

Q5 (a)

### Introduction

Pakistan, with a population exceeding ~~241m~~ 241m, with a growth rate of 2.55 percent.

It ranks as the fifth most populous country in the world. This population explosion poses significant challenges to the country's socio-economic development.

Understanding the causes of this rapid population growth and implementing effective control measures is crucial for sustainable development.

### Causes of Population Explosion in Pakistan

#### 1. High Birth Rate

Pakistan has a high fertility rate, with an average of about 3.6 children per woman. Cultural and religious factors often encourage large families, and access to family planning services is limited.

#### 2. Early Marriages

Early marriages are common in Pakistan, leading to longer reproductive periods for women. This cultural practice contributes significantly to the high birth rate.

### 3. Lack of Education

A lack of education, particularly among women, results in limited awareness and use of contraceptive methods. Education often correlates with smaller family size as educated women tend to marry later and have fewer children.

### 4. Poverty

In many rural and impoverished areas, children are seen as an economic asset, contributing to family income through labour. This perception leads to larger family sizes as a form of economic security.

### 5. Insufficient Family Planning Services

There is an inadequate access to family planning and reproductive health services. Many rural and underserved urban areas lack the necessary infrastructure and resources to provide these services effectively.

### 6. Cultural & Religious Beliefs

Certain cultural and religious beliefs discourage the use of contraception and promote large families. These beliefs can create barriers to the acceptance and use

of family planning methods.

## Control Measures

### 1. Education & Awareness

- **Promote Female Education:** Increasing educational opportunities for girls can lead to later marriages and lower fertility rates.
- **Public Awareness Campaigns:** Educating the public about the benefits of small families and the use of contraceptives through media & community programs.

### 2. Improving Healthcare Services

- **Enhance Family Planning Services:** Ensuring the availability of affordable and accessible contraceptives and reproductive health services, especially in rural and underserved areas.
- **Training Healthcare Providers:** Training healthcare providers to offer comprehensive family planning counseling and services.

### 3. Economic Incentives

**Income Support Programs:** Implementing programs that provide financial support to low-income families, reducing the economic need for larger families.

- **Employment Opportunities:** Creating job opportunities, especially for women, can help in reducing the dependency on having many children for economic support.

#### 4. Legislation & Policy Implementation

- **Strict Enforcement of Marriage Laws:** Enforcing laws against early marriages and promoting the legal age of marriage can help in reducing the reproductive span of women.
- **Population Control Policies:** Implementing and enforcing policies aimed at population control, such as providing incentives for smaller families

#### 5. Cultural & Religious Engagement

**Engage Religious Leaders:** Working with religious leaders to promote the importance of family planning within the cultural & religious context.

**Community Involvement:** Involving local communities in designing and implementing family planning programs to ensure cultural sensitivity and acceptance.

#### Conclusion

Addressing the population explosion in Pakistan requires a multifaceted approach that includes

education, healthcare improvements, economic incentives, legislative measures, and cultural engagement. By implementing these control measures, Pakistan can achieve sustainable population growth and improve the overall quality of life for its citizens.

Q5(b)

### Differentiation between Cyclones & Tornadoes

Aspect	Cyclones	Tornadoes
Definition	Large-scale air mass that rotates around a strong center of flow atmospheric pressure	Small-scale violently rotating columns of air extending from a thunderstorm to the ground
Formation Area	Over warm ocean waters, primarily in tropical & subtropical regions	Over land, usually in association with severe thunderstorms
Size	Hundreds to thousands of kilometers in diameter	Typically 100 to 600 meters in diameter
Duration	Can last for several days to a week or more	Usually last from a few seconds to an hour

Aspect	Cyclones	Tornadoes
Wind Speed	119 Km/h to over 250 Km/h	Can exceed 400 Km/h
Structure	Composed of large, rotating storm system with a well-defined eye at the center.	Funnel-shaped cloud extending from a thunderstorm to the ground
Impact Area	Affects large geographical areas potentially spanning multiple countries	Affects relatively small areas, often just a few Km
Predictability	Easier to predict and track due to their size and longer duration	Difficult to predict accurately and form quickly
Examples	Hurricane, typhoon, tropical cyclone	Commonly known tornadoes

## Cyclones Observed in 2024

**The South-West Indian Ocean:** This region saw cyclones like **Alvaro** (January), **Belal** (January) causing damage in Madagascar & Mauritius respectively.

**Australia:** Cyclone **Kirrily** impacted Queensland in (January)

Q5(c)

## How Earthquakes Occur

Earthquakes are caused by a sudden release of energy in the Earth's crust, resulting in seismic waves.

This release of energy typically occurs due to the following processes:

### 1. Tectonic Plate Movements

The earth's crust is divided into several tectonic plates that sit on the semi-fluid asthenosphere below. These plates constantly move and interact at their boundaries.

- **Convergent Boundaries:** Plates move towards each other, causing one plate to be forced beneath another (subduction) or causing the plates to crumple and form mountains.
- **Divergent Boundaries:** Plates move apart from each other, creating new crust as magma rises to the surface.
- **Transform Boundaries:** Plates slide past each other horizontally, causing friction and stress to build up until it is released as an earthquake.

## 2. Fault lines

⇒ Fault lines are fractures in the Earth's crust where significant displacement has occurred. Earthquakes often occur along these faults.

⇒ The most common type of fault movement includes normal faulting (extension), reverse faulting (compression), and strike-slip faulting (horizontal movement).

## 3. Volcanic Activity

⇒ Earthquakes can also occur due to volcanic activity. The movement of magma within the Earth can cause the surrounding rocks to fracture, leading to earthquakes.

## 4. Human Activities

⇒ Certain human activities, such as mining, reservoir-induced seismicity from filling large dams, and geothermal energy extraction, can induce earthquakes.



## Turkiye Earthquake in 2023:

A devastating earthquake struck Southeastern Türkiye in February 2023, near the border of Syria. The tragic event caused significant casualties. While the exact number can vary depending on the sources, estimates suggest around 42,310 people lost their lives.

## Earthquake Intensity:

The earthquake's intensity was measured on the Richter Scale. Türkiye's February 2023 earthquake was measured at magnitude 7.8 which is classified as "major" on the scale. This signifies a very powerful earthquake with the potential for widespread damage.

## Q5(d)

### (i) Hypocenter

The hypocenter, also known as the focus, is the point within the Earth where an earthquake originates. It is the location where the strain energy stored in the rocks is first released, initiating the seismic waves that propagate outward. The hypocenter is located at a specific depth below the Earth's surface.

## (ii) Epicenter

The epicenter is the point on the Earth's surface that is directly above the hypocenter or focus of an earthquake. It is the location on the surface where the effects of the earthquake are usually most strongly felt.

The epicenter is typically reported in terms of geographic coordinates (latitude & longitude).

## (iii) Eye Wall of Hurricane

The eye wall of hurricane is a ring of intense thunderstorms that surround the calm center of the storm, known as the eye. The eye wall is characterized by the strongest winds, heaviest rainfall, and most severe weather conditions within the hurricane.

It is the most dangerous part of the storm, where the maximum sustained winds and storm surge occur.

## (iv) Shallow Focus

A shallow focus earthquake is one that occurs at a relatively shallow depth within the Earth's crust, typically less than 70 km below the surface. Shallow focus earthquakes are more likely to cause significant surface damage due to their proximity to the Earth's surface.

## (V) Parsec

A parsec is a unit of a distance used in astronomy to measure vast distances between stars and galaxies. It's equivalent to about 3.26 light-years. For reference, a light-year is the distance that light travels in one-year, which is roughly 9.46 trillion KM.

## Q4 (a)

### Bile: The Liver's Digestive Powerhouse

Bile, often referred to as "liver juice" is not quite a juice but a vital fluid produced by your liver and stored in your "Gallbladder". It plays a critical role in digestion, especially for fats.

### What is Bile?

A yellowish-greenish fluid produced by liver. It is composed mainly of water (around 95%), but also contains important components like:

**Bile salts:** These emulsify fats, breaking them down into smaller particles for easier digestion and absorption.

**Bilirubin:** A yellowish waste product from the breakdown of red blood cells. Bile helps eliminate bilirubin from the body through feces (giving stool its brown color).

**Cholesterol:** It helps with the formation and stability of bile.

**Lecithin:** Another emulsifying agent that aids fat digestion.

## What Does Bile Do?

**Fat Digestion:** Bile's main function is to emulsify fats in the small intestine. This process breaks down large fat globules into much smaller particles, allowing enzymes to work more efficiently and increasing fat absorption by the intestines.

**Waste Elimination:** Bilirubin, a byproduct of red blood cell breakdown, is eliminated through bile, helping detoxification.

**Nutrient Absorption:** Bile can also aid in the absorption of certain vitamins, like vitamin K, which is essential for blood clotting.

## Bile & Your Health

⇒ A healthy liver produces enough bile for proper digestion.

⇒ Problems with bile production or flow can lead to digestive issues like:

- Fatty stools
- Indigestion
- Pain in upper right abdomen
- Gallstones (formed from cholesterol in bile)

## Q4 (b)

### The Role of the Kidney in Excretion

The kidneys are vital organs in human body responsible for maintaining homeostasis through the regulation of fluid balance, electrolyte levels, and the removal of waste products. Their primary role in the excretory system is to filter blood, remove waste products, and produce urine.

### Structure of the Kidney

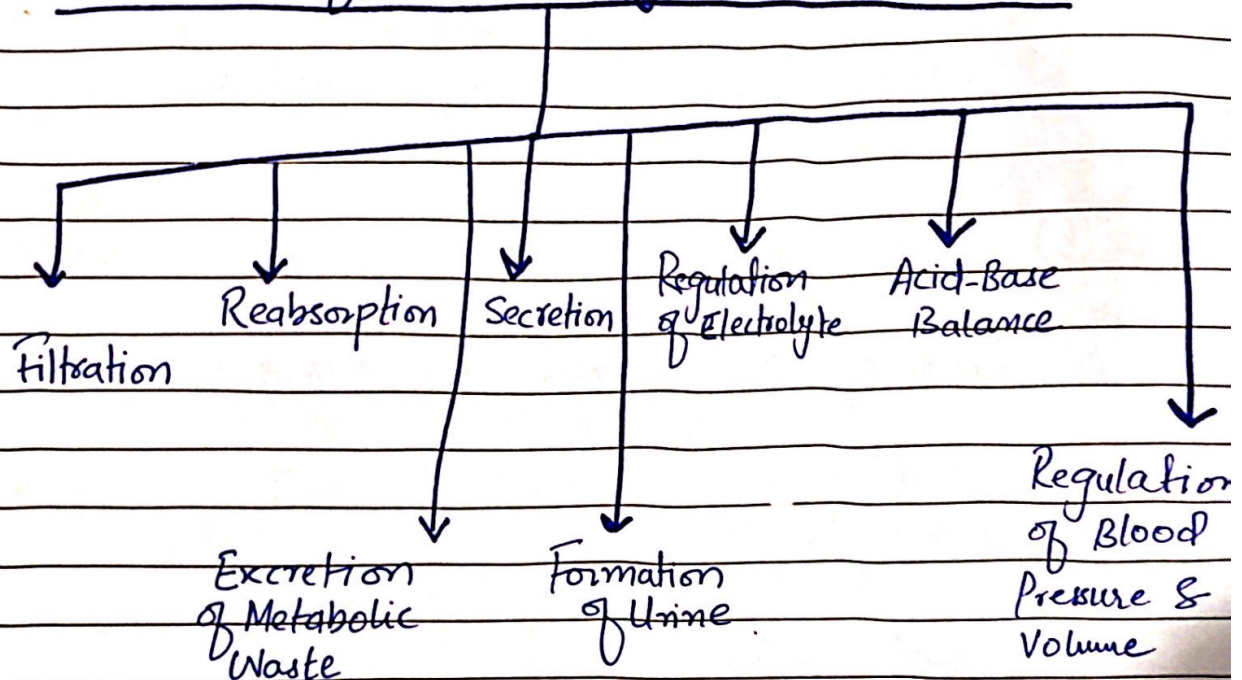
Each kidney contains approximately one million units called nephrons. Each nephron consists of:

**Glomerulus:** A network of capillaries where blood filtration begins

**Bowman's Capsule:** A cup-shaped structure that encases the glomerulus

**Tubules:** where reabsorption and secretion processes begin.

### Functions of the Kidney in Excretion



The kidneys play a crucial role of excretion by filtering blood, reabsorption essential substances, secreting waste products, and forming urine. Thereby contributing to the overall homeostasis of the body.

Q4(c)

## Solid Waste Management Methods

Solid waste management involves the collection, treatment, and disposal of solid waste materials generated by human activities.

Effective management is essential for minimizing environmental impact and promoting public health. Various methods are employed in solid waste management.

### (i) Landfills

Landfills are designated areas where solid waste is disposed by burying it. Modern landfills are engineered to minimize environmental impact.

### (ii) Incineration

Incineration involves burning solid waste at high temperature, reducing its volume and generating energy.

### (iii) Recycling

Recycling involves collecting, processing, and reusing materials such as paper, glass, plastic, and metals.

## 1) Composting

Composting is a biological decomposition of organic waste (such as food scraps & yard waste) into a nutrient-rich soil amendment.

## 2) Anaerobic Digestion

Anaerobic digestion is a process where micro-organisms break down organic waste in the absence of oxygen, producing biogas & digestate.

## (vi) Waste-to-Energy (WTE)

Waste-to-Energy facilities convert non-recyclable waste materials into usable heat, electricity, or fuel through processes like incineration, gasification, and pyrolysis.

## (vii) Mechanical Biological Treatment (MBT)

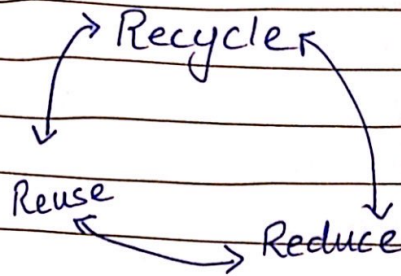
MBT combines mechanical sorting and biological treatment processes to separate recyclable materials and treat organic waste.

## (viii) Sanitary Landfilling

Similar to traditional landfills but with enhanced engineering and management practices to prevent environmental contamination.



## The Ideal Approach



By implementing a combination of these strategies, we can move towards a more sustainable future for solid waste management.

Q4 (d)

### (i) Anaemia

Anaemia is a medical condition characterized by a deficiency of red blood cells or hemoglobin in the blood, leading to reduced oxygen transport to tissues and organs.

**Causes:** It can be caused by nutritional deficiencies (such as Iron, vitamin B12, or folate), chronic diseases, bone marrow disorders, or genetic conditions.

### (ii) Appendicitis

Appendicitis is inflammation of appendix, a small pouch attached to the large intestine, It is a medical emergency that requires

a prompt treatment.

**Causes:** Appendicitis often occurs due to obstruction of the appendix by fecal material, infections, or tumors, leading to bacterial growth and inflammation.

## (ii) Spleen

The spleen is an organ located in the upper left part of the abdomen, under the rib cage. It plays a crucial role in filtering blood, storing platelets, and immune responses.

## (iv) Myopia

Myopia, commonly known as near-sightedness, is a refractive error of eye where close objects are seen clearly, but distant objects appear blurred.

**Causes:** Myopia occurs when the eyeball is too long relative to the focusing power of the cornea, and lens, or when the cornea and lens are too curved.

## (v) Isotones

Isotones are atoms of different elements that have the same number of neutrons but different numbers of protons, resulting in

different atomic numbers and chemical properties.

**Example:** Carbon-12 (6 protons & 6 neutrons) and Nitrogen-13 (7 protons & 6 neutrons) are isotones because they have same numbers of neutrons (6) but different numbers of protons (6 for Carbon & 7 for Nitrogen)

## Section II

Q7 (a)

The radius of the cylinder is = 30cm

The height of the cylinder is = 1m = 100cm

The volume of the cylinder is =  $\pi r^2 h$

$$V = 3.142 \times (30)^2 \times (100) \text{ cm}$$

$$V = 282743.1 \text{ cm}^3$$

Q7 (b)

Average age of the three boys is 15 years

$$\frac{3x + 5x + 7x}{3} = 15 \rightarrow \text{eq (1)}$$

Simplify:

$$\frac{15x}{3} = 15$$

$$5x = 15$$

$$\boxed{x = 3}$$

Age of the youngest boy =  $3x$   
 $x=3$

$$3(3) = 9 \text{ years}$$

Therefore, the age of youngest boy is 9 years.

Q7

(C)

(i)  $8, 19, 52, 151, 447, \boxed{1336}$

$$\begin{array}{ccccccccc} & \uparrow & \uparrow & \uparrow & \uparrow & \uparrow & \uparrow & & \\ & 11 & 33 & 99 & 296 & 889 & & & \\ & & \downarrow & \downarrow & \downarrow & & & & \\ & & 3 \times 11 & 3 \times 33 & 3 \times 99 + 1 & & & & \end{array}$$

$$296 \times 3 + 1 = 889$$

$$447 + 889 = \boxed{1336}$$

(ii)  $11, 13, 17, 19, 23, \boxed{29}$

- Series consists of prime numbers
- Prime number: A number that can be divided exactly only by itself and 1
- The next prime number after 23 is 29

Q6(a)

Given:

The ratio of blocks A : B : C : D is 4 : 7 : 3 : 1

The number of 'A' blocks is 50 more than the number of 'C' blocks

$$A = 4x, B = 7x, C = 3x, D = 1x = x$$

⇒ "A" blocks is 50 more than the number of "C" blocks

$$4x - 3x = 50$$

$$x = 50$$

⇒ The number of "B" blocks =  $7x = 7(50) = 350$

Q6(b)

Original cost of 80 \$

Apply a 15% discount

$$\text{Discounted} = 80 - (0.15 \times 80)$$

$$= 80 - 12$$

$$\text{D.P} = 68$$

Apply 10% Sales tax

$$\text{Sales tax Amount} = 0.10 \times 68$$

$$= 6.8$$

For final price adding sales tax to discounted price

$$\text{Final Price} = 68 + 6.8$$

$$\boxed{F.P}$$

$$\boxed{= 74.8\$}$$

Q6(c)

Given:

$$\text{Distance} = 42 \text{ Km}$$

$$\text{Average Speed} = 36 \text{ Km/hr}$$

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\text{Time} = \frac{42 \text{ Km}}{36 \text{ Km/hr}}$$

$$T = 1.1667 \text{ hr}$$

$$\text{Conversion: } 1.1667 \times 60 \text{ mins} = 70 \text{ mins} = 1 \text{ hour } 10 \text{ mins}$$

⇒ The train departs at 4:00 PM

add 1 hour 10 mins to 4:00 PM

$$4:00 + 1 \text{ hour } 10 \text{ mins} = \boxed{5:10 \text{ PM}}$$

Q 6(d)

(i) *teninsuperted* = *superintented*

(ii) *hweti* = white