

Question #1:-

(a) "Artificial Intelligence is the new electricity". Justify with your opinion.

I. The AI Revolution - New Electricity:

The revolutions of artificial intelligence (AI) are transforming the world in various aspects. Just like the electricity, which transformed the world in 20th Century, AI is also having similar impacts on the daily life, work life and interaction of people.

II. The Impacts of AI, Similar To Electricity:

The impacts of AI are similar to the electricity. It is affecting various sectors:

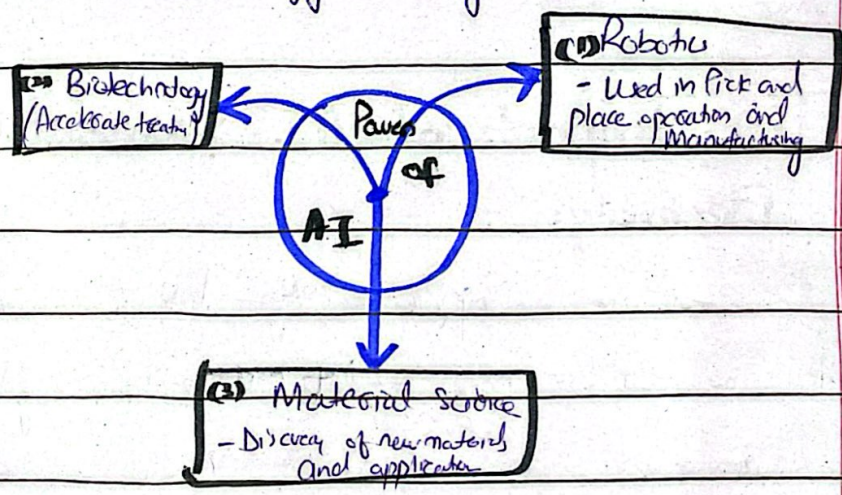
I. Health Care Sector: The discovery of drugs using AI and diagnostics are saving lives and improving treatment. As, the electricity revolutioned health industry in the past.

II. Finance: As the electricity generation contributed to finance by increasing the jobs and creating productive growth so did the AI. The AI-driven fraud detection reduce the risk of financial loss.

III. Transportation: Electricity enhanced the transportation system with the inclusion of electric vehicles so did the AI by introducing self-driving cars.

III. The Power of AI as Enabling Technology:

Just as electricity powered factories and communication network, AI is also a foundational technology offering services.



IV. Unlocking Economic Growth and Opportunities:

Just the way electricity led to economic growth so did the AI, by.

AI Growth

By automating routine tasks, productive gains are possible.

Job creation in the field of AI development, Robotics, and maintenance.

Foster innovation in sectors which drive economic growth.

Some Challenges Ahead with AI:-

Though AI offers tremendous opportunities, it still encompasses severe challenges.

Challenges

Critical ethical concerns need to be addressed regarding privacy.

Educating the people about accurate use of AI.

Regulatory framework regarding the development.

So, AI is transforming the world like the electricity did in the past. Therefore, it is termed as new electricity in sectors like Healthcare, Education, Economic, and medical field. However, certain challenges exist with AI which need to be addressed.

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(b) CPU is brain of computer, how it resembles human brain in working.

Humans and computers have brain-
The brain of human is natural while that of computer is artificial. However, the working of both brains is same in some aspects. Human brain works through neurons while computer's brain works with wires connected to IC's and related components.

Similarities in the Working of CPU (Central Processing Unit) and Human Brain:

Both CPU and Brain are the central processing units that receive, process, and transmit information. Following are key similarities in the working of CPU and brain:

I. Communication Process:

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CPU and brain rely on electrical signals for communication of signals. Neurons in human brain transmit information via the electrochemical signals while the CPU uses electrical signals to move data between its components.

II. Complex Structure of Network:

The brain has a vast network of neurons while the CPU consists of a complex network of ^{electrical} wires and transistors.

III. Memory Storage System:

The brain uses long-term and short-term memory for storing information. On the other hand, CPU relies on Random Access Memory (RAM); Read only Memory (ROM) and other storage devices, for permanent and temporary storage.

IV. Some Key Difference Between CPU and Human Brain:

Although CPU has similarities with human brain regarding certain purposes, however there exists key differences-

Human Brain

CPU

It is a biological organ.

It is a man-made system.

It has ability to learn, adapt and make changes.

It requires instructions and programming for new tasks.

It ~~considers~~ perceives self-awareness and consciousness in performing multiple tasks.

It is not efficient in performing multiple tasks.

To sum up, brain and CPU share some similarities - However, brain surpasses CPU when considering the consciousness and self-awareness feature.

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(C) What do you mean by balanced diet? Deficiency of Vitamins A, B and C can result into what type of imbalance in human body?

Understanding the Concept of Balanced Diet:

A balanced diet is defined as a diet that provides the body with all the essential nutrients, proteins, carbohydrate, fats, and Vitamins, which are essential for proper functioning of body. A balanced diet helps fighting against chronic disease, and improves overall health.

Components of Balanced Diet:-

A balanced diet contains following components for the growth and development of body.

I- Carbohydrates:

Carbohydrates are the main source

of energy. They come in simple form i.e.

Sugars and in complex form i.e. Starch and fibre. It is found in vegetables, whole grains, fruits and vegetables.

II- Proteins:

Proteins are essential to build and repair tissues in the body including bones, muscles and skin. They are formed of amino acids, essential for growth. They are found in fish, egg, dairy products and nuts.

III- Fats:

Fats are required to provide energy and absorb vitamins. They are generally saturated fats (unhealthy and solid fat) and unsaturated (healthy and liquid fats). They are generally found in fish, meat, coconut oil, olive oil and seeds.

IV- Vitamins:

Vitamins are essential nutrients to support various bodily functions including growth, immunity and

energy - They are either fat-soluble vitamins or water-soluble vitamins. Fruits, vegetables, Eggs, and meats are the sources of vitamins.

V. Minerals:

Minerals are essential for growth, maintenance and for nerve and muscle function.

They are either macro ^{minerals} or micro ^{minerals}.

Generally found in nuts, seeds, ^{and} dairy products.

Results of Deficiency of Vitamins:

(1) Vitamin A

- ⊙ Night Blindness
- ⊙ Permanent Blindness

⊙ Vitamin E

- ⊙ Fatigue
- ⊙ Poor wound healing
- ⊙ Joint pain and swelling
- ⊙ Skin Issues

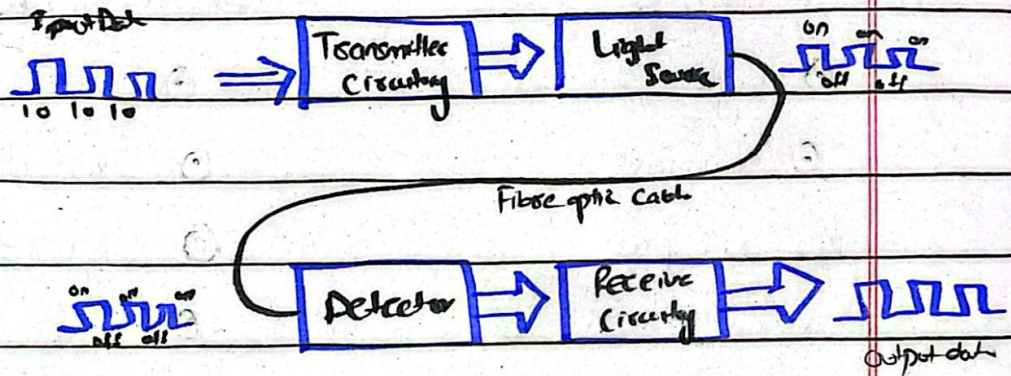
(2) Vitamin B

- ⊙ Fatigue and weakness
- ⊙ ~~Skin~~ ^{Problems} in Nervous system
- ⊙ ~~Weak digestive system~~ ^{Digestive system issue (Diarrhea)}
- ⊙ Heart disease.

(D) Discuss working of Optical Fibers- What is GPs? How 2D and 3D locations are measured by Satellites?

"Optical Fibre refers to technology which transmits information as light pulses along a hollow glass tube or fibre- It works on the phenomena of total internal reflection."

Working of Optical Fibers:



Input data in the form of electrical signals is given to transmitter circuitry, it converts it into light signal with the help of light source (LED). This light beam is then carried to destination

circuitry with the help of fibre optic cables then the information is transmitted back to electrical signal by a receiver circuit. It has a photo-detector which measures the angle, phase, frequency and magnitude of optic field.

What is GPS:-

Global Positioning System (GPS) is a satellite-based navigation system that is used to provide geographical location and time information to the users on Earth or the device. It works by containing 24 satellites orbiting the Earth, which transmit signals to receivers of GPS on Earth.

Measurement of 2D and 3D location by Satellite:

I. 2D Location:

It is a method named Trilateration. The receiver of GPS calculates their position by measuring the distances of at least three

satellites - Their interactions form 2D location on ground

II- 3D Location:

It is named as trilateration - It is used to determine longitude, latitude and altitude - GPS receivers need to measure the distances of atleast four satellites - Their interaction forms a 3D position -

Question #2:

Why atoms form ^{chemical} bonds - Discuss covalent bond in a water molecule -

Chemical bonding refers to strong electrical force of attraction between the atoms or ion in the structure -

Reason of Formation of Chemical Bonds:

Atoms form chemical bonds in order

to make their outer electron more stable-

As chemical bonding maximizes their stability with having a full outer electron shell namely valance shell. Atoms which have incomplete valance shell tend to be more reactive. By forming bonds, they either gain, lose or share electrons to attain stability. It leads to lower energy state, making the arrangements more energetically favourable.

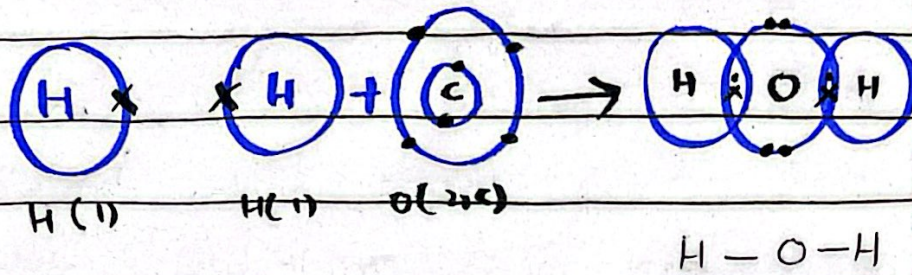
Understanding the concept of Covalent Bond:

When two non-metal atoms combine, they share one, or more pairs of electrons. This sharing of electrons between atoms forms a shared pair of electron called covalent bond or bond pair.

Covalent Bond in Water Molecule:

The formation of water molecule (H_2O) is a classical example of

Covalent bond-



As oxygen has 6 electrons in its valance shell and it needs two ^{more} for achieving stability. On the other hand, each hydrogen atom has one electron in its valance shell and needs ~~two~~ ^{seven} more to achieve stability. To achieve stability, each hydrogen atom shares its single electron with oxygen atom. This mutual sharing of electron forms two covalent bonds-

(B) What is Doping? Discuss different types of ceramics

Doping in Semiconductors:

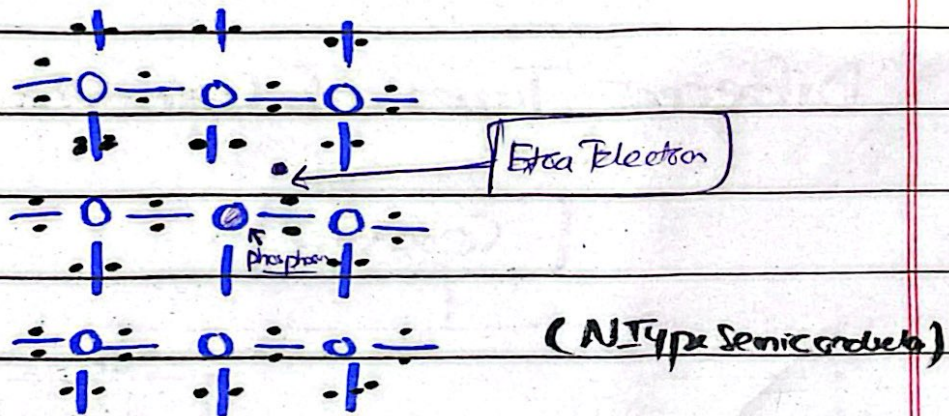
Doping is defined as the process of intentionally adding impurities into a semiconductor material to change its

chemical properties. These impurities, known as dopants, are usually the elements of group III and V of periodic table.

Types of Doping in Semiconductors

I. N-Type Semiconductors:

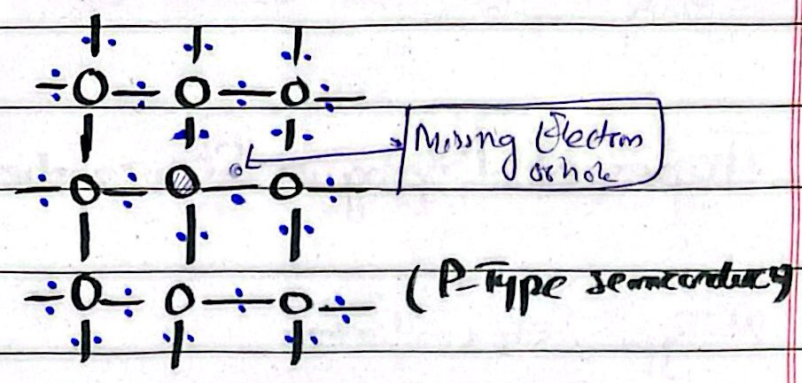
It is created when the dopant has five electrons in its valance shell. It usually involves Group V members. But most common is Phosphorus (P). It creates excess electrons making the semiconductor negatively charged.



II. P-Type Semiconductors:

It happens when the dopant has three electrons in its valance shell. It involves adding group III element. Boron is most common.

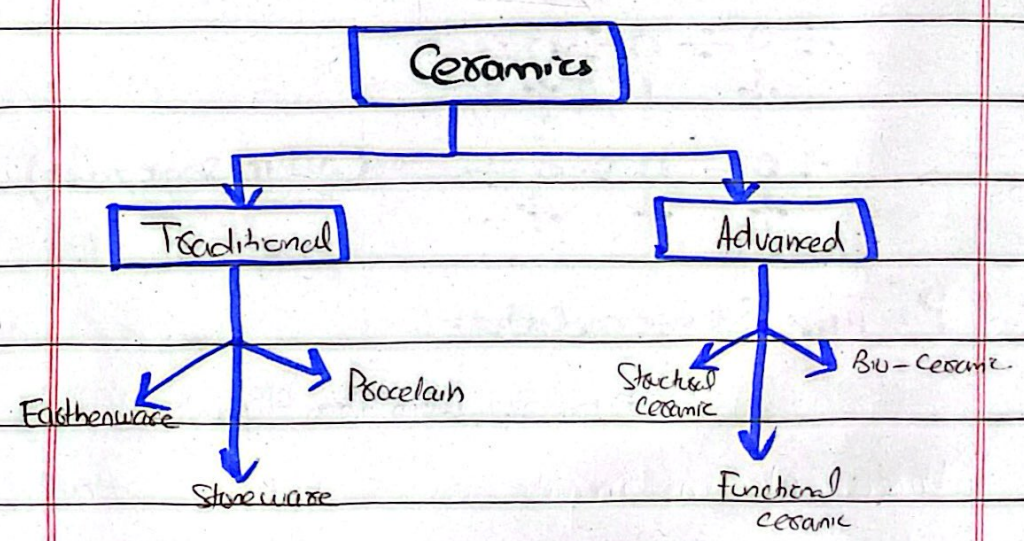
Due to the absence of electrons it creates holes, making the semiconductor positively charged



What are Ceramics:

A ceramic is an inorganic, non-metallic solid made up of clay that has been shaped and then hardened by heating at high temperatures

Different Types of Ceramics:



I- Traditional Ceramics:

Traditional ceramics are those which are made from natural materials such as clay, silicate etc, which are processed and fired at high temperature. They are:

(A) Earthenware:

Porous and low fired ceramics used for pottery, bricks and tiles.

(B) Stoneware:

Dense and high fired ceramics used for table ware, and art objects.

(C) Porcelain:

Fine grained and translucent ceramic known for their strength and beauty to be used in art and electrical applications.

II Advanced Ceramics:

Ceramics which are made from synthetic material or refined natural materials.

I. Structural Ceramics:

High strength ceramics used in aerospace, automotive and industrial applications.

II. Functional Ceramics:

Ceramic having special mechanical, electrical or optical properties as silicon.

III. Bioceramics:

Ceramics used in medical implants and prosthetic.

(c) What is Polio? What are the challenges in eradication of Polio in Pakistan.

Understanding Polio:-

Polio is a highly infectious viral disease which mainly affects young children.

It is caused by a polio virus which invades the nervous system and causes

paralysis.

Symptoms of Polio:

Initial symptoms are:

- ⊙ Fever
- ⊙ Fatigue
- ⊙ Headache
- ⊙ Vomiting
- ⊙ Stiffness in Neck
- ⊙ Pain in Joints.

It invades the nervous system and can cause total paralysis.

Ways Through which Polio Spreads:

The polio virus spreads through:

- Human Faeces
- Poor Sanitation and Hygiene areas
- Contaminated food and water
- Improper Sewage system

Challenges in Eradication of Polio ⁱⁿ Pakistan:

The two countries which have never stopped transmission of Polio are **Afghanistan and Pakistan**. In 2024, there were total **60** polio virus cases in both countries, with **34** from Pakistan.

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and 17 from Afghanistan. Eradicating polio from Pakistan has proven to be a significant challenge due to following factors:

(A) Security Issues:

Pakistan faces security challenges, including terrorism and political instability. The terrorist attacks on the workers of polio vaccine hinder the access to those affected areas. As recently in December, attacks on Pakistan polio team kills vaccinators in Kasak of Khyber Pakhtunkhwa. These security issues make it difficult to reach the children with polio vaccine.

(B) Mistrust and Hesitancy Towards Vaccination:

The misinformation and rumors about the vaccine continue to circulate especially in the far-flung areas, leading to hesitancy and refusal from parents. It is further linked with lack of trust in the healthcare system of country. As in 2024,

Inactivated Polio Virus (IPV) was first time injected in Karachi with almost 27k people refused. (Down)

(c) Population Movement and Migration:

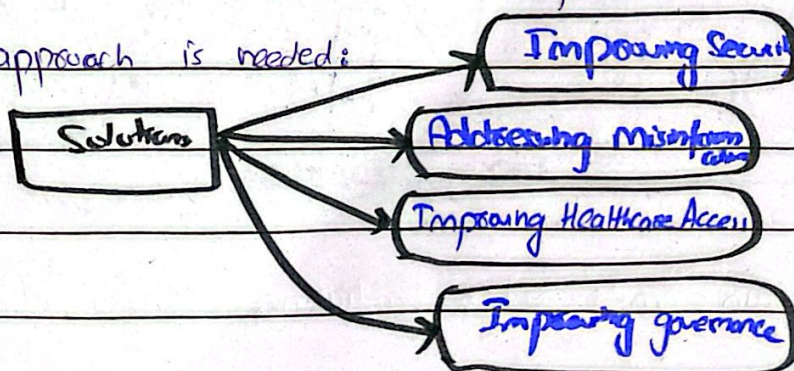
The movement of people within and across borders ~~can~~ facilitates the spread of polio virus, making it difficult to contain outbreaks.

(d) Political Instability and Governance Issues:

The weak governance structure and political instability ~~can~~ hinders the effective implementation of policy to prevent polio virus spreads.

Suggestions to address challenges:

To overcome challenges, a multi-pronged approach is needed:

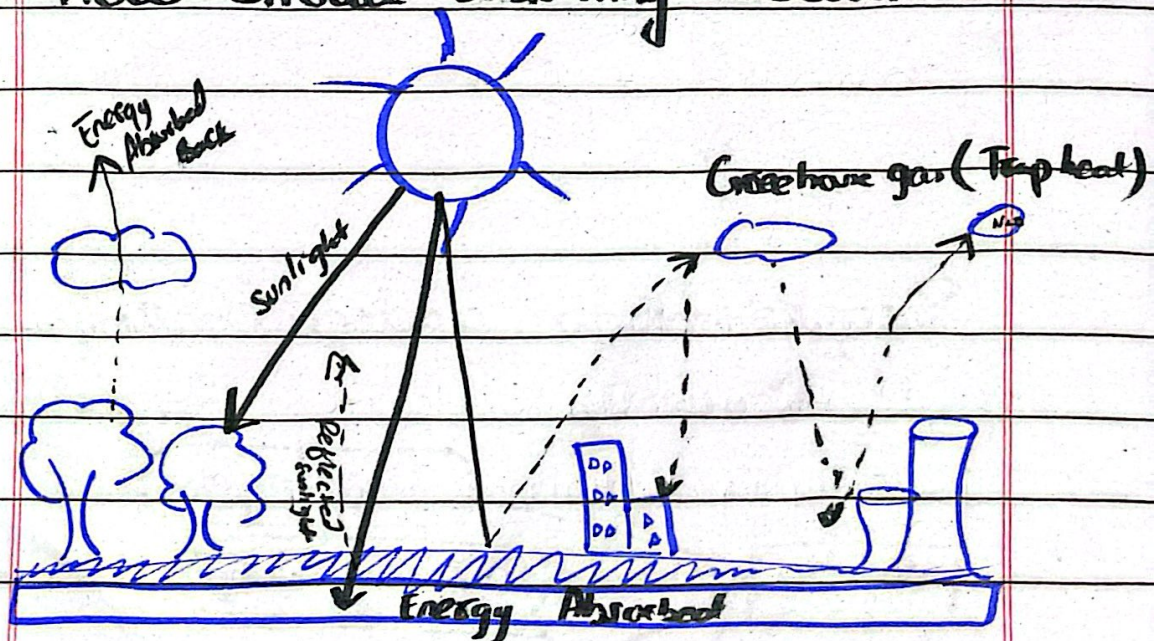


(D) State some of merits and demerits of global warming

Defination of Global Warming:

Global Warming is defined as the rapid increase in the average surface temperature, particularly the emission of greenhouse gas. While it presents some benefits, the overwhelming consequences weigh heavily on the earth.

How Global Warming Occurs:



The sun emits solar radiations, which travel

through space and earth - Some of it is absorbed and some as CO_2 , CH_4 and H_2O trap - This trapped heat increases the earth temperature.

Merits of Global Warming:

I. Longer Growing Season:

In some regions, warmer temperature has increased the growing season for some agricultural activities to grow. As Intergovernmental Panel on Climate Change (IPCC) 5th assessment report acknowledged it -

II. Improved Shipping Routes:

Melting ice in the arctic region could open new shipping routes, reducing the transportation cost. National Snow and Ice Data Centre (NSIDC) reports on the decline of ice -

III. Reduced Winter Deaths:

Warmer winters could lead to fewer

deaths in some region-

Demerits of Global Warming:

Global warming has severely impacted the life on earth. Following are the demerits of global warming:

I. Extreme Weather Events:

The increase in the temperature of earth and more frequent and intense heatwaves have resulted in floods, droughts and storms. In 2022, Pakistan faced severe flood with a loss of \$30 billion.

II. Rising Sea levels:

The sea level has risen which resulted in the coastal erosion. It lead to the displacement of people living near coastal areas. IPCC Fifth Assessment Report projects significant sea level rise due to thermal expansion of

water and melting glaciers - Himalaya
mountain ice also impacted.

III. Disrupted Ecosystems:

The ecosystem disrupted severely as there is a loss of biodiversity, habitat destruction and species extinction as reported by World Wildlife Fund (WWF)

IV. Water Scarcity:

Due to altered precipitation patterns, there is a reduction in the availability of water. The United Nations (UN) projects that global warming may reduce water availability in many regions.

V. Impacts on Human Health:

The World Health Organization (WHO) reports that global warming may increase heat-related illness particularly respiratory problems as evidenced from the Smog level in Lahore where AQI was

hazardous

VI. Economic Loss:

As noted by International Monetary Fund (IMF) global warming has caused certain economic losses in the form of infrastructure damage, agricultural loss and tourism. The 2022 floods in Pakistan caused a loss of \$30 billion.

It's crucial to consider that the downside of global warming is more than its benefits. So, necessary actions are required to save the world from deadliest impacts of global warming.

Section II

Question # 3:

(a) Boat having a length ---

Given Data:

Dimensions of boat are:

$$(1) \text{ Length} = 2\text{m}$$

$$(2) \text{ Breadth} = 1\text{m}$$

$$\text{Boat sinks} - \text{len} = 0.01\text{m}$$

To find:

Mass of man = ?

Solution:

(1) Volume of water displaced.

$$\text{Volume} = \text{Length} \times \text{Breadth} \times \text{Depth}$$

$$= 2\text{m} \times 1\text{m} \times 0.01\text{m}$$

$$\text{Volume of water} = 0.02\text{m}^3$$

displaced

(2) Mass of water displaced.

$$\text{Mass of water} = \text{Density of water} \times \text{Volume of water}$$

$$= 1000 \text{ kg/m}^3 \times 0.02$$

$$= 20\text{kg}$$

According to Archimedes' principle,

mass of water displaced is equal to

mass of man as 20kg.

(B) On selling 17 balls -

Given Data:

$$\text{Sold balls} = 17$$

$$\text{Selling price} = \text{Rs. } 720$$

$$\text{Loss} = 5 \times \text{Cost price}$$

To Find:-

$$\text{Cost price of a ball} = ?$$

Solution:

$$\text{Let, cost price} = \text{CP}$$

$$\text{So, total price of 17 balls} = 17\text{CP}$$

$$\text{Selling price} = \text{SP}$$

$$\text{Loss incurred} = 5\text{CP} \quad \text{--- (1)}$$

So,

$$17 \times \text{CP} - 720 = 5 \times \text{CP}$$

$$17\text{CP} - 5\text{CP} = 720$$

$$12\text{CP} = 720$$

$$\text{CP} = 720/12$$

$$\text{CP} = 70$$

The cost price of one ball is Rs. 70

(c) A man is 24 yrs ...

Let the present age of son be 'S'

So,

Father's age will be = $S+24$

After 2 years

$$F = S+24+2 = S+26 \quad \text{--- (1)}$$

and will be two

$$F = 2(S+24) \quad \text{--- (2)}$$

$$S+26 = 2(S+24)$$

$$S+26 = 2S+4$$

$$26-4 = 2S-S$$

$$22 = S$$

The present age of son is 22 years old.

(1) Rashid and Kamran ...

(1) Rashid typed 32 pages in 6 hours.

So, his rate is $\frac{32}{6}$ page $\frac{16}{3}$ per hr

(2) Kamran typed 40 pages in 5 hr

So rate = $\frac{40}{5}$

L-CM of Sand 6 = 30

Converting the rate to pages per 30 hours -

$$\textcircled{1} \text{ Rashid's rate} = \frac{18}{6} \times \frac{36}{1}$$

$$= 160 \text{ pages per 30 hours.}$$

$$\textcircled{2} \text{ Kamran's rate} = 8 \times \frac{30}{1} = 240 \text{ pages per 30 hours}$$

$$\text{Total rate} = 240 + 160 = 400 \text{ pages per 30 hours}$$

$$\text{Time taken} = \frac{\text{Total Pages}}{\text{Combined Rate}}$$

$$= \frac{110}{400/30}$$

$$= \frac{110}{13.33}$$

$$\text{Time taken} = 8.25 \text{ hours.}$$

Question #4:

(a) Saqib took a loan - - - -

Given: Principal amount = 1200
 $SI = \text{RS. } 432$

To Find:

Rate of $\frac{\text{int}}{\text{yr}} = R = ?$

Solution:

Simple Interest = $\frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$

$$SI = \frac{P \times R \times T}{100}$$

Here $R = T$

$$SI = \frac{P \times T^2}{100}$$

$$\frac{100 \times SI}{P \times T} = R^2$$

$$R = \sqrt{\frac{100 \times SI}{P \times T}}$$

$$R = \sqrt{\frac{100 \times 432}{1200 \times R}}$$

$$R = \sqrt{36R}$$

Squaring both side. $R^2 = \sqrt{36R}$

$$R = \sqrt{36} = 6\%$$

(B) Avg. visitors ...

$$\text{Avg. Sunday} = 510$$

$$\text{Other day} = 240$$

$$\text{Total days} = 30$$

$$\text{Total visitors on Sunday} = 5 \times 510 \quad (\text{5 Sunday in month})$$

$$\text{" " other days} = 0 \times 240$$

$$\begin{aligned} \text{Total visitors in month} &= \text{Total visitors on Sunday} + \text{On other days} \\ &= 5 \times 510 + 0 \times 240 \end{aligned}$$

$$\text{Average} = \frac{510 \times 5 + 240 \times 0}{30}$$

$$= \frac{2550 + 0}{30}$$

$$\boxed{\text{Average visitors} = 285}$$

(C) Ratio of Numbers.

$$40\% \text{ of } x = \frac{2}{3} \text{ of } y$$

$$\frac{40}{100} (x) = \frac{2}{3} (y)$$

$$\frac{40x}{100} = \frac{2y}{3}$$

$$3(40x) = 2y(100)$$

$$120x = 200y$$

$$\frac{x}{y} = \frac{200}{120} \times \frac{5}{3}$$

$$x : y = 5 : 3$$

(D) Probability of even number

$$\text{Total outcomes} = 6 \times 6 = 36 \text{ (Two dice)}$$

Favourable outcome for the

product to be even number:

$$\therefore (1,2), (1,4), (1,6), (2,1), (2,2), \dots, (2,6)$$

$$(1,2) \quad (1,4) \quad (1,6)$$

$$(2,1) \quad (2,2) \quad (2,3) \quad (2,4) \quad (2,5) \quad (2,6)$$

$$(3,2) \quad (3,4) \quad (3,6)$$

$$(4,1) \quad (4,2) \quad (4,3) \quad (4,4) \quad (4,5) \quad (4,6)$$

$$(5,2) \quad (5,4) \quad (5,6)$$

$$(6,1) \quad (6,2) \quad (6,3) \quad (6,4) \quad (6,5) \quad (6,6)$$

The favourable outcome = 18 with even product

$$\text{So, } P = \frac{18}{36} = \frac{1}{2} = 0.5$$

i.e. $\boxed{50\% \text{ chance}}$