

What is solar system, indicate the position of planet pluto on it. state the characteristics that clarify it as a planet and an asteroid?

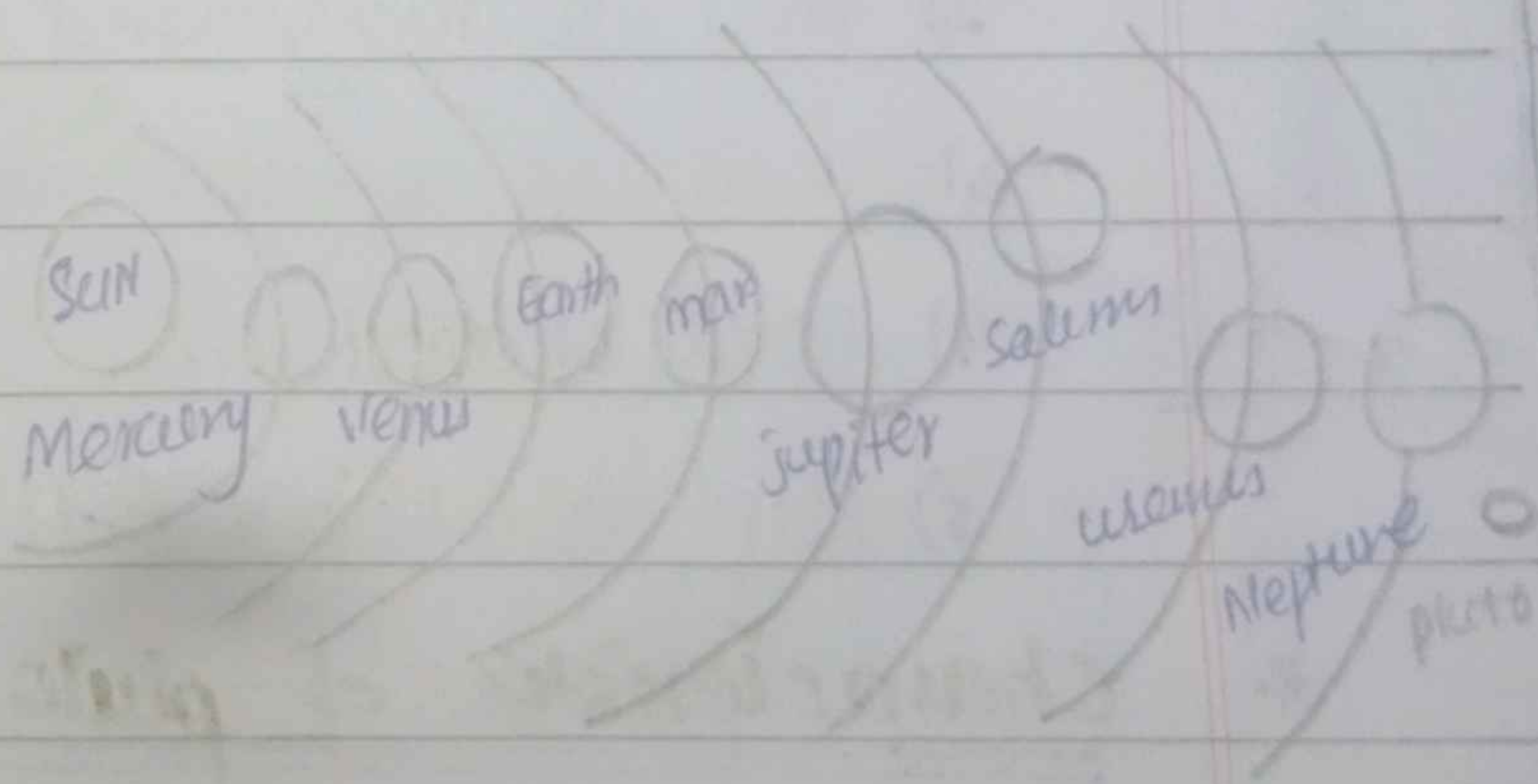
Solar system:

- Our solar system consists of 8 planets, the sun, dwarfs, moons etc.
- Sun is the centre of solar system and all other objects surrounds around the sun
- Our solar system is elliptical in shape, it means that is egg in shape.

* Position of Planets in solar system:

There are 8 major planets which surrounds sun.

- Mercury
- Venus
- Earth
- Mars
- Jupiter
- Saturn
- Uranus
- Neptune
- Pluto (dwarf planet)



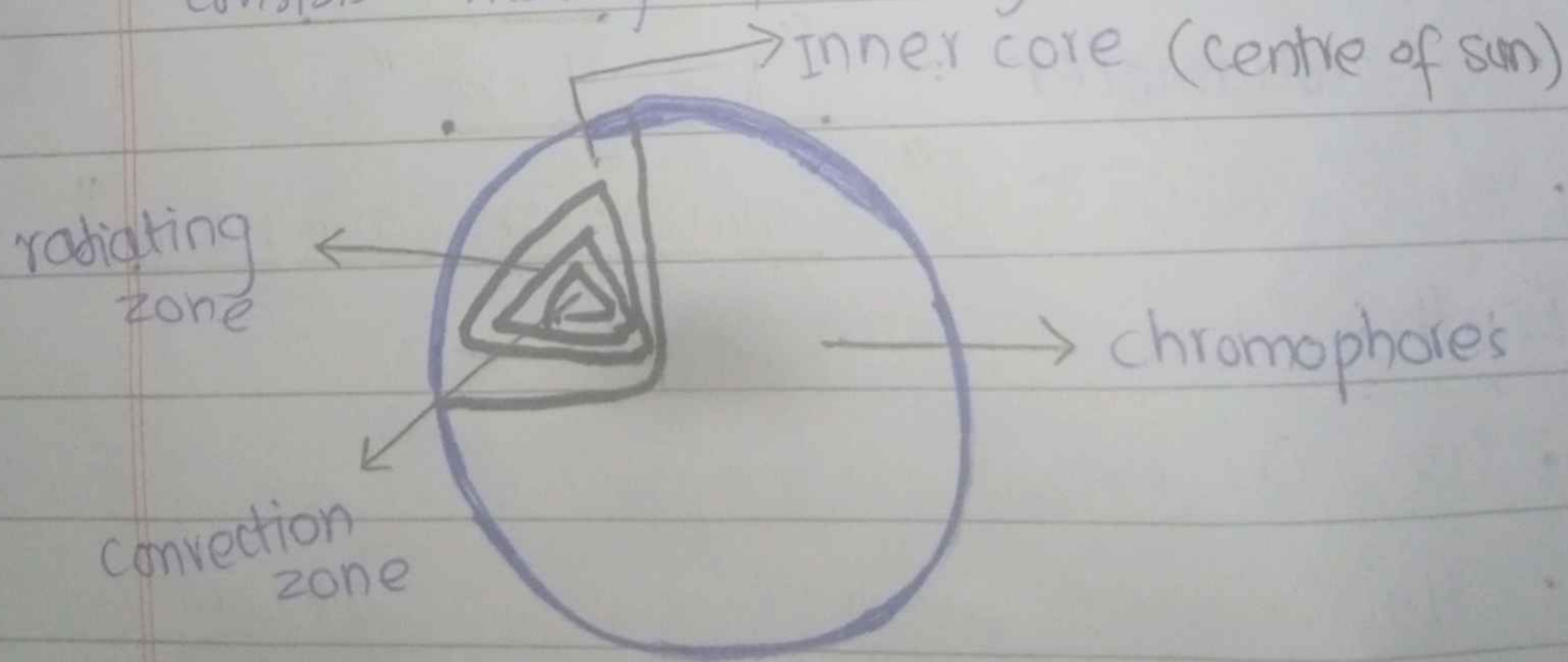
Q2 Discuss briefly about solar system.

Solar System:

- The system in which sun is present in centre, and all 8 planets along with dwarf planets, moon etc surrounds the sun and move around the sun is termed as "solar system".
- solar system is elliptical in shape it means that it is like "egg shaped".
- Sun is the biggest part of solar system.

SUN:

- Biggest part of solar system.
- Made or contain "99%" of the solar system mass.
- Present in centre of solar system.
- All planets move around sun.
- consists mainly of "Hydrogen and Helium".



Planets of solar system:

There are 8 major planets which revolve around the sun.

1) Mercury :-

- "closest planet" to the sun
- very hot during day, cold during night
- NO atmosphere, NO moon
- "smallest planet" in the solar system
- revolution around sun : 1 year (88 days)
- Diameter : 4880 km
- Also called as "swift planet".

2) Venus :

- It spins backward
- Similar to earth in size
- Hottest planet due to thick CO₂ atmosphere
- Rocky surface
- NO moon
- Revolution around sun : 225 days
- diameter : 12,104 km
- Also called as "Morning star, Earth's Twin".

3) Earth :

- life exists on it
- Having 1 moon
- Water rich
- Revolution around sun : 365.25 days
- Diameter : 12742 km

• Also called "Blue planet".

4)

Mars:

- Contain polar ice and dust particle
- Red due to FeO_2 on surface
- Having 2 moons i-e "Phobos and deimos"
- revolution around sun: "687 days"
- diameter: "6779 km"
- Also known as "Red Planet"

5)

Jupiter:

- largest planet of the solar system
- fits 1300 earths inside
- famous for "Great Red spot" (storm)
- Have 95 moons i-e Ganymede (largest)
- Having faint rings, also called "gas giant / king of planets"
- revolution around sun: "12 years"
- diameter: "139820 km"

6)

Saturn:

- known for its stunning ring (made up of ice and dusts)
- "Second largest planet"
- least denser
- Having 145+ moon - "Titans" (and largest moon)
- revolution around sun: "29.5 years"
- diameter: "116460 km"

Also called "Ringed planet"

7) Uranus :

- It has pale blue colour due to methane gas.
- Rotates on its side
- very cold planet, has thin rings
- Have 27 moon
- revolution around sun :- "84 years"
- diameter : "50,724 km"
- Also called "Blue-green planet" & "sideways planet"

8) Neptune

- Deep blue colour due to methane and
- unknown bacter
- had fastest wind in solar system.
- have 14 moons
- revolution around sun : "165 year"
- diameter : "49,224 km"
- Also called "windy planet, deep blue giant"



3)

The sun is massive, glowing ball of hot gases at the centre of our solar system.

a) Distance from Earth:

- Approximately "149.6 million km" (AU)

b) Mean distance from centre of gravity:

- $\approx 25000 - 28,000$ light year from galactic centre.

c) Velocity around centre of gravity:

- About 828,000 km/h (roughly 230 km/s)

d) revolution period around C-O-Galaxy:

- $\approx 225 - 250$ million years (cosmic year)

e) Equatorial diameter

- ≈ 1.392 million km.

f) rotation period along equator

- 24.47 along equator

g) core temperature

- 15 million $^{\circ}\text{C}$ ($K = 15 \text{ million K}$)

h) solar wind

- A continuous flow of charged particles emitted by sun, moving at 400-800 km/s

i) lovely diamond ring effect

- This is observed during a total solar eclipse when last bit of sunlight shines like a diamond on the ring of the Moon's silhouette.

j) Future of Sun :

- Currently in main sequence phase.
- After about "5 billion year", it will become a red giant, then sheds its outer layers and finally end up a white dwarf.

(4) What is galaxy? earth belong to which galaxy?

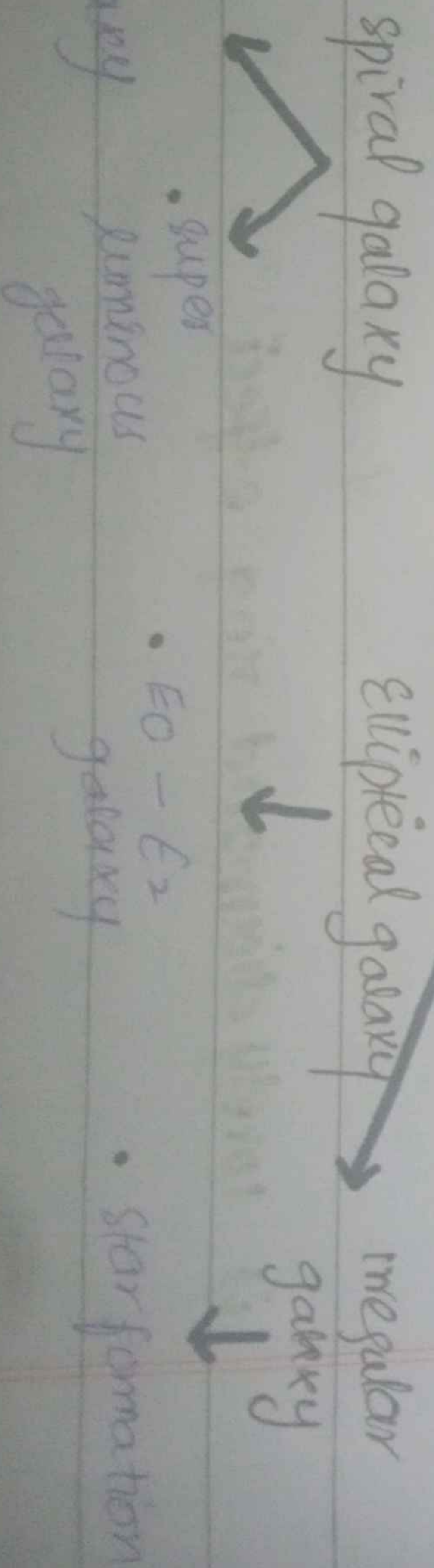
Galaxy :

- A galaxy is a huge system of stars, gases and dust particles along with dark matter bounded together by gravity.

- comes in different shapes irregular, elliptical and ^{spiral}spherical shapes.

contain 10,000 millions of stars and look like a disc with tail centre and spiral arm.

Classes of galaxy :



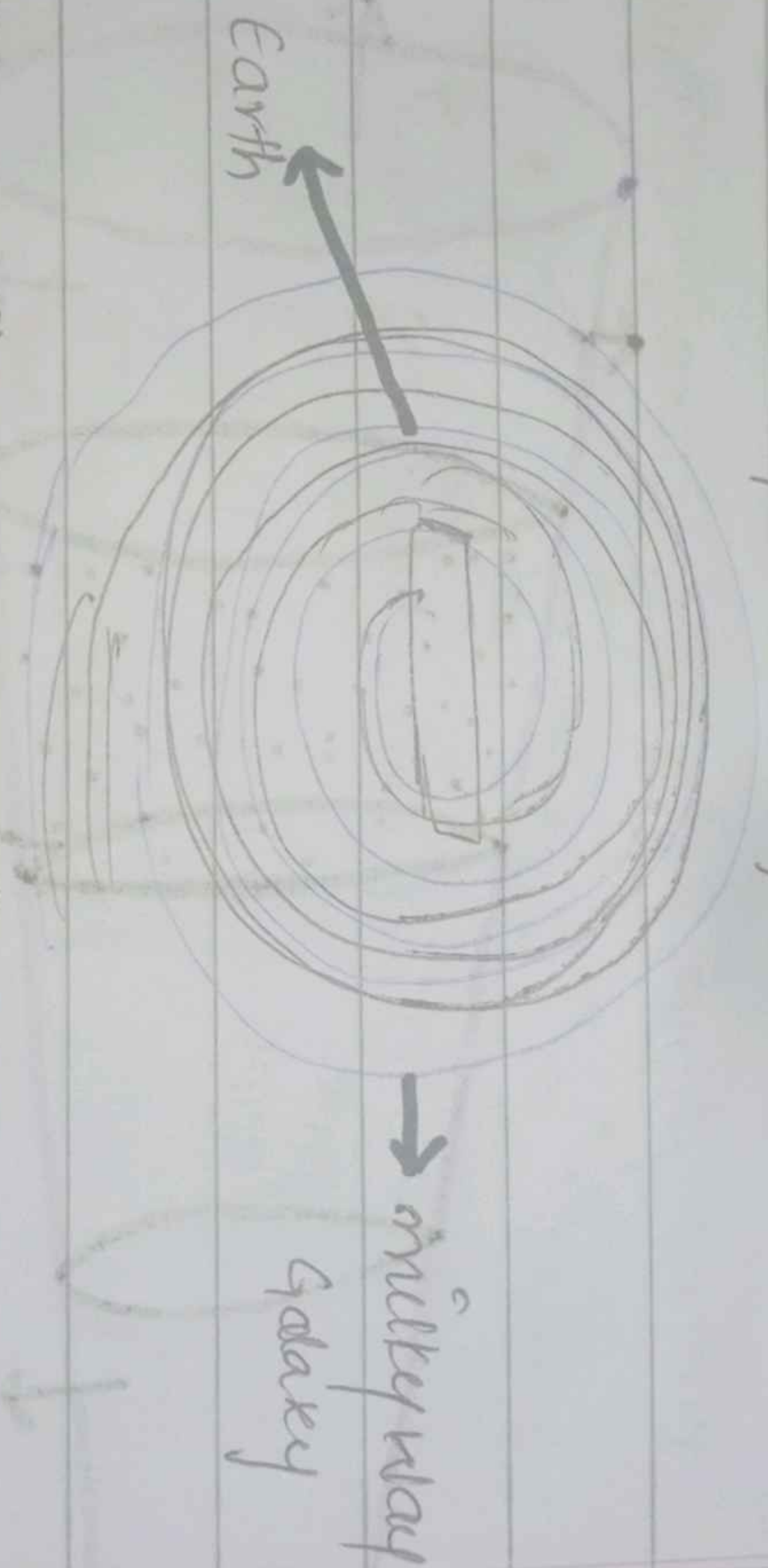
- Earth belong to which galaxy?

Earth belong to milky way galaxy because,

- It is spiral shaped galaxy
- It contain more than 100 billion stars.

As our sun belong to milky way galaxy and earth orbits around sun, so earth also belong to milky way galaxy.

- Having diameter of $\approx 100,000$ light years.
- Earth is present in spiral arm called "Orion Arm".



5) Briefly describe Big bang theory?

Big Bang Theory:

Most widely accepted theory with regard to universe.

According to this theory,

universe was created

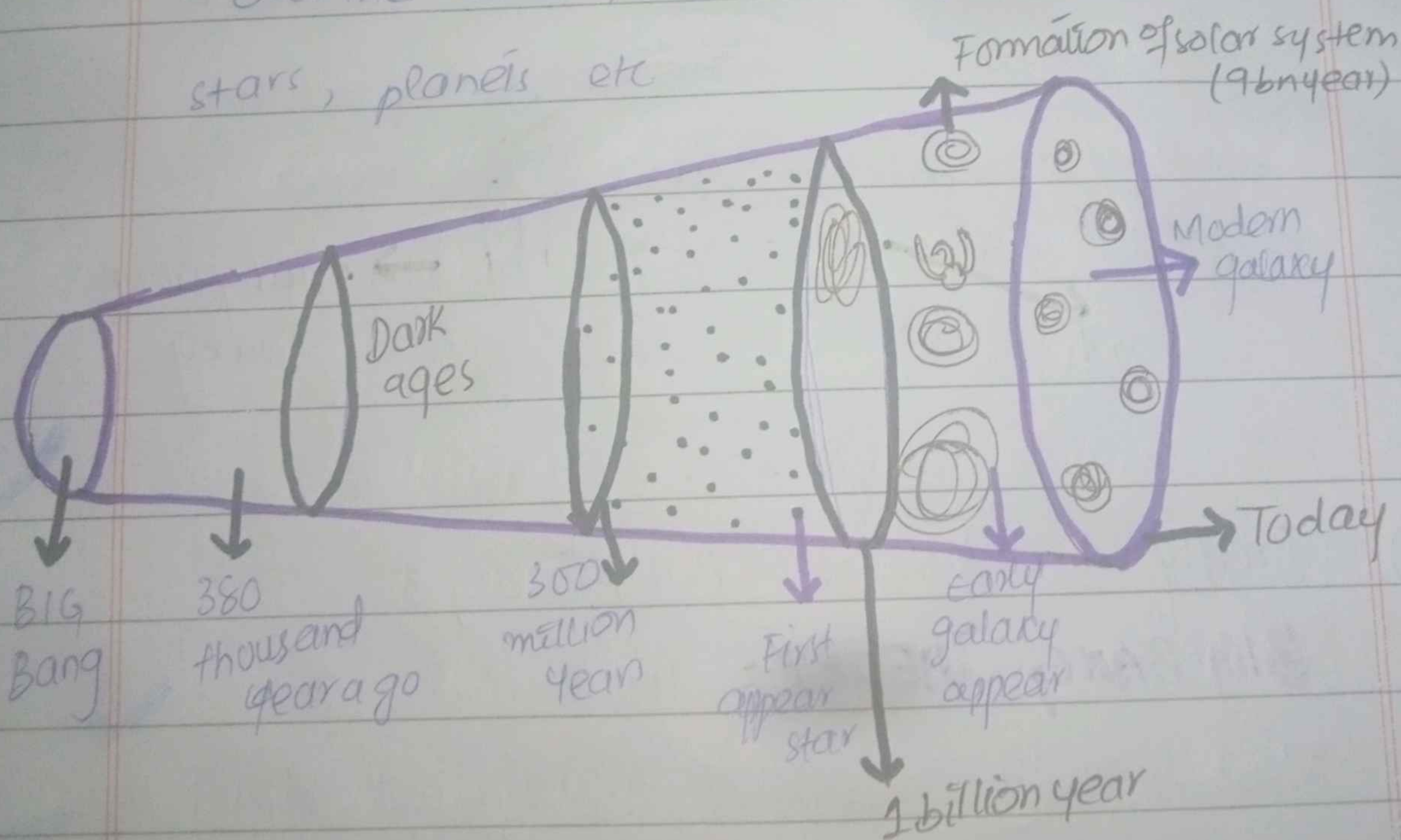
between 10 billions and 20 billions ago.

From cosmic explosion that hurdle matter

All galaxy formed from this

Big Bang theory

- Around 13.8 billion year ago, the entire universe was extremely hot, dense and small - like a tiny ~~particle~~ point (singularity).
- Then suddenly, it exploded or expanded rapidly. This event is called as "Big bang".
- After explosion universe cool down, and matter start forming.
- Over the time, this matter formed galaxies, stars, planets etc



6) Do you think pluto is still 9th planet of universe, if yes than why, if not then why?

Pluto is not considered as 9th planet of universe:

Pluto is not considered as 9th planet

Why not?

In 2006, the International Astronomical Union (IAU) changed the definition of planet.

According to them, a planet must have

- Orbit the Sun
- Be spherical (having enough gravity to pull itself around round shape).
- Clear its orbit

But Pluto does not follow 3 characteristics of (IAU) so it can't be called as planet.

Called as Dwarf planet:

Pluto is called as "Dwarf planet" because it follows 2 characteristics of (IAU).

- As it orbits around Sun
- Have enough gravity to pull itself around round shape.

Due to these 2 characteristics, it is called as "Dwarf planet".

Q 7) Describe different methods to estimate the age of the universe?

Different Methods to estimate the age of universe:

and ≈ 8 light minutes

1) Cosmic microwave background radiation:

- After big bang, the universe cool down and release faint radiation.
- These ancient light is called as "Cosmic microwave background radiation (CMB)".
- From this scientist estimated the age of universe as 13.8 billion years.

2) Expansion rate of universe ("Hubble's law"):

- The universe is expanding, galaxies are moving faster away from us.
- The Hubble constant tell us about how fast its expanding.

$$\text{Age} = 1 / \text{Hubble constant}$$

3) Observing oldest stars:

- Star changed over times, By studying the oldest stars, we can estimate the age of universe.

some stars are nearly 13 billion year ago.

for example :

HD 140283

Methuselah star ≈ 13.2 bn year

4) Radiometric Dating of cosmic elements :

- Elements like uranium and thorium, we can calculate their ages by their decays.
- Uranium and thorium present in stars, so by finding their decay rate we can calculate it.
e.g carbon dating

5) white dwarf cooling :

- White dwarf are old dying stars.
- Their temperature decreased slowly over billions of years.
- By measuring coolest star, we can estimate the age of universe.

Method	Measuring	estimated Age
CMB radiation	light from early radiation	13.8 billion year
Hubble's law	expansion rate	13-14 billion year
old stars	star Age	13.2 billion year
decay rate	Decay of elements	13+ billion year
white dwarf cooling	star cooling rate	13.5 billion year

Q#8

How Sun have such a strong gravitational field if its made up of gases?

SUN have strong gravitational field:

Even though Sun is mostly made up of gases but have strong gravitational field because of important following reasons:

1) Mass is what creates Gravity :

It is the mass which creates the gravity, not material

- Sun is extremely massive
It had about 330,000 time more mass than earth.
- Even though gases are light, the sun has so much gas packed ~~through~~ together in small space that its total mass is huge.

2) Gases of sun are compressed :

- The sun is not loose cloud of gas floating around.
- Its gases which are pulled tightly inwards by gravity making sun dense in core.
- Infact, core is extremely hot and dense and where nuclear fusion reaction occur.

In short :

The sun has strong gravitational field due to its massive size, not because of what it made of. Even of gas, it had a powerful gravitational field.

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What is black hole, ~~how~~^{space} it formed and what inside it?

Black hole :

- Place in universe where gravity pulls so much that even no light can pass out.
- It is so denser that nothing can escape from it due to strong gravitational field.

*** Singularity :**

The point at every centre of a black hole is called "gravitational singularity".

Had enormous amount of mass in an indefinite small place.

*** Event horizon :**

The outermost boundary of the black hole is called as "Event horizon".

*** Point of no return :**

Point at which the gravitational force overcome light ability to escape the black hole pull. This point is called as "point of no return".

Formation of black hole :-

- Massive star : Stars more than 6 times of as massive than sun is called massive star.
- Super giant : Hydrogen in the centre of core of massive star is used to move ^{at} faster speed. After 50-100 million year, massive star had no hydrogen left, due to which massive star collapse and become 1000 time more greater than original size than it become "Super giant".
- Supernova : With the passage of time,

The supergiant become so denser that it can't tolerate the pressure of outer space. Outer layer collapse with tremendous explosion and called "Supernova".

• Neutron star :

At the time of supernova, the light of stars becomes more than other stars. A great shell of star gases fly off due to which the core left.

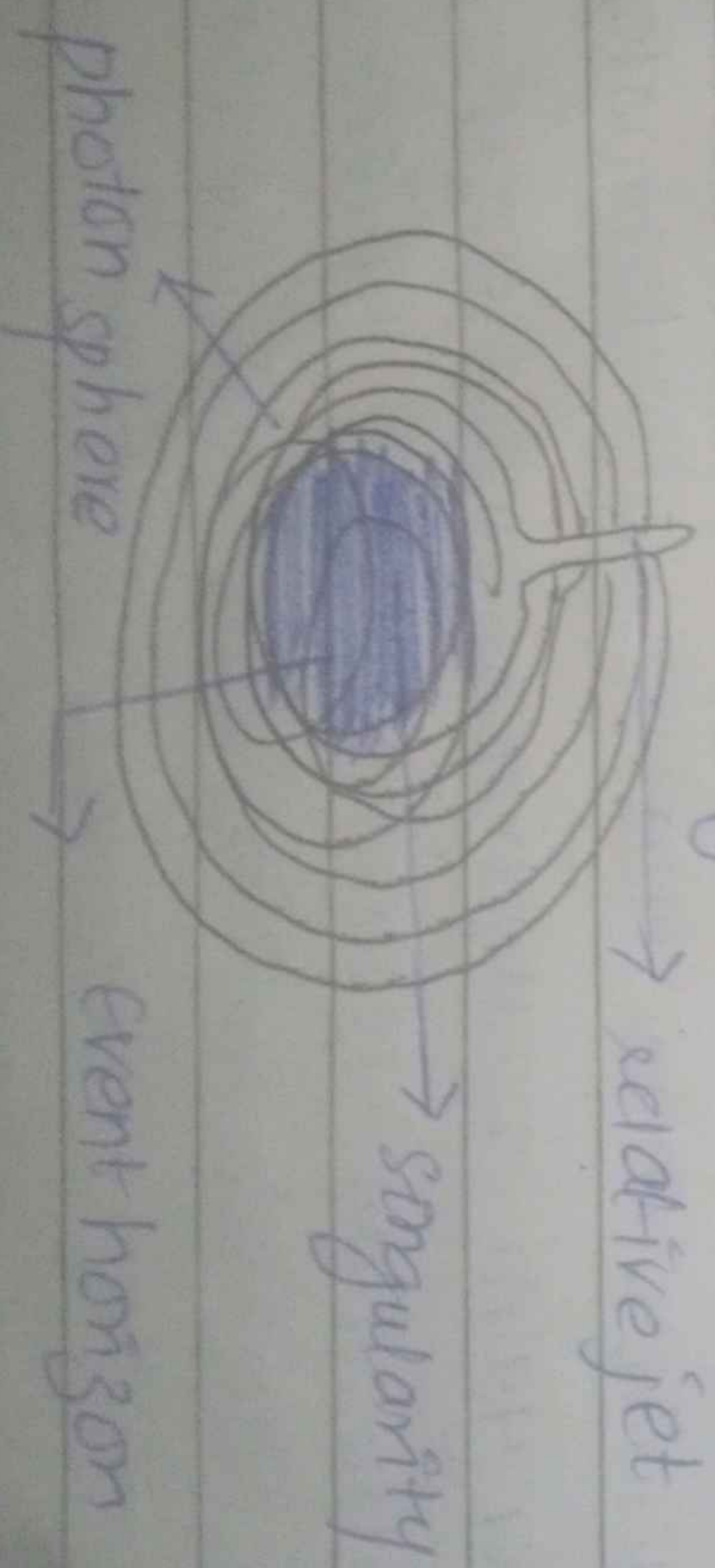
• Core consists of only neutrons called "neutron star".

• Black hole :

- It is extremely denser than sometime after supernova, from where explosion occur and massive star become "big hole".
- It is so denser that nothing can escape from it.
- It is last stage of life cycle of massive star.

What inside black hole :

- Between singularity and event horizon there is nothing only the empty space present with tremendously strong gravitational forces. When all hydrogen left the singularity then no one knows how really look like.



(GSA) :-

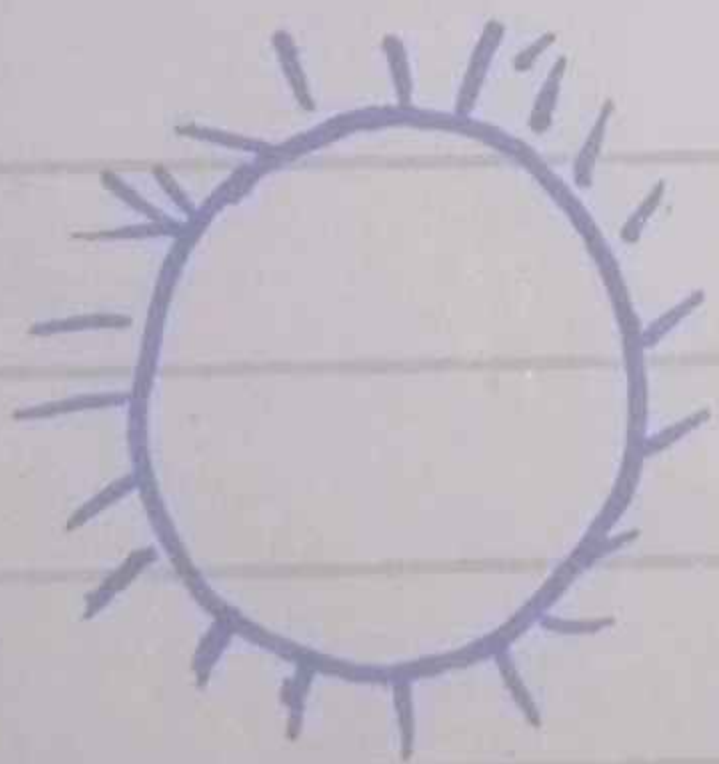
Diff star and planet ? what is the magnitude of star and how the color of star is correlated with their temperatures ?

Star

- Huge ball of hot gases that gives off light and heat
- Very high temperature ($^{\circ}\text{C}$ million)
- twinkle when see from Earth
- Generally much bigger than planets

Example

- Sun, Sirius



planet

A large body which surrounds the sun and does not produce their own light

Much cooler than star

Does not twinkle

Smaller than stars

example

Earth, Mars, Venus, Jupiter etc



Magnitude of the star :-

Magnitude of star means, how bright the star is.

Types of magnitude :

Apparent
magnitude

Absolute
magnitude

magnitude
is correlated

which
and
own light

star

Apparent magnitude

How bright the
star look like
from the Earth

Absolute magnitude

How bright the
star look if
we're placed exactly
10 parsecs (32.6 Lg)
from Earth.

How color of star related to its temperature?

colour of star tell us about its surface temperature.

- Hottest star emits shorter wavelength of light, which appears to be blue or white.
- cooler star emits longer wavelength of light, which appears red or orange.

More the temperature $\rightarrow$ More colour (bright) $\rightarrow$ Hottest star.

color of star

Blue

Yellow

Temperature

Above (10000°C)

5000 °C - 6000 °C

Rigel

Sun

Q Briefly explain the most popular and most accepted theory of origin of universe.

BIG BANG theory:

Most popular and accepted theory of origin of universe.

According to this theory, "Universe was created between 10 billion - 20 billion ago, from cosmic radiation that explosion that hurdle in all direction."

- All galaxy formed from this.

Assumption of big bang theory:

- Around 13.8 billion year ago, universe was hot extremely, dense and small just like a tiny point (singularity)
- Suddenly it exploded and expanded. This event is called "big bang".
- After explosion universe cooldown and matter formed.
- over the time, matter formed galaxies, planets etc.

