

GSA

Q. No. (3)

- a) What is the Big Bang Theory, and how does it explain the origin and evolution of universe? Discuss the role of dark matter and energy. What are some of key evidences.

Big Bang Theory

The Big Bang Theory states that the universe originated about 13.8 billion years ago from a singular point which has high temperatures and infinite density.

This event caused space time, matter, energy to expand rapidly, leading to the formation of stars, galaxies, and cosmic structures.

Dark Matter

An invisible form of matter that does not emit light but provides gravitational pull, holding galaxies together.

Dark Energy

A mysterious force driving the accelerated expansion of the universe.

Evidences of Big Bang

Cosmic Microwave Background

Discovered in 1965.

Radiations left over from the early universe.

Expansion of Universe

Distant galaxies are moving away from us, the farther they are, the more faster they move.
(Red Shift).

Abundance of Elements

Elements like hydrogen, helium, lithium matches Big Bang prediction.

(b)

Galaxy

A galaxy is a massive system of stars, dust, dark matter, and planetary system, all bound together by gravity.

Classification of Galaxy

Spiral Galaxy

Shape - flat, rotating disk with a central bulge and spiral arms.

Contain lots of dust and gas, leads to stars formation.

Example: Milky way galaxy.

Elliptical Galaxy

Spherical or elliptical shape with no spiral structure.

Contain mostly old stars, very little gas and dust, leads to little or no star formation.

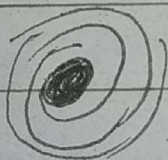
Example: Centaurus A

Irregular Galaxy

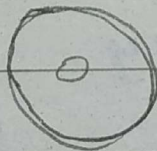
Having no definite shape, forms as a result of galaxy collision.

Rich in dust and gas - heavy star formation.

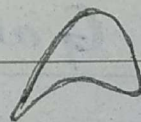
Example: IC 10



Spiral



Elliptical



Irregular

Formation of Galaxy

Initial Density Fluctuation:

After Big Bang, matter was distributed uniformly. Small density differences allowed gravity to start pulling matter together.

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Protogalaxies:

Clumps of gas and dark matter collapsed under gravity to form protogalaxies.

Merger and Growth:

Galaxies grew by merging with other galaxies and accumulating mass.

Milky Way Galaxy

It is a large, disk-shaped galaxy with 200-400 billion stars, having spiral arms and a massive dark matter.

The center harbors a supermassive black hole - Sagittarius A.

(C)

Remote Sensing

It is the science of obtaining information about Earth's surface without direct contact, using sensors on satellite.

Types :

Satellite Imaging :

It is a multispectral, hyperspectral radar system used for large scale observation.

Aerial Photography :

It gives a detailed, localized imagery.

Applications of Remote Sensing

Environmental Monitoring :

Used in environmental monitoring including deforestation, desertification, water resources.

Natural Disasters :

Helpful in floods, droughts, earthquakes and forest fires tracking.

Agriculture :

Used for crop ^{health} yield, yield prediction.

Urban Planning :

Used in land use mapping, infrastructure growth.

(d)

Functions of Human Brain

The Human Brain is the central organ of the nervous system, responsible for controlling body functions, behavior, emotions, and cognition. It contains nearly 86 billion neurons that communicate through complex neural networks.

Cerebrum :

It is the largest part divided into lobes. Frontal lobe controls reasoning, voluntary movements, speech, problem-solving. Parietal Lobe processes sensory information like touch. Temporal manages hearing, memory, and language comprehension. Occipital process vision.

Cerebellum :

It coordinates balance, posture, and fine motor skills.

Brainstem :

Regulates essential involuntary processes such as breathing, heartbeat.

Limbic System :

Includes hippocampus and amygdala, regulates emotions, memory, motivation.

Integration :

Different areas work in synchrony through electrical impulses and neurotransmitters. Example: Reading a book involves visual processing, comprehension.

Factors Affecting Brain Function

Sleep :

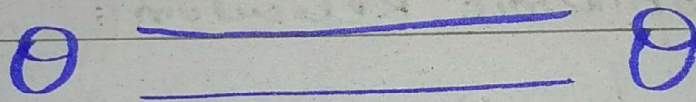
Vital for memory consolidation, attention. Sleep deprivation impairs focus and decision making.

Stress :

Chronic stress elevates cortisol, damaging the hippocampus, leading to memory loss and reduced learning capacity.

Nutrition :

Adequate amount of glucose, vitamins, omega-3 fatty acids to body support brain activity. Malnutrition can slow processes.



Q. No. 2

Components of a Cell

A cell is the fundamental structural and functional unit of life. Its components work in harmony to sustain life.

Plasma Membrane :

A selectively permeable membrane barrier that regulates nutrient entry,

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waste removal, and cell signaling.

Nucleus :

Stores genetic material (DNA) and directs protein synthesis.

Cytoplasm :

Semi-fluid matrix where biochemical reactions occur.

Mitochondria :

Power house of the cell, producing ATP for energy.

Endoplasmic Reticulum :

Rough ER synthesizes proteins, smooth ER produces lipids.

Golgi Apparatus :

Modifies, packages, and distributes proteins and lipids.

Lysosomes :

Contain enzymes to digest waste and recycle materials.

Ribosomes :

Sites of protein synthesis.

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Prokaryotic vs Eukaryotic

Prokaryotes are small, simple, having no true nucleus or organelles while Eukaryotes are large, complex with nucleus and membrane-boarded organelles. Example: Bacteria (Pro-ky) Animals, fungi (Eukaryotic).

Homeostasis and Response

Cells respond to external stimuli via receptors and signaling pathways.

Example: Insulin signaling regulates glucose uptake.

Homeostasis is maintained through feedback mechanisms, including balancing temperature, PH, and water to ensure survival.

Mobile Phones

Mobile phones are handheld devices that transmit data using radio waves. Transmitted to nearby tower and then routed through networks and satellites to reach the receiver.

Key Technologies :

2G/3G/4G/5G - cellular networks for fast communication.

SIM Cards - for identity verification.

GPS for navigation

Bluetooth and Wifi for short range and wireless connectivity.

Advantages :

- Instant global communication (calls, video)
- Access to education, banking, healthcare and emergency services.
- Boosts business and global trade through e-commerce.

Disadvantages:

- ↳ Overuse leads to addiction, social isolation.
- ↳ Negative impacts on mental health.
- ↳ Health risks from long exposure
- ↳ Privacy concerns like data theft and surveillance.

Social Transformation:

Mobile phones shifted communication from letters and landlines to instant, interactive platforms (WhatsApp).

They democratized access to information but created dependency, reshaping both personal relationships and society.

(C)

Earth's Layers:

Earth consists of four layers.

Crust:

Thin outer shell, continents and

Oceans rests on it.

Mantle :

Thick layer of semi-molten rock, where convection drives plate tectonics.

Outer Core :

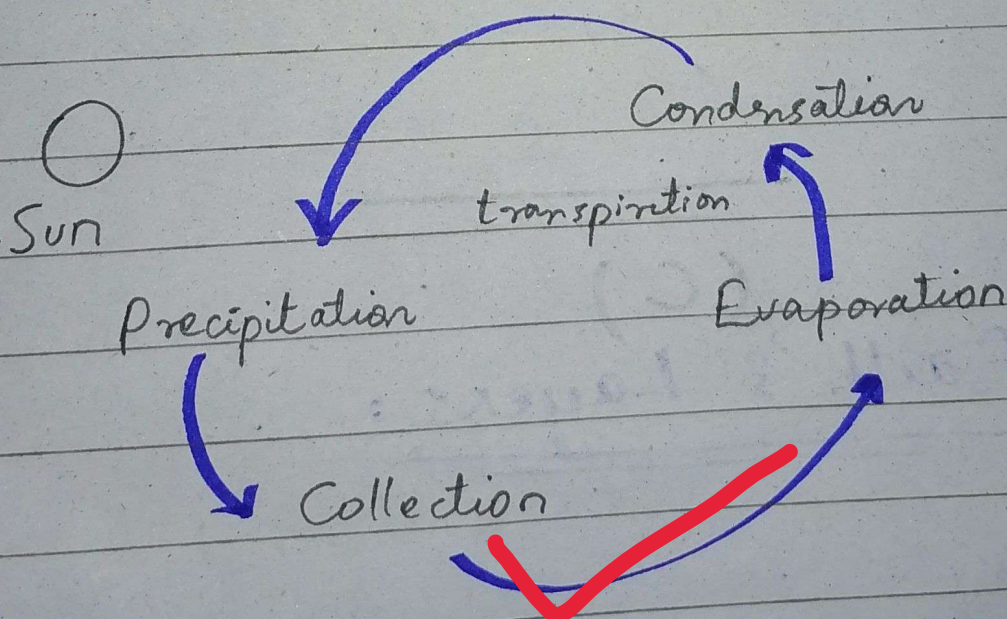
Liquid iron-nickel, generates Earth's magnetic field.

Inner Core :

Solid dense iron-nickel sphere, very hot.

Interaction of these layers drives natural processes like earthquakes, volcanic eruptions etc.

Water Cycle



Sun's energy drives evaporation →
condensation → precipitation →
run off → back to oceans.

It regulates global temperature,
support agriculture and refill fresh
water.

Human Impact

- Deforestation reduces rainfall and biodiversity.
- Pollution contaminates air, soil, and water.
- Overexploitation of fossil fuels → leads to greenhouse gases and then climate change.
- Unsustainable farming, mining, and urbanization degrade ecosystem.

(d)

Air Pollution :

Air pollution occurs when dust, gases

and odour occurs in harmful amounts.

Sources of Air Pollution

Primary Pollutants

Direct emissions like carbon monoxide (CO) from cars, sulfur dioxide (SO_2) from industries, dust from construction occur.

Secondary Pollutants:

Formed in the atmosphere e.g.:
ozone, smog, acid rain.

Effects

On Humans:

Causes asthma, bronchitis, lung cancer, cardiovascular disease and premature death.

On Environment:

- Acid rain damages forest, crops, and aquatic life.
- Ozone depletion increases harmful UV radiation.
- Smog reduces visibility and harms wildlife.

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Greenhouse gases - CO_2 , CH_4 ,
trap heat, causing global warming.

Reduction Strategies:

- Use public transport
- Energy efficient appliances
- Reducing plastic and waste burning.
- Shift to renewable energy.
- Promote afforestation and sustainable urban planning.
- International agreements.

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Section - II

Q.No. 5

(a)

Let the numbers = a, b, c

$$p \quad a + b + c = 187$$

$$\text{Avg} = \frac{187}{7} = 62.33$$

middle prime no - closest to 62.

Prime no below 62 = 61

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Prime no before 61 = 59

After 61 = 67

$$59 + 61 + 67 = 120$$

$$120 + 67 = 187$$

The numbers are 59, 61, 67.

(b)

Let no = x

$$x + 17 = 60 \times \frac{1}{x}$$

$$x \times x + 17 = 60 \times \frac{1}{x} \times x$$

$$x^2 + 17 = 60$$

$$x^2 + 17x - 60 = 0$$

$$x^2 + 20x - 3x - 60 = 0$$

$$x(x + 20) - 3(x + 20) = 0$$

$$(x - 3)(x + 20) = 0$$

$$\boxed{\begin{array}{l} x = 3 \\ x = -20 \end{array}}$$

$$\boxed{x = 3}$$

(c)

$$P_1 = 1,75,000$$

$$P_2 = 2,62,500$$

$$T = 10 \text{ yrs}$$

$$\begin{aligned} \text{Total increase} &= 2,62,500 - 1,75,000 \\ &= 87,500 \end{aligned}$$

$$\% = \frac{87,500}{1,75,000} \times 100$$

$$= \frac{50\%}{10} \text{ ✓ in 10 yrs.}$$

$$= 5\% \text{ per year}$$

$$\underline{\underline{5\%}}$$

(d)

$$20 \text{ dozens} = 20 \times 12 = 240 \text{ eggs}$$

$$CP = 375$$

$$20 \times 375 = 7500$$

$$SP = 33$$

$$240 \times 33 = 7920$$

$$\text{Profit} = SP - CP$$

$$= 7920 - 7500$$

$$= 420 \text{ ✓}$$

$$\text{Profit \%} = \frac{\text{Profit}}{CP} \times 100 \Rightarrow \frac{420}{7500} \times 100$$

$$5.6\%$$

0 _____ 0

Q.No. 6

(a)

$$\text{Product} = 120 = x \cdot y$$

$$\text{Sum of squares} = x^2 + y^2 = 289$$

$$(x+y)^2 = x^2 + y^2 + 2xy$$

$$(x+y)^2 = 289 + 2(120)$$

$$= 289 + 240 = 529$$

$$\sqrt{(x+y)^2} = \sqrt{529}$$

$$x+y = 23$$

(b)

$$\text{Kamran} = K$$

$$\text{Salman} = S$$

$$\text{Total years b/w ratio} = 6+4 = 10$$

$$\text{Ratio change } 6:5 \rightarrow 11:10 - 10 \text{ yrs.}$$

$$K - S = ?$$

$$6:5 = \text{difference} = 1$$

$$11:10 = \text{difference} = 1$$

$$\text{Parts } 1+1 = 2$$

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$$1 \text{ part} = 10 \div 2 = 5 \text{ yrs}$$

6 yrs ago, Salman = 5 parts

$$5 \times 5 = 25$$

$$5 \times 2$$

(c)

Ratio of 1st to 2nd = 2:3

$$A : B = 2 : 3$$

2nd to 3rd = 5:8

$$B : C = 5 : 8$$

$$1^{\text{st}} \text{ no } A = \frac{2}{3} B$$

$$3^{\text{rd}} \text{ no } C = \frac{8}{5} B$$

$$\text{Sum} = A + B + C = \frac{2}{3} B + B + \frac{8}{5} B$$

$$\text{LCM} = 15 = \frac{10}{15} B + \frac{15}{15} B + \frac{24}{15} B$$

$$= \frac{49}{15} B$$

$$\text{Total sum} = 98 \rightarrow B = \textcircled{30}$$

(d)

$$22.5\% = \frac{22.5}{100} = \frac{9}{40}$$

$$SP = 392$$

$$CP \times \frac{49}{40} = 392$$

$$CP = 392 \times \frac{40}{49}$$

$$= 320$$

$$\text{Profit} = SP - CP$$

$$= 392 - 320 = 72$$

0 = 0