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Mock Exams for CSS- 2026

General Knowledge - I

General Science and Ability

Part - II

Section - I

Question: 3

a. Big Bang Theory and the Origin of the Universe

The Big Bang Theory is the leading scientific explanation for the origin and evolution of the universe. It suggests that the universe began about 13.8 billion years ago from the singularity = an extremely hot dense state, and has been expanding ever since. Instead of being explosion into space, the Big Bang was an expansion of space itself, carrying matter, energy and galaxies with it. Over time, cooling allowed the formation of subatomic particles, atoms, stars, galaxies and eventually planetary systems.

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Roles of Dark Matter and Dark Energy

I. Dark Matter

1. Dark Matter

- Dark matter makes up about 27% of the universe's mass-energy content.

- It does not emit, absorb or reflect light, making it invisible but its gravitational effects can be observed.

- It plays a vital role in galaxy formation and stability by providing the necessary gravitational pull to hold galaxies together.

2. Dark Energy

- Dark energy accounts for about 68% of the universe.

- It is the mysterious force that causes the universe's expansion to accelerate.

- Observations of distant supernovae and the large-scale structure of the cosmos suggest that dark energy dominates cosmic dynamics in the present era.

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Key Evidence

Big Bang Theory:

1. Cosmic Microwave Background (CMB):

It was discovered as the faint background radiation providing evidence of a dense universe.

2. Expanding Universe

Edwin Hubble's discovery that galaxies are moving away from us at increasing velocities is evidence of an expanding universe.

3. Abundance of Light Elements

Predictions from the Big Bang model match the observed abundances of light elements like hydrogen and helium in the early universe.

Key Evidence Supporting the Big Bang Theory:

1. Cosmic Microwave Background Radiation (CMB):

It was discovered in 1965, the CMB is the faint afterglow of the Big Bang, providing strong evidence of an early hot, dense universe.

2. Expanding Universe:

Edwin Hubble's observations showed that galaxies are moving away from us, with velocity proportional to their distance, an evidence of ongoing expansion.

3. Abundance of Light Elements:

Predictions of Big Bang nucleosynthesis match observed proportions of hydrogen, helium and trace amounts of lithium in the universe.

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4. Large Scale Structure of the Universe

The distribution of galaxies and cosmic filaments aligns with predictions from Big Bang models and the influence of dark matter. (8M)

b) Galaxies And Classification

A galaxy is a huge collection of stars, gas, dust and dark matter, all held together by gravity. Galaxies are the fundamental units of the universe, ranging in size from millions to trillions of stars.

Classification of Galaxies:

Astronomer Edwin Hubble classified galaxies into four main types.

1. Elliptical Galaxies: Oval shaped, containing mostly old stars with very little gas and dust, hence little star formation.

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2. Spiral Galaxies: Disk shaped with spiral arms, rich in gas and dust, and active in forming new stars.

3. Barred Spiral Galaxies: A type of spiral galaxy with a central bar of stars extending through the nucleus.

4. Irregular Galaxies: No definite shape, often formed due to collisions or gravitational interactions, with abundant gas and active star formation.

Structure and Composition of the Milky Way

The Milky Way is a barred spiral galaxy, about 100,000 light years across and containing 200-400 billion stars. Its main parts include:

- Galactic Bulge: The dense central region with older stars and a supermassive black hole.

- Disk and Spiral Arms: Containing young stars.

nebulae, gas, and dust where new stars are born.

Halo: A spherical region surrounding the disk, containing globular clusters and dark matter. This structure allows the Milky Way to sustain both old and new star populations.

Formation And Evolution of Galaxies

Galaxies began to form after the Big Bang about 13.8 billion years ago. Small fluctuations in matter density caused clouds of gas and dark matter to collapse under gravity. They evolve through star formation, mergers and collisions, often changing shape over time. Dark matter and dark energy have been central to their structure and long-term development.

200) Remote Sensing (b)

Remote sensing is the process of gathering information about the Earth's surface without direct contact, using sensors on satellite or aircraft.

Types of Remote Sensing Technologies:

- Satellite Imaging: Provides wide, repetitive coverage for global monitoring.
- Aerial Photography: Offers detailed local scale image from aircraft or drones.

Uses in Environmental Monitoring And Disaster:

Remote sensing tracks environmental changes such as deforestation, urbanization and climate impacts. It also helps in disaster management by detecting floods, earthquakes, forest fires and cyclones, enabling early warning and response.

d) Human Brain & Functions

Main Functions of the Human Brain:

The human brain is the control center of the body, responsible for regulating vital functions, processing information, and enabling high order thinking. Its main functions include:

- Controlling Body Processes: Breathing, heartbeat, movement and coordination.
- Processing Sensory Input: Vision, hearing, touch, taste and smell.
- Cognition and Emotions: Thinking, memory, decision making and emotional regulation.
- Communication and Behavior: Language, problem solving and social interaction.

Brain Regions and Their Roles:

- Cerebrum: Largest part, responsible for thought, memory, language and voluntary movement.
- Cerebellum: Coordinates balance, posture,

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and motor control

- Brainstem: Regulates vital involuntary functions such as breathing and heartbeat
- Limbic System: Controls emotions, motivation and aspects of memory

These regions work together through complex neural networks to ensure smooth functioning of the body and mind.

Factors Affecting Brain Functions:

- Sleep: Essential for memory consolidation, focus and repair of neural connections, lack of sleep impairs learning, concentration, and decision making
- Nutrition: A balanced diet rich in omega-3 fatty acids, vitamins and glucose supports healthy brain activity
- Stress: Prolonged stress level increases the cortisol level, which can damage

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memory, reduce focus and negatively effect emotional well being.

Question: 4

a) Fiber Optics And Its Working

Fiber Optics are thin strands of glass or plastic that transmit data as pulses of light. They work on the principle of **total internal reflection**, where light signal bounce along the fiber core with minimal loss, allowing information to travel over long distance.

Advantages over Copper Wire

Communication:

- Higher Bandwidth: Can carry much more data than copper wire.
- Faster Speed: Light travels faster with

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less signal delay

- Longer Distance: Minimal signal loss compared to copper cables.
- Smaller and Lighter: Easier to install and maintain.

High Speed Data Transmission:

Fiber Optics transmit information as light pulses, which travel extremely fast and with little distortion. Multiple signals can be sent simultaneously through wavelength - division multiplexing (WDM), allowing very high data rates. This makes fiber optics ideal for internet, telecommunications and global networking.

b) Causes and Effects of Earthquakes

Causes: Earthquakes occur due to sudden release of energy in the Earth's

movement, faulting volcanic activity, or human activities like mining and reservoir induced ~~str~~ seismicity

Effects: They can cause ground shaking, property damage, and long term economic and social impacts.

Types of Seismic Waves:

Primary Waves (P-waves): Faster, travel through solids and liquids, cause particles to move back and forth.

Secondary Waves (S-waves): Slower, move only through solids, cause particles to move up and down.

Surface Waves: Travel along the Earth's surface, slower but most destructive.

Measurement: Seismic waves were recorded by seismographs, and earthquake strength is measured using the Richter Scale (magnitude) and the Modified Mercalli scale (intensity).