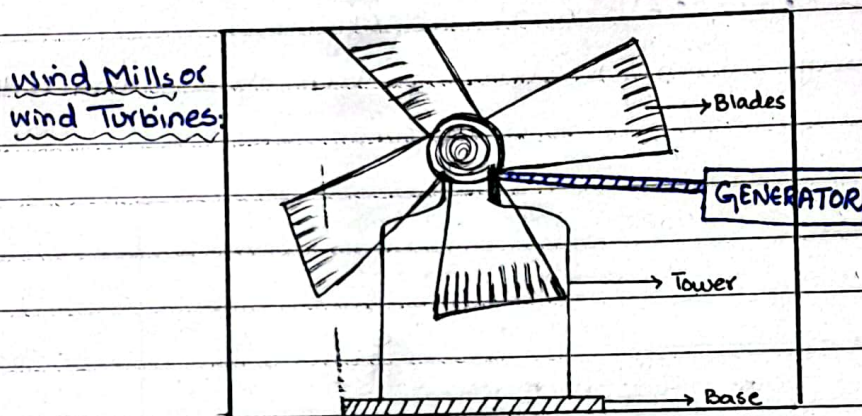
• Wind Energy

The energy which is produced through winds.

- wind energy depends on winds speed.

• Speed required to produce wind Energy:

- 13 km/hr - 15 km/hr is the min. speed of wind to produce wind energy.



• working:

- wind rotate the blades of the wind turbine

- Due to blades fast rotation energy is produced when the Generator's operates.

- Thus these generators convert wind energy into Electrical energy.

• Potential areas in Pakistan:

- In Pakistan Northern areas like coastal belt (Gawadar) is capable to produce much greater amount of wind energy

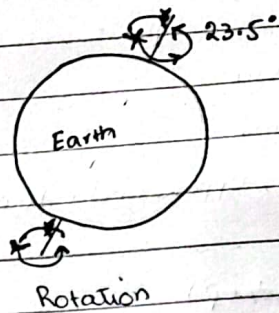
- while in Sindh e.g. Jampur or Thatta Projects are installed.

b- Differentiate between
 i- Rotation and Revolution ii- Solar and Lunar Eclipse

i-

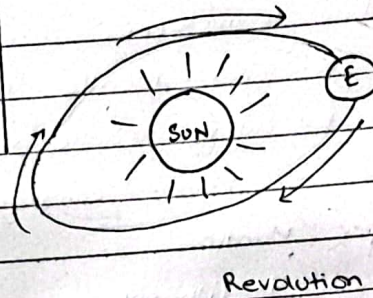
Rotation

- Movement of earth on its axis.
- Rotation takes around 24hrs
- Days and nights occur
- The Earth rotates on axis, which is an imaginary line.



Revolution

- Mov. of Earth around the sun.
- It takes 365 days and 6 hours
- Seasons change.
- The Earth revolves around the sun in an elliptical path.

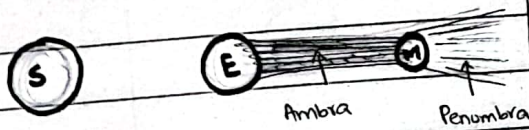


ii-

Lunar Eclipse

- when one celestial body i.e. Earth totally covers the other celestial body i.e. Moon.
- when three bodies (Earth, sun, moon) are perfectly aligned
- Earth shadow makes them invisible

- a- Penumbra: shadow 'lighter'
- b- Umbra: shadow 'darker'



- Positions of Moon: 03

- a- Umbra Eclipse b- Penumbra
- c- Partial Eclipse

Solar Eclipse

- when one celestial body i.e. Moon partially covers the other celestial body i.e. Earth.
- Three bodies are aligned perfectly but due to size solar eclipse occurs.
- Moon cannot cover the entire sun due to its size.



- Positions of Moon: 03

- a- partial eclipse b- Total E.
- c- An-umbra.

D- What is Mantle? Explain?

Mantle

Mostly solid bulk of Earth's interior -

• Location: Mantle is the Earth's second layer. It lies between Earth's dense, super heated core and its thin outer layer the crust.

• Thickness and volume: The mantle is about 2900 km (1802 miles) thick and accounts for 82-84% of Earth's total volume.

- Due to thickness there are two parts.

a- inner mantle \approx 2260 km

b- outer mantle \approx 640 km.

• Parts of Mantle: composed of upper and lower mantle.

• upper Mantle:

i- Lithosphere (70 km deep)

ii- Asthenosphere (200 km deep)

iii- Transition zone (410 km deep)

• lower Mantle:

i- Mesospheric mantle (250 km)

• Mantle composition: Mantle is composed of mostly

i- Iron

ii- Nickel

• Temperature: The mantle ranges in temp from 200-4000°C.

'Volcanoes' originate from inner mantle.

