Lipids:

Lipids are group of organic compounds that are insoluble in water but soluble in non-polar solvents. They play crucial roles in energy storage, cellular structure, and signaling processes.

Types of Lipids:

1. Triglycerides:

Composed of glycerol and three fatty acids, chains and primarily used for energy storage.

2. Phospholipids:

It contain glycerol, two fatty acids and a phosphate group; essential for building cell membranes.

3. Steroids:

Include cholestrol and hormones like testosterone and estrogen involved in regulatory functions

4. Waxes:

It provides protection by forming water resistant coatings.

Functions of Lipids:

Energy Storage:

Lipids serve as a long-term energy reserve in the body.

Structural Role:

They form cellular membranes and contribute to structural integrity

Hormone Production:

for hormones like Steroids. Lipids Precursors

Insulation:
to maintain body temperature. Provide thermal insulation

Protection:
Lipids cushion vital organs against physical shock.

P(b)

Measures for energy Conservation and its sustainable use

1. Use Energy efficient applince and LED lighting:

Swiching to energy-efficient applinces and LED lights reduces electricity Consumption significantly. For example, LED bulbs use up to 75% less energy than incandescant bulbs and last longer, reducing both energy bills and waste.

2. Implement renewable energy sources like Solar and wind power:

Utilizing renewable energy sources minimizes dependence on fossil fules. Solar panels and wind turbines produces clean energy, helping to reduce greenhouse gas emissions and combat climate change.

3. Practice energy saving behaviors such as turning off unused devices:

Simple actions like turning off unused devices, unplugging

Chargers, and setting electronic devices in power saving modes can save substantial amounts of energy and lower utility costs.

4. Improve insulation in buildings to reduce heating and cooling demands:

Proper insulation in walls, roofs, and windows help maintain indoors temperatures reducing the need in winter of heating and cooling is summer. This leads to significant energy savings and increased comforts.

5. Promote Public transport, Carpooling and biking to decrease fuel consumption.
Using shared transportation methods reduces the number of vehicles on the road, cutting down on fuel usage, traffic congestions and air pollution, encouraging walking and biking also promotes healthier lifestyle.

6. Encourage Industrial Processes to adopt energy efficient technology:

Industries can upgrade to energy efficient machinery, recycle waste heat, and optimize Production Processes to reduce energy consumption and improve sustainability in operations.

P(c)

Hydrogen bonding:

It is a type of inter-molecular force that occurs when a hydrogen atom covalently bonded to an electronegative atom (such as oxygen, nitrogen

or fluorine) interacts with another electronegative atom.

Examples:

1. **Water (H_2O):** Hydrogen bonds between .... oxygen and hydrogen atoms of adjacent molecules give water its unique properties.

2. **DNA:**

Hydrogen bonding between complementry nitrogenous bases (adenine, -thymine and guanine-cytosine) stablizes the double helix structure.

P(d)

Central Nervous System (CNS)

Brain: The control center of the body responsible for thought, emotion, memory, and all voluntary and involuntary actions

Spinal Cord:

A long, thin bundle of nerves that extands from the base of brain down the back. It transmits messeges between the brain and the rest of the body.

Peripheral Nervous System:

Somatic Nervous system controls voluntary actions, such as muscle movement and sensory perception, while Automatic Nervous System controls involuntory actions, such as heart rate, digestion, and respiration.

Functions of the Nervous system:

1. Sensory Input: Detects stimuli from the environments such as, light, sound, Touch, Temperature, and pain. This information is transmitted to the brain and spinal cord through sensory Neurons.

2. Integration: Processes the sensory information and make decisions about how to respond. The brain and spinal cord coordinate the response, often involving the integraction of multiple neurons.

3. Motor outputs: Sends commands to muscles and glands to execute the response. Motor neurons carry these signals from the CNS to the target tissues.

Importance of the Nervous system:
1. It enables us to interact with the world around us.
2. Maintains homeostasis, the balance of bodily functions.
3. Controls essential life processes, such as breathing and heartbeat.
4. It coordinates complex behaviors, such as learning and memory.

Question No. 05 P(a)
Eukaryotic cells are characterised by the presence of well defined nucleus enclosed by a nuclear membrane. This nucleus houses the

cell's genetic matrial, DNA, which is organized into linear chromosomes complexed with protein called histones. Eukaryotic cells also possess various membrane bounded organelles such as mitochondria, endoplasmic raticulum, Golgi apparatus, lysosomes and others each with the specific functions. These orgenlles compartmentalize cellular activities allowing for greater efficiency and specialization. Eukayotic organisms can be unicellular or multicellular and they undergo complex cell division processes like mitosis. Examples of Eukaryotic cells include plants, animals, fungi, and protists.

3

In contrast, Prokaryotic cells lack a true nucleus. Their gentic material, typically a single circular DNA molecule, is concentrated in region called nucleiod within the cytoplasm. Prokaryotic cells don't possess membrane-bound organelles. They are genenraly smaller and simpler in structure compared to eukaryotic cells. Prokaryotes reproduce through a process called binary fission, a simpler form of cell division.

Key differences between Prokayotic cells and Eukaryotic cells:

Feature	Eukaryotic cells	Prokaryotic cells
Nucleus	Present	Absent
Organelles	Present	Absent
DNA	Linear, complexed with histones	Circular, naked
Cell size	Larger	Smaller
Cell division	Mitosis, Meiosis	Binary fission
Examples	Plants, animals, fungi	Bacteria

P (b)

Global Warming:

Global warming refers to the long term rise in earth's average temperature due to an accumulation of greenhouse gases such as carbon dioxided (CO_2), methane CH_4, and nitrous oxide (N_2O) in the atmosphere. These gases trap heat from the Sun, creating a "greenhouse effect" that warms the Planet. Over the Past century, human activities such as burning fossil fuels, deforestation and industrial processes have significantly increased the concentration of these gases, contributing to rapid climate change.

Kyoto Protocol:

This is an international agreement aimed at combating climate change by reducing greenhouse gases emission. Adopted in December 1997 in Kyoto Japan. The treaty set legally binding targets of industralized nations to reduce the emission of six key

greenhouse gases. These targets were meant to be acheived during the first commitment period from 2008-2012. The Protocol operates on the principles of common but differentiated responsibilities recognizing that developed countries, historically responsible for most significant share of emissions, should take the lead in reducing their impact on the climate. While protocol helped raise awareness and establish a framework for global action on climate change. It faced challenges such as lack of binding commitments for developing countries and the withdrawl of the U.S in 2001. It was eventually succeeded by the Paris agreement in 2015.

P(C)
Geographic Information System (GIS):
GIS is a powerful computer based tool designed to capture, store, analyze, the visualize spatial data. This technology allowes us to understand the spatial relationships and patterns within geographic information, enabling informed decision making across various fields.

Key components of GIS

1. Hardware:
The physical components of GIS system include computers, GPS devices, and other hardware necassary to collect, process and display geographic

data.

2. Software: GIS software provides tools and functionality to perform spatial analysis, mapping, and data management. Popular GIS software packages include ① GIS and Google earth.

3. Data: GIS relies on spatial and attribute data which contains geographic features like points, lines, and polygons that is often stored in geographic coordinate system

4. People: skilled GIS Professionals are essential to operate and interpret GIS system. They possess expertise in data collection, analysis, and visualization which can effectively communicate spatial information to diverse audiences.

Applications of GIS:
GIS has wide range of applications in various sectors:

1. Urban Planing: Designing urban infrastructure like road transportation networks, and utilities with identifying stable locations for new development. used to analyze urban growth pattern and forecast future trends.

2. Environmental management: Monitoring deforestation, land degradation, and Pollution. Assessing the impact of climate change on ecosystems. Managing natural resources and conservation efforts.

3. Disaster Management:
Identifying areas vulnerable to natural hazards, floods, earthquakes, wildfires. Developing emergency response plans, Assessing Post-disaster damage and Planing recovery efforts.

4. Business:
Optimizing logitics and supply chain operations, Identifying potential market areas and costomer demographics. Selecting optimal locations for retail outlets and service centers.

By integrating geographic data with other relevent information, GIS empowers decision makers to gain valueable inights solve complex Problems, and make informed choices.

SECTION-II
Question No. 06
P(a)

Solution:

Let x = the hundreds digit
y = the tens digit
z = Unit digit

the Sum of all digits:
$$x + y + z = 15 \quad\text{---(1)}$$

the sum of tens and unit digits:
$$x + y = 12 \quad\text{---(2)}$$

the difference between the unit and tens digit:
$$z - y = 2 \quad\text{---(3)}$$

Substitute equation ③ in equation ②
$$y + (y + 2) = 12$$

$2y + 2 = 12$

$2y = 12 - 2$

dividing both sides by 2

$y = 5$ ③ $z = y + 2$ —④

from equation ③

using equation ④

$z = y + 2 = 5 + 2 = 7$ ∴ $y = 5$

$z = 7$

Substitute $y = 5$ and $z = 7$ into

equation ①

$x + y + z = 15$

$x + 5 + 7 = 15$

$x + 12 = 15$

$x = 15 - 12$

$x = 3$ —⑦

Hence, the digits are $x = 3$, $y = 5$,

and $z = 7$. So, the number is 357

P(b)

Solution:

Given that: The ratio of slices for small

medium, and large Pizzas i 2:3:4

⟹ Each slice weighs 40 g

⟹ Price of small Pizza (with all it

slices) is Rs. 320.

Let the number of small, medium, and

large Pizzas be $2x$, $3x$, and $4x$ reflection

Since the total number of slice is 18

$2x + 3x + 4x = 18$

$9x = 18$ $\boxed{x = 2}$

Thus the number of slices is

Small Pizza: $2x = 4$ slices

Medium Pizza: $3x = 6$ slices

Large Pizza: $4n = 8$ slices

Total weight:

Each Pizza slice weighss $40g$ and there are 18 slices in total

Total weight $= 18 \times 40 = 720g$

Price Per Slice:

For Small Pizza:

$$\frac{320}{4} = 80 \text{ PKR}$$

Using the ratio of slices, the price per slice of medium and large Pizzas is proportional:

Medium Pizza Per Slice:

$$80 \times \frac{3}{2} = 120 \text{ PKR}$$

Large Pizza Price per Slice:

$$80 \times 2 = 160 \text{ PKR}$$

So total Price $= (4 \times 80) + (6 \times 120) + (8 \times 160)$

$= 320 + 720 + 1280 = 2320 \text{ PKR}$

P(c)

Solution:

The radius is half the diameter:

$$r = \frac{diameter}{2} = \frac{6}{2} = 3cm$$

We know that the formula for circumference is:

$$C = 2\pi r$$

Substituting $r = 3$

$$C = 2\pi(3) = 6\pi \approx 18.85 cm$$

The formula for area is:

$$A = \pi r^2$$

Substitute $\delta = 3$:

$$A = \pi(3)^2 = 9\pi \approx 28.27 \text{ cm}$$

$$P(d) \quad (i)$$

Solution:
The given sequence:

13, 24, 46, 90, 178, ___ ?

each approximately doubles the previous term and subtracts 2:

$13 \times 2 - 2 = 24$, $24 \times 2 - 2 = 46$, $46 \times 2 - 2 = 90$

$90 \times 2 - 2 = 178$, $178 \times 2 - 2 = 354$

So, the answer is 354

$$P(ii)$$

Solution:
The given sequence:

5, 6, 9, 14, 21, ___ ?

observing the pattern, each term increases by consecutive odd numbers:

$5 + 1 = 6$, $6 + 3 = 9$, $9 + 5 = 14$, $14 + 7 = 21$

So, $21 + 9 = 30$.

Question No. 07 P(a)
Intelligence Quotient (IQ):

The cognitive abilities like logical reasoning, Problem-Solving, and understanding complex ideas. It is measured through **tests** like math Puzzles or verbal reasoning. For example Solving a difficult verbal reasoning Question/Problem.

Emotional Quotient (EQ):

The ability to recognize, manage, and influence emotions in oneself and others. It is key for leadership and interpersonal relationships. for example. Staying calm in stressful meeting.

P(b)

Aman's age after 20 years will be 10 times his age 10 years ago.

Let Aman's present age be x

after 20 years: $x + 20$

10 years ago : $x - 10$

from $\ast$: $x + 20 = 10(x - 10)$ [from Problem]

simplifying for x:

$$x + 20 = 10x - 100$$
$$20 + 100 = 10x - x$$
$$120 = 9x$$
$$x = \frac{120}{9} = 13.33 \approx 13 \text{ years}$$

So, Aman is approximately 13 years old.

P(c)

Solution:

- Peter's rate of work: $\frac{1}{40}$ lawn/min
- John's rate of work: $\frac{1}{60}$ lawn/min

Total rate:

$$\frac{1}{40} + \frac{1}{60}$$

$$\frac{3}{120} + \frac{2}{120} = \frac{5}{120}^{24} = \frac{1}{24}$$

So, time to mow lawn together:

$$\frac{1}{\frac{1}{24}} = 24 \text{ minutes}$$

P(d)

Solution:

Let x be the number

We know that the formula

$$= \frac{\text{Actual result} - \text{Incorrect result}}{\text{Actual result}}$$

substituting the values we get,

$$\text{Error} = \frac{\frac{5x}{3} - \frac{3x}{5}}{\frac{5x}{3}} \times 100$$

Since: Actual result $= x \times \frac{5}{3} = \frac{5x}{3}$

Incorrect result $= x \times \times \frac{3}{5} = \frac{3x}{5}$

So,

$$\frac{\frac{25x - 9x}{15}}{\frac{5x}{3}} \times 100$$

$$\frac{\frac{16x}{15}}{\frac{5x}{3}} \times 100$$

$$= \frac{16x}{15} \times \frac{3}{5x}$$

$$\frac{16x}{25x} \times 100 = \frac{16}{25} \times 100 = 0.64 \times 100$$