

SECTION - A

~~1 page~~
for each
question

Q. No - 2

(a) Age of universe is estimated to be 13.8 billion years. How was it estimated?

(5 mark question)

Mainly, the age of the universe is estimated by two prominent methods. First is by looking at the age of oldest star in the universe. Second method measures the rate of expansion of universe and extrapolate it back to the big bang theory.

(a) oldest stars

Oldest stars, known as globular clusters were formed shortly after the big bang. The lifecycle of star depends upon its mass. High mass stars are much brighter than low mass stars; thus they rapidly burn through their supply of hydrogen-fuel. This is the base for astronomers to estimate the age of star and ultimately the universe.

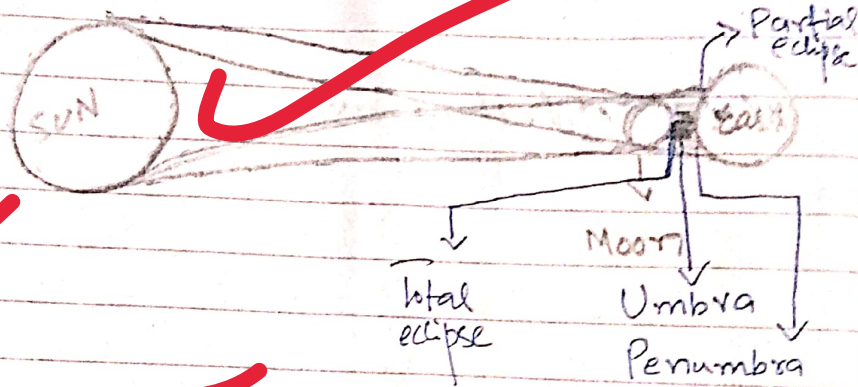
(b) Extrapolating back big bang
Hubble's law is applied here which says all galaxies are moving away with certain receding speed which is written as $(v \propto d)$, that is evidenced by

• Discuss it in more detail

red shift. Ultimately, there will be big crunch, where it will turn to singularity.

(b) Explain the phenomenon of Solar Eclipse.

Solar eclipse occurs when moon comes in between sun and earth. That phenomenon is depicted with a diagram below:



Explaining the diagram:

The surface of earth parallel to the moon will experience total eclipse which is called Umbra. In that area light from the sun is blocked the most by the moon. Whereas, the rest of surface will experience partial eclipse which is known as Penumbra.

A 5 marks answer should be at least on 2 sides of a page.

(d) Explain the Global Positioning System and its applications:

Global positioning system is a navigation system which helps the users to determine their position from anywhere in the world, along with their velocity and time, regardless of weather conditions.

Application of global positioning system.

Global positioning system can be applied in variety of fields. Currently, the system is used by all stakeholders of the society, the military, civil and commercial.

Global positioning system is U.S. owned system it consist three segments: The space segment, the control segment, and the user segment.

Space Segment

There is minimum collection of 24 satellites for a GPS to be operational. Currently, there are 32 in the orbit, 24 are operational and 8 spare.

GPS satellites orbit in medium earth orbit (MEO), each satellite circles the earth twice a day. Each satellite contains a computer, an atomic clock and a radio. With understanding of its own orbit and the clock, it continuously broadcast its changing position and time

Control Segment

The GPS control segment consists of a global network of ground facilities that tracks the GPS satellite, monitor their transmission, perform analysis and send command and data to the constellation. The current operational control segment includes a master control station, an alternate master control system, 11 command and control antennas and 15 monitoring sites.

User Segment

GPS receivers are composed of an antenna, tuned to the frequencies transmitted by the satellites, receivers-processors, and a highly stable clock

Draw the diagram as well

Q. No - 3

(a) What is a weather cycle?
Describe its causes and parts.

Merriam Webster define weather cycle as periodic recurrence of some feature of the weather. That recurrence is caused by movements and chemical changes in air pressure, ocean currents, sunlight and other natural factors, weather cycles have been fairly predictable, as evidenced by the seasons of the year.

Parts of weather cycle.

There are six main part of weather cycle, which include, temperature, atmospheric pressure, cloud formation, wind, humidity and rain. A small change to any of these parts can create a different weather pattern.

Temperature:

Describes how hot or cold the atmosphere is.

Atmospheric pressure:

It is the result of the weight and density of the clouds:

These are the visible masses of water vapours in our atmosphere.
wind:

It is a movement of air in the sky which is caused by different air pressure in our atmosphere.

Humidity:

It describes the amount of water vapour in the air.

Rain:

It happens when water vapours fall from clouds in the sky.

Parts of weather cycle.

Attempt and upload a single qs at a time. Work on the pointed

(b) what is 'Air Pollution' Discuss its causes and measurement methods. Name the countries with highest and lowest percentage of it.

Air pollution occurs when the air contains gases, dust, and fumes in harmful amount. Earth is surrounded with atmosphere which contain mixture of gases when the pollutant enter in the atmosphere in such concentrations which remains harmful to the human health, plants, animals, aquatic life, micro organisms and to the environment. In other words, when the amount of waste entering an area of the atmosphere exceeds the atmosphere's ability to disperse or break down pollutants, problems result.

Pollutant are substances which cause air pollution. There are primary and secondary air pollutants. Primary pollutants arises directly from its sources and secondary pollutants arises from the primary pollutants as a result of chemical reaction such as, Acid rain, Sulphuric acid reaction with H_2O , Nitric acid reaction with H_2O .

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Causes of air pollution

There are various causes which have accumulated over the time and caused the menace of air pollution.

Population Explosion:

According to US ^{census} bureau of statistics there were 3 billion people in 1960 and 6 billion in 2000's. Currently, 8.1 billion that has caused massive industrial exploitation which in turn has adversely impacted environment.

Combustion of fossil fuels:

According to Inter Governmental Panel on Climate Change 96% of world's total energy requirement is met by burning fossil fuels such as, coal, oil, diesel and natural gas.

Massive deforestation

According to global forest watch more than 10 million hectares have been deforested in the world over the past 3-4 years.

Rapid urbanization.

According to UN report 2015, 54% of global population will be in urban settlements till 2026.

Wild fires

On yearly basis the number of wildfire incidents are increasing

Solid waste

As per United Nations Environment Programme report 2023, more than 350 million tonnes of waste is produced annually in the world.

Rapid industrialization.

Industries cause volatile organic compound and emit various gas harmful gases such as, CH_4 , CO_2 and N_2O .

Volcanic eruption:

Volcanic eruption emits Sulphuric acid, Ash, HCl and heat.

Electric Appliances

Electric appliances such as, Air conditioners and refrigerators cause chlorofluro carbons in the environment.


Measures to mitigate air pollution

Though atmosphere has self-cleaning processes such as dispersion, gravitational settling, absorption, rain-washout to cleanse the atmosphere. Hence, humans too have to put efforts to mitigate air pollution. Such as, using unleaded petrol, use fuel with low sulphuric and ash content, plant trees, establish waste disposal centres outside of the city and safe and secure.

treatment of waste. Mechanical devices should be used to mitigate air pollution such as, scrubbers, cyclones, bag houses in manufacturing processes.


Countries with high and low air pollution.

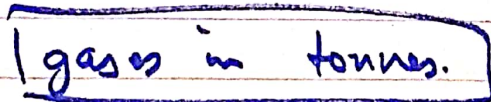
USA 

china 

India 

Brazil 

others 

 gases in tonnes.

(C) write a comprehensive note on 'pole reversal' of Earth.

Pole reversal also known as geomagnetic reversal, this phenomenon occur when suddenly earth's magnetic field change direction drastically.

Earth's magnetic field is region around the planet where magnetic forces can be detected. It is generated by the movement of molten iron and other metals in the earth's core. In pole reversal earth's north pole becomes south pole and south becomes north pole. this phenomenon occurs at random interval of time it can take million years sometimes and thousand years other times. However, the actual reason of pole reversal is unknown many scientists argue that it happens because of molten iron in the earth's core. when it becomes unstable and start moving in different direction it cause pole reversal. this movement of molten iron cause the magnetic field to flip in opposite direction.

There are various effect of pole reversal such as, disruption of navigation systems, increased

radiation exposure, change in climate and power grid disruption. Currently, earth's magnetic field is weakening and some scientist believe we may be on the verge of pole reversal, however, its difficult to predict pole reversal.

(d) Describe different Ocean current, their cause and effects on climate.

Ocean currents happen with the combination of various elements and impact movement of water in the Ocean. Mainly, wind, tides and Coriolis force come together and cause ocean current. There are different ocean currents as discussed below:

Surface current

These currents are in upper layer of ocean around 400 meters deep, they are driven by ~~some~~ wind and are responsible for transporting heat, nutrients, and marine life across the ocean.

Deep water currents:

Flow in deeper layers of the ocean and are driven by changes in density caused by temperature and salinity.

Tidal currents

These currents flow in response to gravitational pull of the moon and sun causing tides to rise and fall.

Upwelling Currents

These currents bring nutrient rich water on the surface and support growth of marine life.

Causes of Ocean Currents

There are various causes to the ocean currents few of them are discussed below:

Wind:

Wind is one of the primary cause of ocean currents.

Thermohaline Circulation:

This is the changes in temperature and salinity which drive deep-water ocean currents.

Coriolis Force:

This is caused by earth's rotation it deflects moving objects to the right in Northern Hemisphere and left in Southern Hemisphere.

Tides

Gravitational pull of sun and moon causes tides in the ocean.

Effect of Ocean current on climate:

Ocean current have rendered various effect on the climate accumulating over the period.

Heat Transport

Ocean current is responsible to transport heat around the globe. which influence weather as well as climate of the region.

Temperature Regulation:

Ocean current in a way try to balance balance out the temperature of the globe which helps in the mitigation of climatic effect.

Precipitation Pattern

Warm currents induce rain where in cold current lessen the precipitation in the region.

Weather patterns

Ocean current effect the formation of high and low-pressure system, influence regional weather pattern.

Sea level Rise

Ocean current and temperature

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Sea level Rise

Ocean current and temperature

Marine ecosystem
Support growth of marine life

Carbon sequestration.

Helps in sequester carbon dioxide from the atmosphere, mitigating the effect of climate change.

Q. No. 4 - (a)

Note on data storage in a 'USB'. How it is different from the Hard disk?

A USB (Universal Serial Bus) is a portable storage device that allows users to store and transfer data between devices.

A USB stores data using flash memory, a type of non-volatile memory that retains data even when the device is powered off. Some of key characteristics of USB are; Non-volatile, solid state, Portable, Fast data transfer and low power consumption.

There are mainly two types of USB storage, a USB flash drive a small portable device that stores data using flash memory and USB external hard drive a large device that stores data using a

traditional hard drive or solid-state drive.

USB data storage has various advantages such as, convenience, fast data transfer, durable and low cost. It is used as data transfer, data backup, file storage and bootable usb.

USB Vs Hard disk drive (HDD)

Storage	
Flash memory	Magnetic storage
Parts	
Solid state	Mechanical parts
Size	
Small	Large
Power Consumption	
Low	High
Speed of data transfer	
Fast speed.	Slow speed.
Durability	
More resistant to physical shock	
Usage	
used for small to medium size files	used for storing large amount of data.

(c) comprehensive note on food cycle in our body

Food cycle also known as digestive process is a process of which food having a first bite of any food till it changes into a waste. This process involve a chain of steps:

Ingestion:

Food enters the body through the mouth, where its chewed and mixed with saliva that contains enzymes to break down carbohydrates.

Swallowing

A bolus is swallowed down through esophagus into the stomach.

Digestion in small intestine stomach:

Stomach secretes digestive enzymes and acids that break down proteins and fats.

Digestion in the small intestine:

The partially digested food enters the small intestine, where most of the nutrient absorption takes place.

Absorption:

Nutrients are absorbed into the bloodstream through the walls of the small intestine.

Transportation:

Nutrients are transported to the liver for processing and

distribution to the rest of the body.

Utilization:

Nutrients are used ~~for~~ by body for energy, growth and repair.

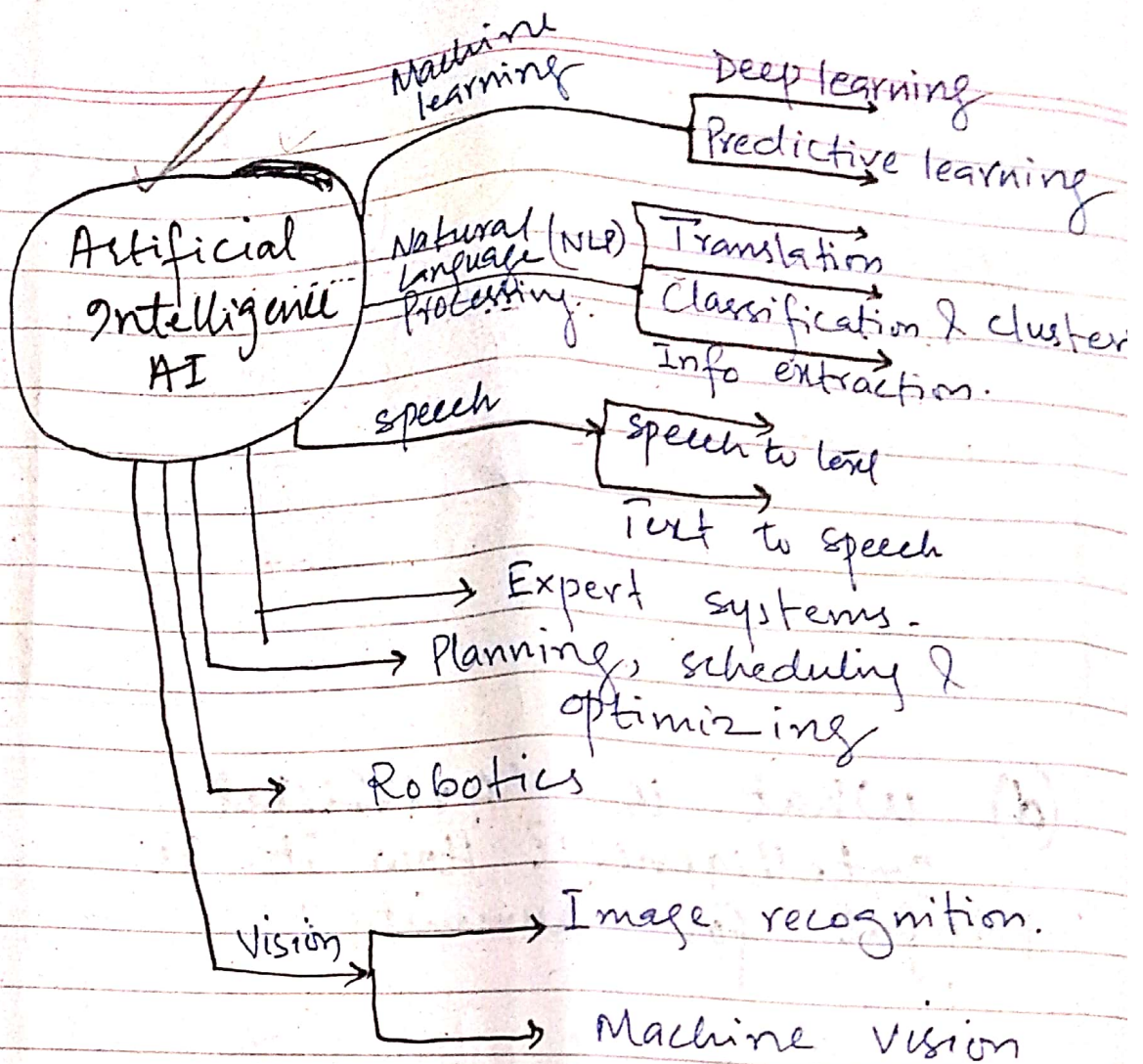
Elimination

waste is eliminated from the body through large intestines, kidneys, and liver.

(d) What is 'Artificial Intelligence'? How it is helpful for humanity?

Artificial Intelligence is the study and engineering of intelligent machines capable of performing the same kind of functions that characterized human thoughts.

John McCarthy coined the term 'Artificial Intelligence' in 1956 defined it as "the science and engineering of making intelligent machines"
machine learning



How AI is helpful for the humanity?

AI can assist human in many ways and in different fields such as, daily life, science, infrastructure design and development, AI and consumers

Q. No - 5 (a)

Explain the concept of diabetes, its causes and classifications in the human body.

Diabetes is a condition that happens when blood sugar (glucose) is too high. It develops when pancreas doesn't make enough insulin or any at all. Glucose in bloodstream needs help of insulin (hormone) to its final destination. when pancreas doesn't produce enough insulin then glucose builds up in bloodstream and cause high blood sugar (hyperglycemia).

Technical term for diabetes is diabetes mellitus another condition shares the same name that is diabetes insipidus, but they are distinct. There are various symptoms of diabetes such as, dry mouth, frequent urination, fatigue, Blurred vision unexplained weight loss, Numbness or tingling in hands and feet.

Causes of Diabetes

When glucose is accumulated in bloodstream it caused the diabetes regardless of its type.

why these glucose levels rise in blood that depend on type of diabetes.

Insulin resistance:

This happens when cells in body muscles, fat and liver do not respond as they should to insulin. This is because obesity, lack of physical activity, diet, hormonal imbalances, genetics.

Auto immune disease

When immune system attacks insulin producing cell in pancreas.

Hormonal imbalances

That is caused by pregnancy

Pancreatic damage

Physical damage to pancreas

Genetic mutation:

Classification of diabetes

Type 1 diabetes:

Symptoms of this kind of diabetes develop ~~over~~ quickly in week to month.

Type 2 Diabetes and Prediabetes

Gestational diabetes

This is temporary kind of diabetes which happens in or during pregnancy.

(b) Describe the different sources of renewable energy. How it is helpful for the environment.

Renewable energy is generally defined as energy that is collected/produced from natural sources available to the humankind such as sunlight, wind, rain, tides, waves and geothermal heat.

Wind power:

Wind turbines are installed and when the wind blow it rotates the blades of turbines which provides the motion movement to turbines.

Hydro power:

Here the turbines are installed on water and flow of water helps turbines to get momentum by this it

electricity.

Solar energy:

Solar panels which are made up of solar cells are exposed to sunlight which converts the solar energy into the electricity.

Biomass and Biofuel:

In this process plants or animal waste is used to generate liquid or direct electricity.

Geothermal energy:

Hot water and steam from deep under ground can be used to drive turbines.

How renewable energy is helpful for environment?

Non-renewable energy emits the unwanted gases in the atmosphere of the earth which pollute the air, land, soil and water, such as Carbon dioxide emission by from the burning of fossil fuels, chloroflouro carbons effect the ozone

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layer whereas renewable energy does not emit any gases. It just utilize already available resources to the humans. Moreover, its sustainable in terms of cost-effectiveness.

(C) Define 'Enzymes'. Describe its types and functions within organism.

Enzymes is specialized organic substance, composed of polymers of amino acids that act as catalyst to regulate the speed of chemical reactions involved in the metabolism of living organisms. The job of enzymes is to catalyze speed of chemical reactions and they are highly specific in their job, a small quantity is needed to catalyze the process. Enzymes are highly sensitive to pH and temperature change. They don't effect the nature of product.

Types of Enzymes:

There are various types of enzymes and each one is responsible for specific task, particular chemical reaction only.

Individual enzymes are named by adding "ase" to the name only trypsin and pepsin are exception.

Functions of Enzymes

Most enzymes are associated with metabolic processes, like digestion and breathing, there are some which are related to blood clotting, healing of wounds, controlling the production of ~~wounds~~ hormones, destroying pathogens and environmental toxins. They are major component in signal transduction and cell regulation, also help in bodily movement with the help of protein. Enzymes also play a vital role in digestion and breathing.

(d) Describe the 'Cell Structure'. Elaborate 7 main function of a Cell in human beings.

A cell is basic structural and functional unit in human body. It consist several organelles, which perform their respective functions. Such as

Plasma membrane is the outermost layer of the cell which provide shape, support and protection to cell, that is made up of protein and lipid. Plant cells also have cell wall over plasma membrane. Cytoplasm that is fluid filled region with 90% of water, provides site and protection to the organelles, most of cellular activities takes part here and this is also known as storehouse of cell. Then, cell has endoplasmic reticulum which is divided into rough and smooth endoplasmic reticulum. Ribosomes are attached with rough endoplasmic reticulum which does protein synthesis and smooth reticulum does fats synthesis. Mitochondria, the powerhouse of cell where energy is produced. Lysosomes, membrane-bound sacs that contain digestive enzymes and help break down waste materials. finally, in the centre, Nucleus where DNA is stored.

Seven main functions of cell.

cell is main functions in the body which are most important for body to function properly.

(i) Metabolism:

Cells does metabolism process

such as respiration, photosynthesis and glycolysis to produce energy and synthesize essential molecules.

(ii) Protein Synthesis:

Cell also does protein synthesis with which are vital for cellular functions i.e enzymes activity, hormone regulation and structural support.

(iii) Cell division:

Cell divides to produce new cell, which is essential for growth, repair, and maintenance of tissue.

(iv) Communication:

Cell communicate with each other through signalling pathways, which helps them to coordinate.

(v) Transport:

Molecules and ions are transported by cells across their membrane.

(vi) Waste Management:

Cells eliminate waste product to maintain cellular homeostasis.

(vii) Response to Stimuli:

Cells response various stimuli, changes in temperature, light and chemicals.

These are the essential functions of cell to keep the body healthy. Any dysfunction or disorder in these functions can lead to various diseases and disorders in human body.

(SECTION - B)

Q - No - 6 (a)

Find the area of a rectangular field whose length is 20 m and its diagonal is 25 m.

To find the area of rectangular field we need the width of the field too. Therefore, we'll find width first, by the use of Pythagorean theorem.

$$d^2 = l^2 + w^2$$

$$25^2 = 20^2 + w^2$$

$$w^2 = 625 - 400$$

$$w^2 = \sqrt{225}$$

$$w = 15 \text{ metres.}$$

Now, we apply the formula for rectangle (the area)

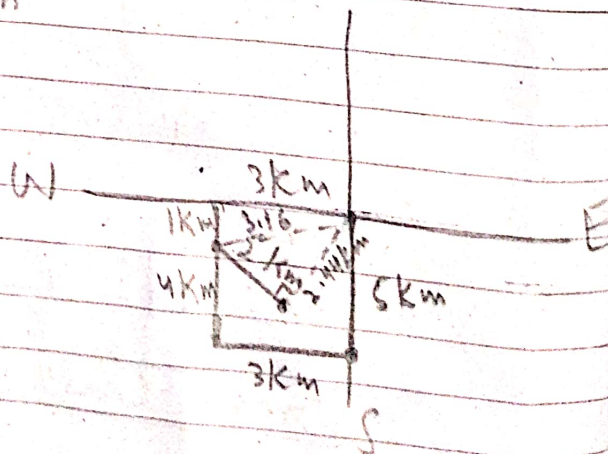
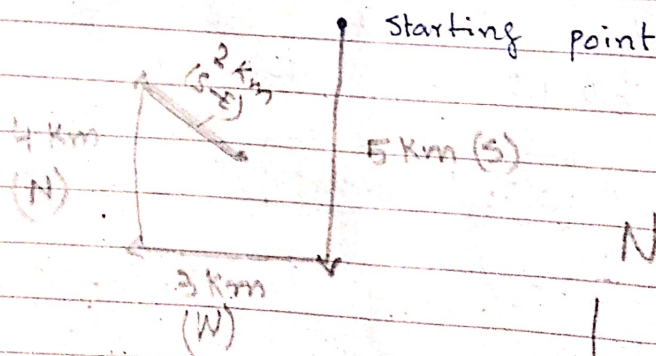
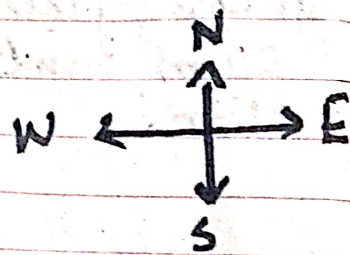
$$\text{Area} = \text{Length} \times \text{Width}$$

$$\text{Area} = 20 \times 15$$

$$\text{Area} = 300 \text{ Square metres}$$

Therefore, the area of rectangular field is 300 Sq metre.

(6) A crow travels 5 km due south, 3 km due West, 4 km due North and 2 km due toward South-East. How far is Crow from its starting point?



(C) Zain, ~~Umar~~ ^{Ali} and ~~Ali~~ ^{Umar} started business with Rs 150,000, Rs 190,000 and Rs 120,000 respectively. Zain manages business and receives allowance of Rs 160,000 - After 5 months Ali withdraw Rs 90,000. Business closed after 9 months - Profit Rs 580,000. What did each receive?

First of all the ratio of all partners is required. Total investment is divided with total time period.

$$\text{Zain} = 150,000 \times 9 = \boxed{1350,000}$$

$$\text{Ali} =$$

$$190,000 \times 5 = 950,000$$

Investment for first- 5 months

After withdrawal of Rs 90,000 Ali's investment for remaining 4 months

$$190,000 - 90,000 = 100,000$$

$$100,000 \times 4 = 400,000$$

$$950,000 + 400,000 =$$

$$\boxed{1350,000} \quad \text{*A*}$$

Umar:

$$100,000 \times 9 = 1080000$$

Finding Ratio.

$$\text{Zain} : \text{Ali} : \text{Umar}$$
$$1350,000 : 1350,000 : 1080,000$$

$$5 : 5 : 4$$

∴ Divided by 27.

$$\text{Zain} = 580,000 / (14 \times 5)$$
$$207143.$$

$$\text{Ali}$$
$$580,000 / (14 \times 5)$$
$$207143$$

$$\text{Umar}$$
$$580,000 / (14 \times 4)$$
$$165714.$$