GSA MOCK

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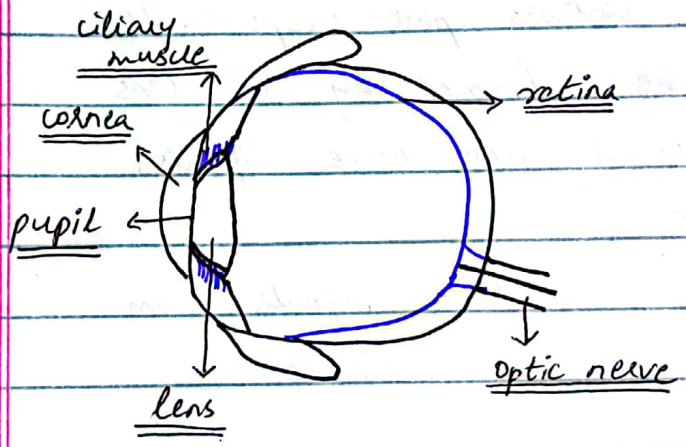
(Q3) (a) Discuss different parts of eye. How far sightedness and short sightedness can be corrected?



Iris

Iris is the colored part of the eye that regulates the amount of light entering the eye.

Cornea

Cornea acts as the eye's outermost lens. It functions like a window, controlling and focusing the entry of light into the eye.

Pupil

Pupil lets light in the eye as the muscles of the iris change its shape.

Ciliary muscle

It is a part of the ciliary body which produces a fluid called aqueous humour. The ciliary muscle changes the shape of the lens when the eye focuses on a nearby object.

Retina

The retina contains photo receptors. It receives images formed by the lens and converts it into nerve signals.

Optic Nerve

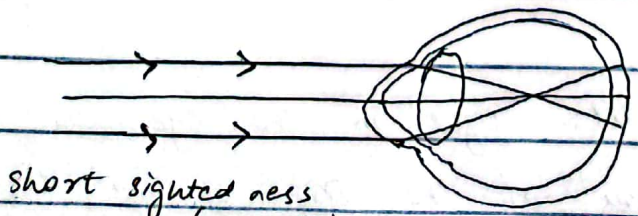
It transfers the nerve signals from the retina to the brain.

Far sightedness

Far sightedness is corrected by a convex lens which causes light rays to bend slightly inwards to focus properly.

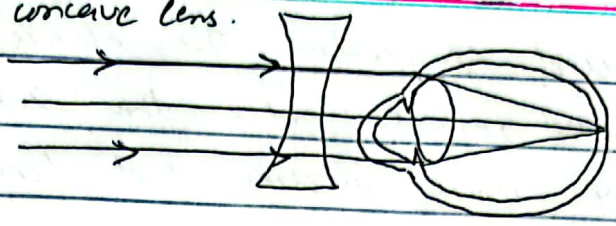
Short Sightedness

Short sightedness is corrected with the help of concave lens which are used to bend light rays slightly outwards.

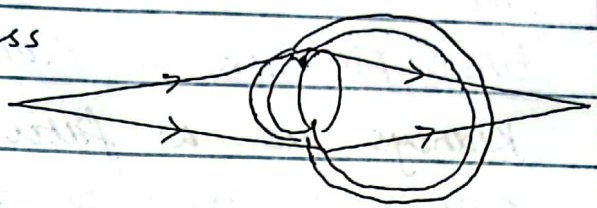


Short sightedness (myopia)

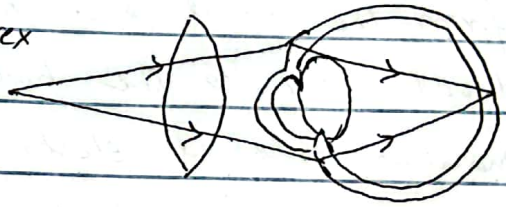
correction: concave lens.



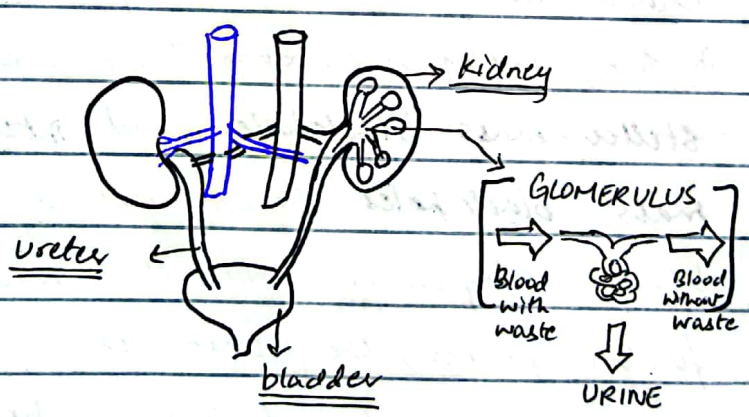
Long sightedness (hypermetropia)



correction: convex lens



(b) How does a kidney work? Explain with diagram.



STRUCTURE OF KIDNEY

Inside the kidneys are a number of pyramid-shaped lobes. Each consists of an outer renal cortex and an inner medulla. Nephrons flow between these sections. Each nephron includes a filter,

called glomerulus. The glomerulus filters blood, which enters the kidneys through the renal arteries and leaves through the renal veins.

BASIC FUNCTION OF KIDNEYS

Kidneys are a filter system. Their main job is to remove waste from the blood and return the clean blood back to the body. They also maintain balanced electrolyte levels, and regulate blood pressure.

(c) How Black holes are formed?

Black holes are constantly being formed in the milky way. ~~then~~ These are called **stellar-mass black holes** and **intermediate-mass black holes**. When massive stars become supernova after the nucleus fusion process, they turn into a black hole. An example of this is **betelgeuse**. However, the supermassive Sagittarius A* in the milky way isn't formed through a nucleus fusion process because there can be no star large enough to have turned into the super massive **Sagittarius A***. The Sagittarius A* has an event

horizon and emits hawking radiation.

Life cycle of a star

Main sequence stage

↓

Temperature reaches the point for fusion to commence.

The Giant phase

↓

the star exhausts the hydrogen in its core and starts to fuse hydrogen in a shell surrounding the helium core.

2 H atoms fuse → 1 + 1 = 2

3 Helium atoms fuse → 6

Resulting in the formation of carbon = 6

carbon buening phase

↓

Temperature rises enough to fuse carbon after helium is exhausted.

neon, oxygen and silicon burning processes

↓

process continues being fueled by neon, oxygen, silicone

↓

Star adopts two paths

↙ path 1

A supernova / Blackhole formation

↘ path 2

White dwarf formation

(d) What are isotopes, isobars, and isotones? Give examples of isotopes of Hydrogen.

ISOTOPES

Isotopes are members of the same element that have the same number of protons but different number of neutrons.

ISOBARS

Isobars are atoms of a different chemical elements having the same number of nucleons (protons + neutrons)

Example of a series of isobars:

^{40}S, ^{40}Cl, ^{40}Ar, ^{40}Ca

ISOTONES

Isotones are two or more types of atoms, having the same number of neutrons but different proton number.

Chlorine - 37 and Potassium - 39 are Isotones, having same number of neutrons = 20 but different number of protons.

ISOTOPES of Hydrogen

The three most stable isotopes of hydrogen: Protium (Hydrogen -1)
Deuterium (Hydrogen - 2)
Tritium (Hydrogen - 3)

Q4) (a) How earthquakes are generated? Distinguish with Tsunami.

Earthquakes are a very common, sudden release of energy that generates seismic waves.

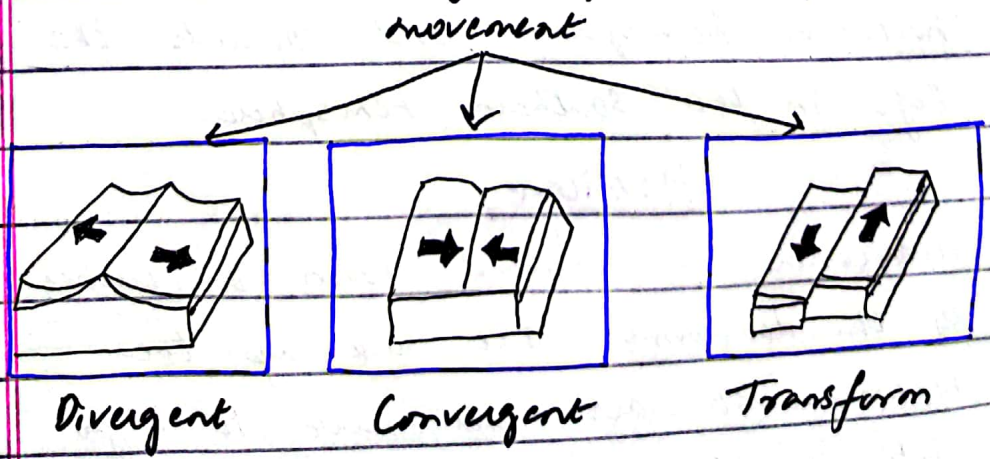
Most earthquakes occur along fault lines.

MOVEMENT of TECTONIC PLATES

The opposing tectonic plates push ~~against~~ against the fault line, building up strain, which eventually gives way releasing stored energy.

This energy spreads out rapidly from the earthquake origin, reaching the surface at the epicentre, and then spreading horizontally.

Three types of tectonic plate movement



TSUNAMI

If an earthquake disturbs the sea floor by shaking it up and down, then the earthquake energy can contribute to large waves at nearby coastlines, called a tsunami.

Tsunami occurs due to under water earthquake. It causes flooding and disrupts transportation, power communication, and water supply.

(b) What is Coriolis force? How Hurricanes are generated?

Coriolis force

Coriolis force is an apparent force caused by the earth's rotation. It is responsible for the deflecting winds towards the right in the northern hemisphere and towards the left in the southern hemisphere

Hurricane

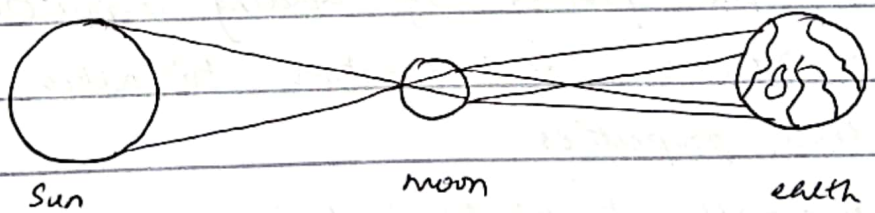
Hurricanes are formed from a cluster of thunderstorms that suck up the warm, moist air and move it high into Earth's atmosphere. The warm air is converted into energy that powers

the hurricane's circular winds.

(c) Distinguish solar and lunar eclipses.

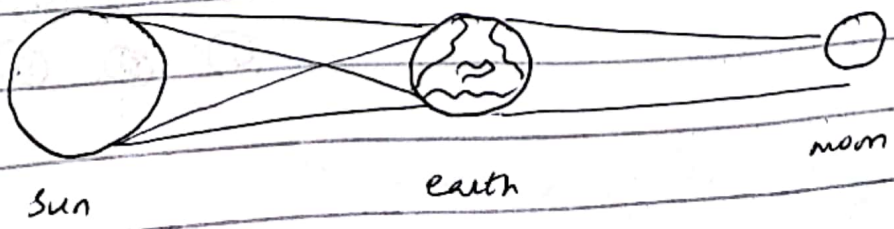
An eclipse is an astronomical event in which one astronomical object is temporarily obscured either by passing into the shadow of another body or having another body pass between it and the viewer. An eclipse occurs during a syzygy.

Solar Eclipse



Solar eclipse happens when the moon passes between the sun and earth, casting a shadow on earth that either fully or partially blocks sun's light in some areas. It occurs during new moon.

Lunar Eclipse

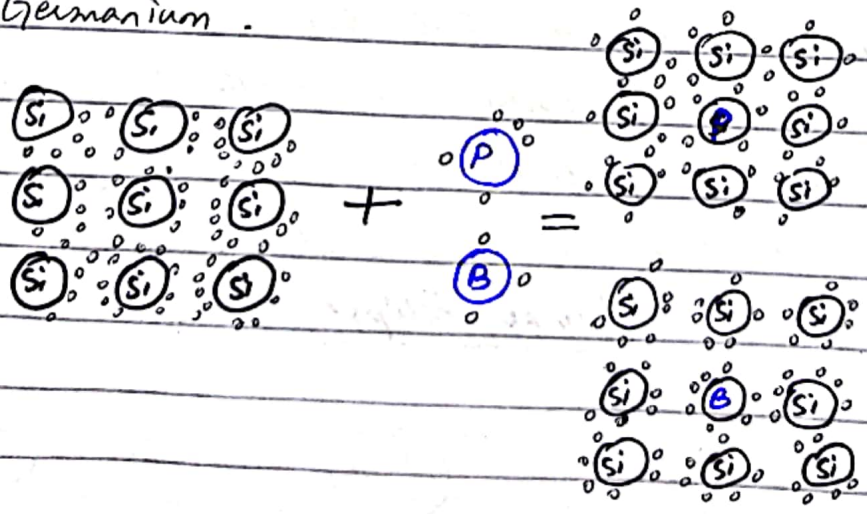


Lunar eclipse happens ~~happens~~ when the moon moves into the Earth's shadow and this casts a shadow over the moon. It occurs every six months, only during the full moon phase.

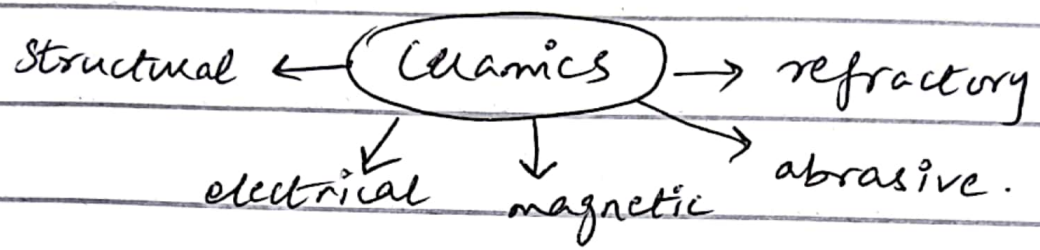
(d) What is doping in semi-conductors. Discuss different types of ceramics.

In semi-conductor production, doping is the process of adding impurities to intrinsic semiconductors to alter their properties.

Normally, trivalent and pentavalent elements are used to dope Silicon and Germanium.



Different types of ceramics



(i) Porcelain

A special type of clay either white or grey to which kaolin and white china stone is added.

(ii) Stoneware

It is a vitreous or semi-vitreous ceramic made primarily from stoneware clay or non-refractory fire clay.

(iii) Earthenware

Earthenware is also called low fired clay because it is normally matured at low temperatures. It is finer than stoneware.

(iv) Terracotta

It is a type of earthenware. It is a clay-based unglazed or glazed ceramic where the fire body is porous.

(v) Fireclay

It is a type of clay that is able to withstand intense heat. It is suitable for making articles which will not melt.

Q6

(a) Five years ago, age of father was thrice the age of son. If son is 30 years old now. What is current age of father?

Age of father five years ago = 75yrs
Age of son five years ago = 25yrs

Current age of son = 30 years.
Current age of father 80yrs

age of son five years ago = 30-5
= 25 years.

father's age five years ago = 25×3
= 75 years.

75+5 = 80 years → current age of father.

(b) Mean of 10, 30, y, and 50 is 50. What is the value of y?

$$\frac{10+30+y+50}{4} = 50$$

$$\frac{90+y}{4} = 50$$

$$90+y = 200.$$

$$y = 200-90 = 110$$

(c) Find the missing terms:

(i) 2, 6, 18, 54, 162

2, 6, 18, 54, 162

×3 ×3 ×3 ×3

$2 \times 3 = 6$ $6 \times 3 = 18$ $18 \times 3 = 54$.

$54 \times 3 = 162$

(ii) 3125, 256, 27, 4, 1

5^5, 4^4, 3^3, 2^2, 1^1

missing no = $3^3 \rightarrow 27$

(d) If the product of two numbers is 320 and their ratio is 1:5. What is the difference between squares of these two numbers?

Let the numbers be $x, 5x$

$xy = 320$

$x \times 5x = 320$.

$5x^2 = 320$

$x^2 = \frac{320}{5}$

$x^2 = 64$

$x = 8$.

$(5 \times 8)^2 = 1600$

difference between squares of $x, 5x$.

$5x^2 - x^2 = 1600 - 64$

$= 1536$

Q7) (a) Woman sold two scooties for = 96000 each

profit = 20% → first scooty

loss = 20% → second scooty

Gain or loss percentage in total?

96000 + 19200 → 120%

= 115,200 (profit)

76,800 (loss) → 80%

$\frac{20\% \times 20\%}{100} = \frac{400\%}{100}$

Total loss percentage = 4%

assume price of scooty 1 = 20 (1.2)

price of scooty 2 = 30. (0.8)

24+24 = 48.

20+30 = 50.

$\frac{50-48}{50} \times 100 =$ **4% loss**

(b) 195 men working 10 hours a day can finish a job in 20 days. How many men are employed to finish the job in 15 days if they work 13 hr a day?

men		hours		days
195	↑	10	↑	20
x		13		15

$$\frac{x}{195} = \frac{13}{10} \times \frac{20}{15}$$

$$\frac{x}{195} = \frac{260}{150}$$

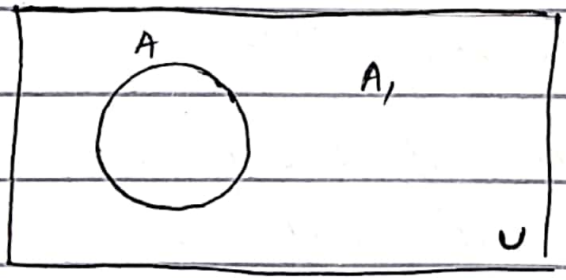
$$x = 338$$

338 men

(c) If $A = \{a, e, i, o, u\}$

$U = \{a, b, c, \ldots\ldots z\}$

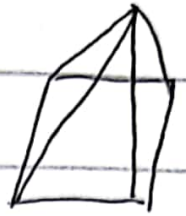
$A' = U - A$



$U - A = A'$

$A' = \{b, c, d, f, g, h, j, k, l, m, n, p, q, r, s, t \ldots\ldots z\}$

(d) Volume = 372 cm³



Height = 3 km

perimeter of base = ?

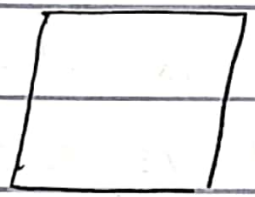
$$V = \frac{h \times l \times w}{3}$$

$$372 = \frac{300{,}000\text{cm} \times l^2}{3}$$

$$372 = 100{,}000\, l^2$$

$$0.00372 = l^2$$

$$0.06 = l.$$



perimeter of base = (0.06)4

= 0.24cm.