

8.05.2024

1

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General Science and Ability

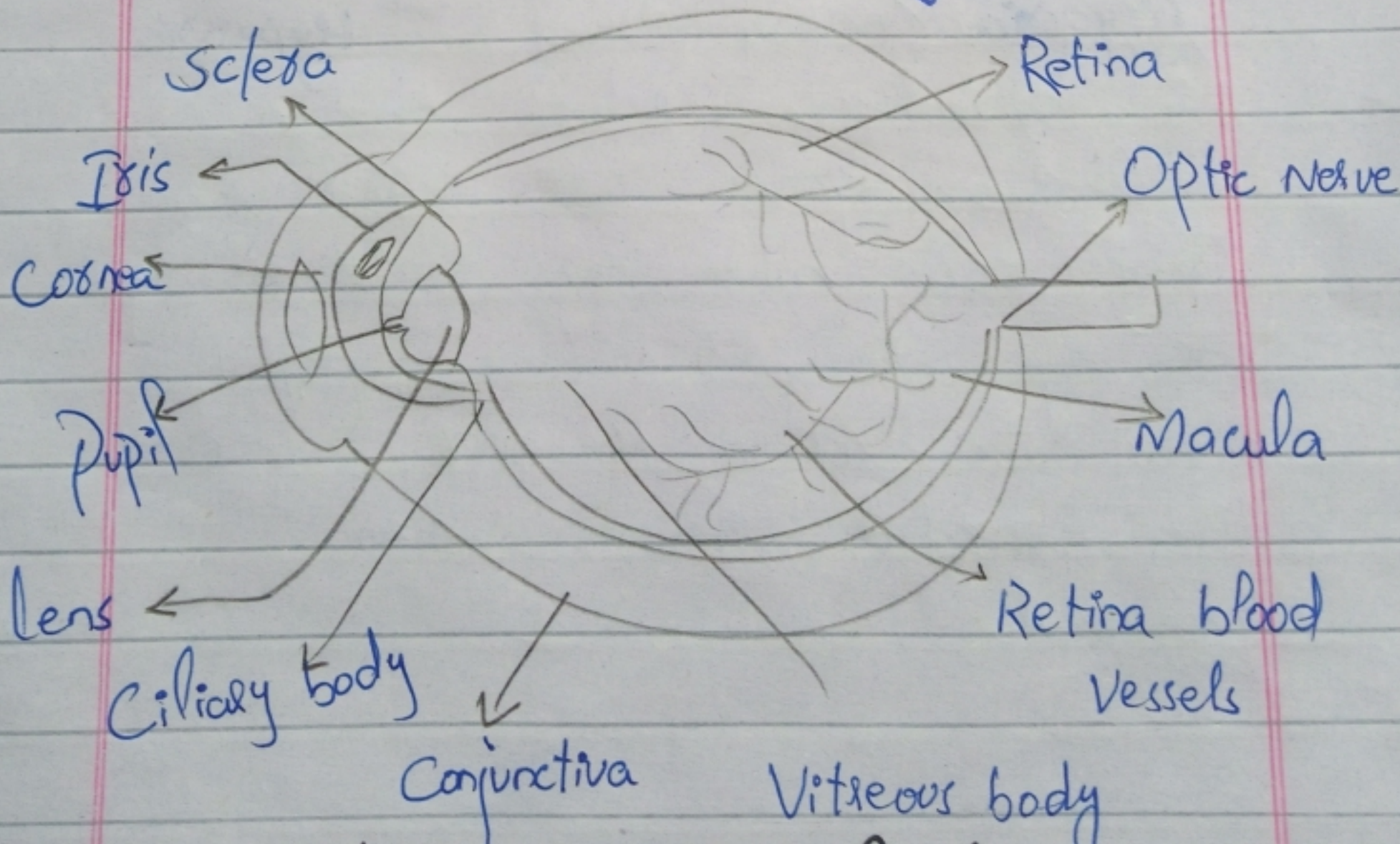
PART-II

SECTION-I

Question No. 4:

- a. Draw the structure of Eye.
How Myopia and Hyperopia can be corrected?

Structure of Eye:



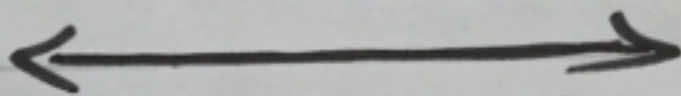
Human Eye Anatomy

8-05-2024

(2) Working of Human Eye:

8-05-

The eye is made up of three coats, which enclose the optically clear aqueous humour, lens and vitreous body. The outermost coat consists of the cornea and the sclera; the middle coat contains the main blood supply to the eye and consists, from the back forward of the choroid, the ciliary body and the iris.



How Myopia and Hyperopia can be corrected?

Myopia (nearsightedness) and **Hyperopia** (far-sightedness), are both common refractive errors that affect vision.

They occur when the light entering the eye does not focus properly on the retina. However, they can be corrected through various methods:

8-05-2024

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Methods of Myopia and Hyperopia

They can be corrected through various methods.

1. Eyeglasses :

This is the most common and simplest way to correct myopia and hyperopia. Concave lenses are used to correct myopia by diverging the incoming light rays before they reach the eye's lens thus allowing them to focus properly on the retina. Convex lenses are used to correct hyperopia by converging the incoming light rays before they reach the eye's lens.

2. Contact Lenses :

Contact lenses can also be corrected of myopia and hyperopia. They sit directly on the eye's surface and provide a wide field of view compared to glasses.

8-05-2024

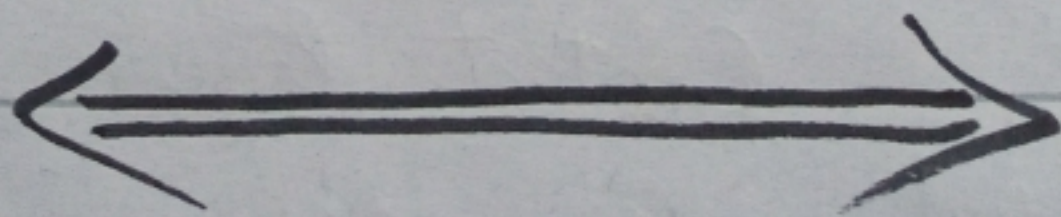
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3. Refractive Surgery :-

Refractive surgery, such as LASIK (laser-assisted in situ Keratomileusis) or PRK (photorefractive keratectomy), can permanently reshape the cornea to correct myopia, hyperopia and astigmatism. These surgeries can typically be performed on adults with stable vision and good overall eye health.

4. Orthokeratology (Ortho-K) :-

This involves wearing specially designed rigid contact lenses overnight to reshape the cornea temporarily. This method can provide clear vision during the day without the need for glasses or contact lenses.



Question: 4

- b. Discuss different units in the Human Cell.

Human Cell:

The human cell is the basic structural and functional unit of all living organisms. Cells are incredibly diverse in terms of their size, shape and specialized functions. Within a typical human cell, several structural and functional units can be identified.

1. Cell Membrane (Plasma Membrane):

The cell membrane is a semipermeable lipid bilayer that encloses the cell and separates its internal environment from the external surroundings. It regulates the passage of substances in and out of the cell, maintaining cellular homeostasis.

2. Cytoplasm:

The cytoplasm is the gel-like substance enclosed by the cell membrane. It consists of cytosol, a water-based solution containing

8-05-2024

(6)

8-05-2024

Various ions, molecules and organelles. The cytoplasm plays a crucial role in cellular metabolism and provides a medium for chemical reactions to occur.

3. Organelles:

• Nucleus:

The nucleus houses the cell's genetic material, including DNA (deoxyribonucleic acid) organized into chromosomes. It serves as the control center of the cell, regulating gene expression and coordinating cellular activities.

• Mitochondria:

Mitochondria are often referred to as the "powerhouse" of the cell because they generate ATP (adenosine triphosphate), the primary energy currency of the cell, through cellular respiration.

• Endoplasmic Reticulum (ER):

The endoplasmic reticulum is a network of membranous tubules and sacs involved in protein synthesis, lipid metabolism and calcium storage.

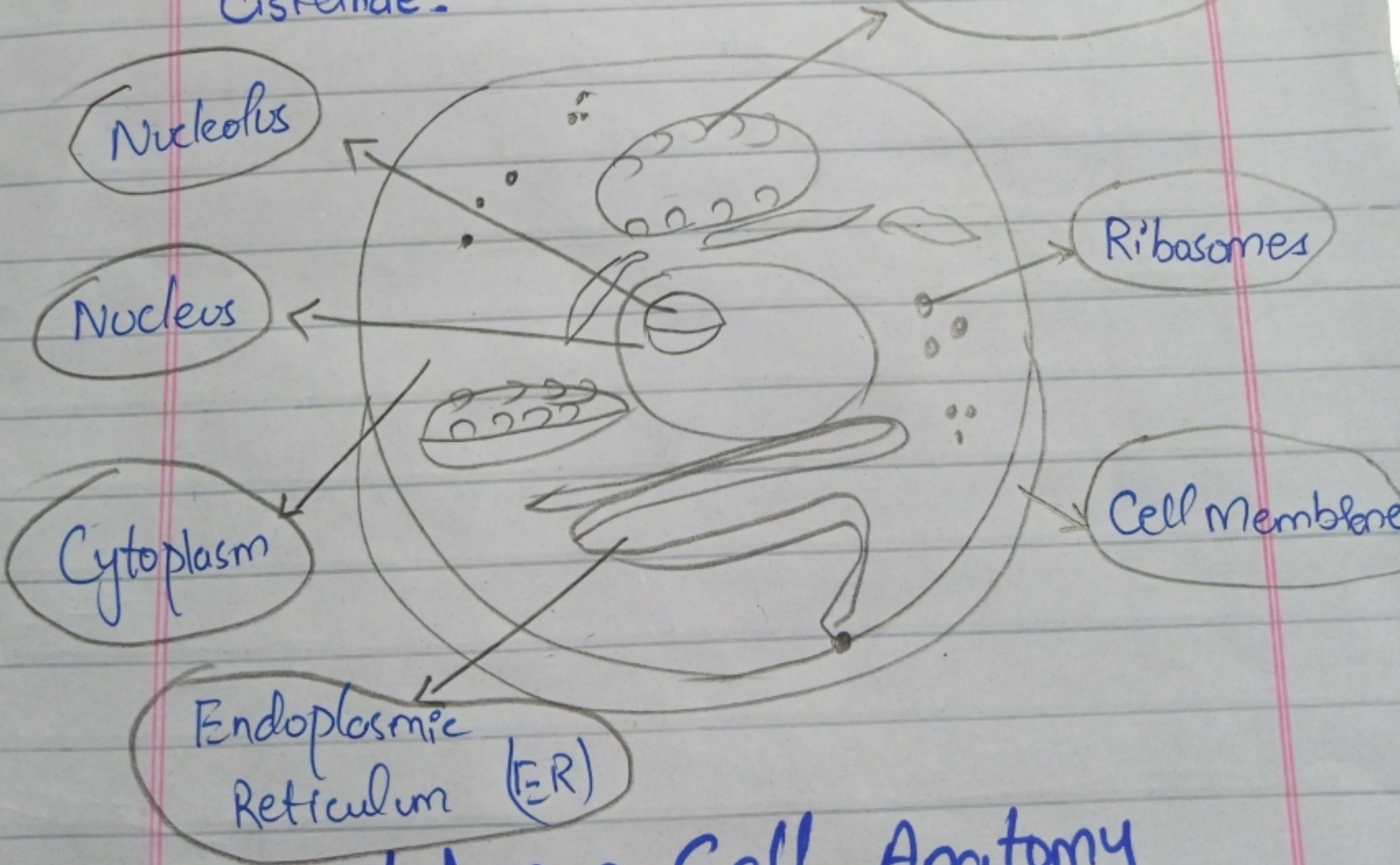
8-05-2024

(7)

Rough ER has ribosomes attached to its surface, while Smooth ER lacks ribosomes.

• Golgi Apparatus :-

The Golgi apparatus is responsible for modifying, sorting and packaging protein and lipids synthesized in the endoplasmic reticulum. It consists of flattened membranous sacs called Cisternae.



Human Cell Anatomy

(8)

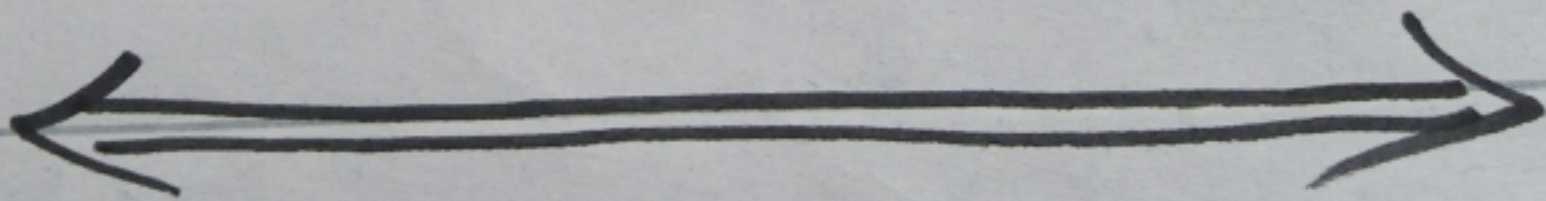
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• Lysosomes:

Lysosomes are membrane-bound organelles containing digestive enzymes. They degrade macromolecules, foreign particles and damaged organelles through hydrolysis.

• Ribosomes:

Ribosomes are the cellular machinery responsible for protein synthesis. They can be found free in the cytoplasm or attached to the endoplasmic reticulum.



8-05-2024

Question: 4

c. What are Galaxies? Give its types.
Are galaxies moving or at rest?
Justify with evidence.

Galaxies:

Galaxies are vast system of stars, stellar remnants, interstellar gas, dust, dark matter and other celestial bodies together by gravity. They are fundamental building blocks of the universe, existing in a wide variety of shapes, sizes and compositions.

The study of galaxies known as galactic astronomy.

Types of Galaxies

There are three main types of galaxies

1. Spiral Galaxies:

Spiral galaxies have a distinct spiral structure characterized by a central bulge surrounding arms of stars, gas and dust.

Milky Way, our home galaxy, is a spiral galaxy.

(10)

8-05-20

8-05-2024

Milky way, our home galaxy is a spiral galaxy.

2. Elliptical Galaxies:

Elliptical galaxies are shaped like ellipsoids and lack the prominent spiral arms seen in the spiral galaxies. They are often composed of older stars and contain little interstellar gas and dust.

3. Irregular Galaxies:

Irregular galaxies lack a defined shape and do not fit into the categories of spiral or elliptical galaxies. Irregular galaxies can be small or large and may result from gravitational interactions with other galaxies.

Galaxies are not stationary objects; they are in constant motion within the universe.

8-05-2024

(11)

Several Evidence from Galaxies:

Evidence for the motion of galaxies comes from several observation:

a. Redshift:

The phenomenon of redshift, discovered by Edwin Hubble in 1920s, occurs when the light emitted by distant galaxies is shifted towards longer (redder) wavelengths. The redshift is a result of the expansion of the universe, causing galaxies to move away from each other.

b. Hubble Law:

Hubble Law described the relationships between the distance to the galaxy and its velocity. It states that "The recession velocity of a galaxy is directly proportional to its distance from us". This empirical relationships provides strong evidence for the expansion of the universe and the motion of galaxies within it.

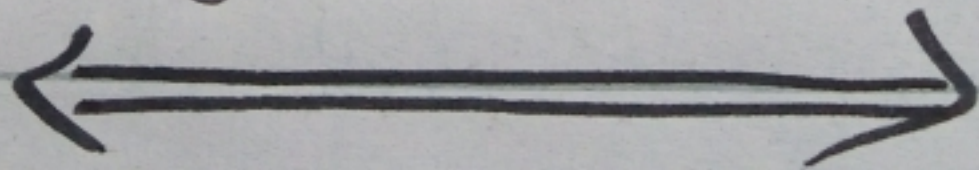
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(12)

C. Galaxy Clusters :-

Observation of galaxy clusters reveal that galaxies within them are not randomly distributed but are instead gravitationally bound to one another.

In summary, galaxies are not stationary but are instead moving with the expanding universe. The evidence for the motion comes from the observation of redshifts, Hubble Law, and gravitational interaction observed within galaxy clusters.



8-05-2024

(13)

Question: 4

d. Compare main parts of the Sun and Earth.

The Sun and Earth are both integral components of our solar system, but they differ significantly in composition, structure and behavior.

Here's a comparison of their main parts.

Sun:

(i) Composition:

The Sun is primarily composed of hydrogen about 74% and helium 24% by mass, with trace amounts of heavier elements such as

- Oxygen
- Carbon
- Neon
- Iron.

(ii) Size:

The diameter of Sun is about 1.4 million km, much larger than Earth.

(iii) Structure of Sun:

The Sun has distinct layers, including the core, radiative zone, convective zone and photosphere. The core is where nuclear fusion occurs, generating immense heat and light. Energy produced in the core slowly radiates outward through the radiative zone and convective zone, before reaching the photosphere, the visible surface of the Sun.

(iv) Atmosphere of Sun:

The atmosphere of the Sun is composed of layers of ionized gases (plasma).

(v) Behaviour of Sun:

Sun: It is of dynamic nature, undergoes nuclear fusion and emits vast energy.

8-05-2024

(15)

Earth:

(i) Composition:

Earth is composed of rocky material, primarily silicate minerals such as

- Quartz
- Feldspar
- Mica

(ii) Size of Earth:

The diameter of Earth is about 12,742 km.

(iii) Structure of Earth:

There are three main layers of Earth

- (i) Solid inner layer
- (ii) Liquid outer layer
- (iii) Mantle crust

(iv) Atmosphere of Earth:

The Atmosphere of the earth contains the following gases;

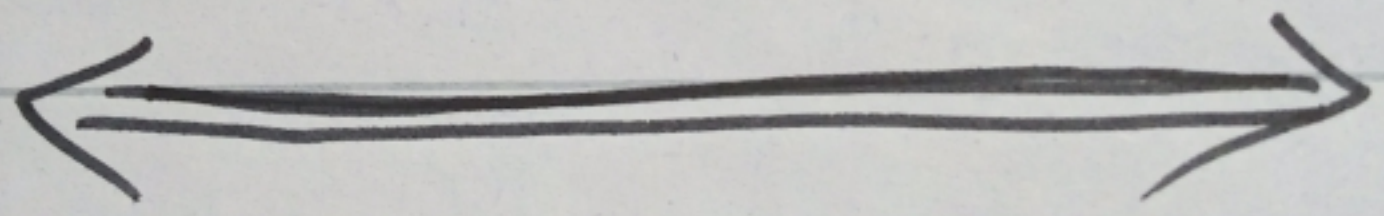
- a. Mixture of Nitrogen
- b. Oxygen
- c. Trace gases.

05-2024

(16)

(v) Behaviour of the Earth :

The Earth is experience of the geological processes and climate variation.



8-05-2024

Question 5:

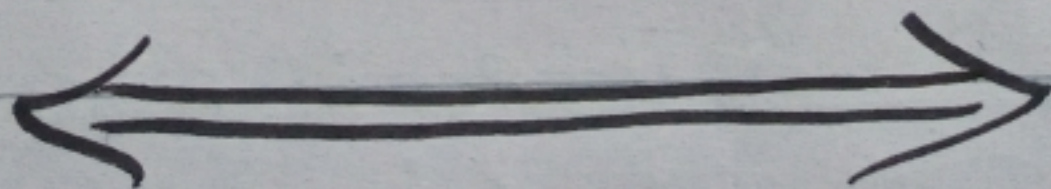
a. How Cyclones are formed? Discuss

Cyclones:

Cyclones also known as hurricanes or typhoons depending on the location, form over warm ocean waters when moist air rises and condenses, releasing latent heat. This process fuels the storm development and intensification. As the air rises, it creates an area of low pressure at the surface, drawing in more warm, moist air from the surrounding area. With the Earth's rotation, cyclones begin to spin, aided by the Coriolis effect.

Coriolis Effect:

The Coriolis effect is an apparent deflection of moving objects, such as air, water, caused by the Earth's rotation.



Question: 5

b. Differentiate between Ionic and Covalent bond.

Ionic bonds:

- Ionic bonds involve the transfer of electrons from one atom to another, resulting, in the formation of ions attracting to each other by electrostatic force.
- It occurs between the metals and nonmetals, leading to the formation of compounds with distinct ionic lattices.
- Ionic bonds tend to form compounds with high melting and boiling points soluble in water.

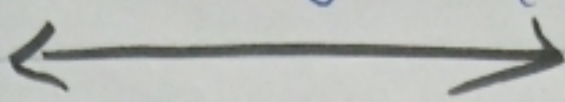
Covalent bonds:

- Covalent bonds involves the sharing of electrons between atoms to achieve a stable electron configuration.
- It usually occurs between nonmetals, resulting in molecules with shared electron pairs.

8-05-2024

(19)

- Covalent bonds forms substances with lower melting and boiling points and solubility depends on polarity.



Question: 5

- c. Give uses of Gamma Rays, X-Rays, and Radio waves.

Gamma Rays:

They are used in medical imaging (gamma-ray radiography) and cancer treatment (radiation therapy) due to their ability to penetrate tissues deeply and selectively destroy cancer cells.

X-Rays:

X Rays are commonly employed in medical diagnostic to visualize internal structure of the body.

Radio waves:

Radio waves are utilized in communication systems such as radio broadcasting and television transmission.

8-05-2024

20

Question 5:

d. What are tides? Write a note on LED

Tides:

Tides are the rise and fall of sea levels caused primarily by the gravitational forces exerted by the moon and sun upon Earth's oceans. These gravitational forces create bulges in the ocean's surface resulting in high and low tides.

LED (Light Emitting Diode) is a semiconductor device that emits light when an electric current passes through it.

It is known for its energy efficiency, longevity and versatility, finding applications in various fields including

- Lighting
- Displays
- Indicators.

8.05.2024

(21)

SECTION-II

Question: 6

- a. Radius of cylinder is 8cm and height is 15cm. Find its volume.

Solution:

To find the volume V of a cylinder, you can use the formula:

$$V = \pi r^2 h$$

Where:

r = radius of a cylinder = 8cm

h = height of a cylinder = 15cm

π = mathematical constant value

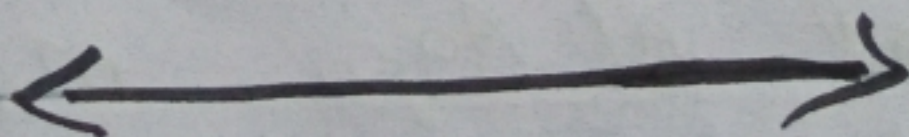
Now putting the value in the formula:

$$V = \pi (8\text{cm})^2 \times 15\text{cm}$$

$$V = \pi \times 64\text{cm}^2 \times 15\text{cm}$$

$$V = 3.14 \times 960\text{cm}^3$$

$$V = 3015.93\text{cm}^3$$



8.05.2024

(22)

Question: 6

b. Al Aqsa Mosque in Jerusalem, Israel has a dome of rock in regular octagonal shape. What will be the angle of each side?

Solution:

To find the interior angle of each side of a regular octagon, we can use the formula:

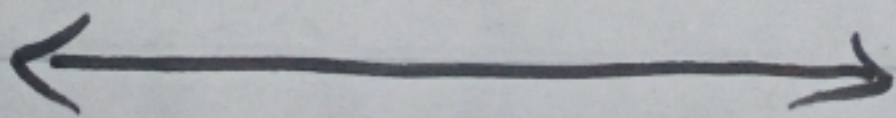
$$\text{Interior Angle} = \frac{360^\circ}{\text{Number of sides}}$$

In this case, the regular octagon has 8 sides, so substituting the value into the formula:

$$\text{Interior Angle} = \frac{360^\circ}{8}$$

$$\text{Interior Angle} = 45^\circ$$

So each interior angle of the regular octagon, including the sides of the dome of the Rock at Al Aqsa Mosque, measured 45°



8.05.2024

(23)

Question: 6

C. Maximum length and depth of Dal Lake in Srinagar is 4.6 miles and maximum width is 2.2 miles. Find Surface area.

Solution:

To find the surface area of Dal Lake, we need to calculate the area of the lake's surface, which can be approximately by treating it as a rectangle.

The formula of the surface area of a rectangular box

$$\text{Surface Area} = 2lw + 2lh + 2wh$$

$$\text{Length (l)} = 4.6 \text{ miles}$$

$$\text{Width (w)} = 2.2 \text{ miles}$$

$$\text{Depth (h)} = ?$$

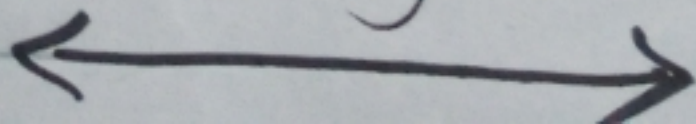
$$h = 2.2 \text{ miles}$$

$$\begin{aligned} \text{Surface Area} &= 2 \times 4.6 \times 2.2 + 2 \times 4.6 \times 2.2 \\ &\quad + 2 \times 2.2 \times 2.2 \end{aligned}$$

$$= 20.24 + 20.24 + 8.8$$

$$\text{Surface Area} = 49.28 \text{ sq miles}$$

So, the surface area of Dal Lake is approximately 49.28 sq miles.



8.05.2024

(24)

Question: 6

d. A ladder is leaning against the side of a 10m tall house. If a base of a ladder is 3m away from the house, how tall is the ladder?

Solution:

In this question, we can use the Pythagorean Theorem.

h = height of ladder = 10m

a = Distance from the base of the ladder to the house = 3m

According to the Pythagorean Theorem:

$$h^2 = a^2 + b^2$$

$$h^2 = (3)^2 + (10)^2$$

$$h^2 = 9 + 100$$

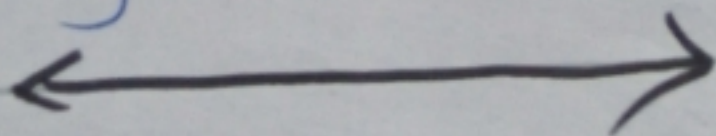
$$h^2 = 109$$

To find h , we take the square root on both sides

$$\sqrt{h^2} = \sqrt{109}$$

$$h = 10.44\text{m}$$

So, the length of the ladder is approximately 10.44 meters.



8-05-2024

(25)

Question: 7

a. A person multiplied a number by $\frac{3}{5}$ instead of $\frac{5}{3}$. What is the percentage Error in the Calculation.

Solution:

Given:

$$\text{Correct Value} = \frac{5}{3}$$

$$\text{Measure Value} = \frac{3}{5}$$

Now, we can use Percentage Error formula

$$\text{Percentage Error} = \frac{\text{Correct value} - \text{Measured value}}{\text{Correct value}} \times 100$$

$$= \frac{5}{3} - \frac{3}{5} \times \frac{5}{3} \times 100$$

$$= \frac{5-1}{3} \times 100$$

$$\frac{4}{3}$$

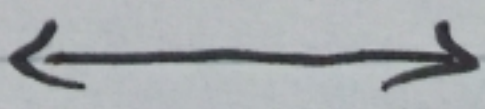
$$= \frac{2}{3} \times 100$$

$$\text{Percentage Error} = 40\%$$

$$\frac{5}{3} = \frac{2}{3} \times \frac{5}{5} \times 100$$

$$= \frac{2}{3} \times 100$$

40



18-05-2024

(26)

Question: 7

- b. If ratio of chocolates to ice cream cones in a box is 5:8 and the number of chocolates is 30. Find the ice-cream cones.

Solution:

Given:

$$\text{Ratio of chocolates} = 5:8$$

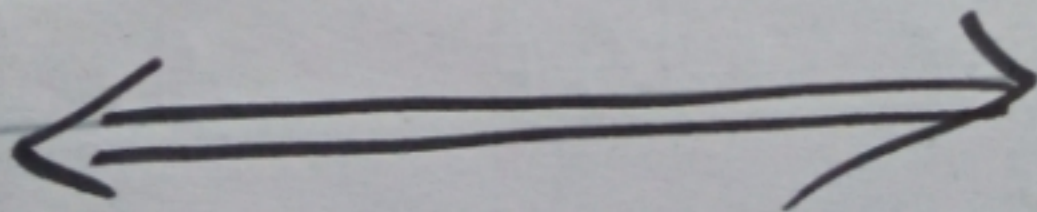
$$\text{Number of chocolates} = 30$$

Thus,

$$\text{Ice Cream Cones} = \frac{8}{5} \times \text{Number of chocolates}$$

$$= \frac{8}{5} \times 30 \text{ (6)}$$

$$\text{Ice Cream Cones} = \boxed{48}$$



8.05.2024

(27)

Question 7:

e. A tablet contains 30mg of medication,
How many tablets will be need
to provide Ms. Smith with 240mg
of medications?

Solution:

Given:

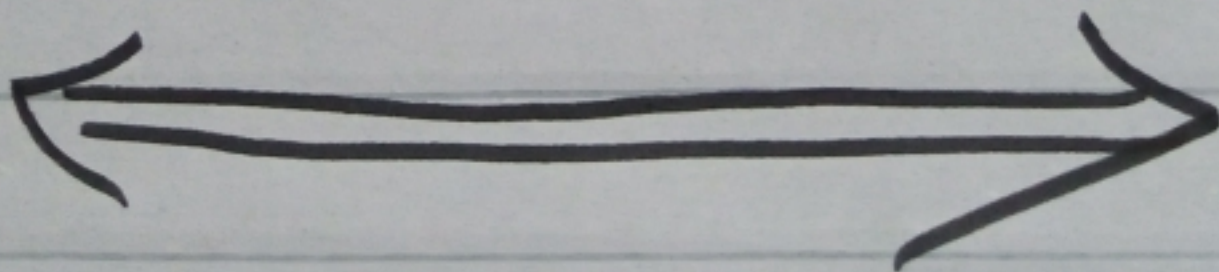
Each tablets contain 30mg of
medicines

Ms. Smith needs 240mg of
medicines

$$\text{Number of tablets needed} = \frac{240}{30}$$

$$x = 8$$

$$\text{Number of tablets needed} = \boxed{8}$$



8-05-2024

(28)

Question: 7

d. The average of 50 numbers is 20. If two numbers are 37 and 43 are discarded, what is the average of the remaining numbers?

Solution:

Average of 50 numbers = 20
Two numbers (37 and 43) are discarded

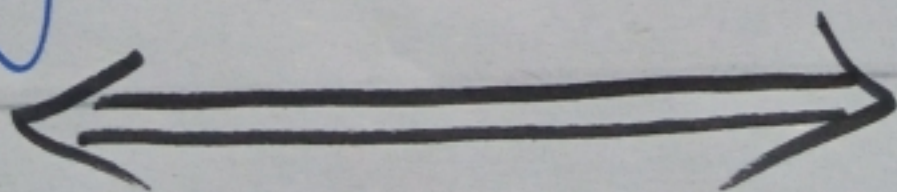
$$\begin{aligned} \text{Total sum of 50 numbers} &= 37 + 43 \\ &= 50 \times 20 - (37 + 43) \\ &= 1000 - 80 \\ &= 920 \end{aligned}$$

$$\text{Total number} = 20$$

$$50 - 20 = 48$$

$$\text{Average} = \frac{920}{48}$$

$$\text{Average} = 19.17$$



THE END