NDA PREPARATION MATERIAL
GAT– GEOGRAPHY
TOPIC 2B

THE ORIGIN OF THE EARTH

Our earth is a member planet of the universe which consists of numerous stellar systems. The earth is a member of the Solar system and in comparison to several planets, earth is a tiny toy. The age of the earth is about 10 thousand million years or 10 billion years. Before this huge age, gaseous matter filled the universe. In this gaseous state of matter a disturbance occurred and as a result condensation was started. As a result of condensation the latent heat was released and it increased the temperature from $5000^{0}C$. The disturbance in the universe and the condensation has been a subject of to $50000^{0}C$ great discussion and speculation. As such, numerous theories have been advanced with regard to the composition, rotation and condensation of the spiral nebulae. Although some believed that the nebulae were composed of solid meteorites but this is no longer subscribed and all the authorities agree on one point that the spiral nebulae were a gaseous mass.

i) GEOCENTRIC THEORY:- The earliest systematic theory of the earth was the " Geocentric theory" According to this theory, the earth was the unmoving centre of the universe, round which the sun and the stars and all other heavenly bodies revolved. One of the earliest proponents of this theory was Euodoxius of Cnidos. The Final Formulation of the theory was made by Claudius Ptolemy.

ii) HELIOCENTRIC THEORY:- This theory was first advanced by Nicolous Koppernigk. A polish astronomer, better known by his latinised name Copernicus. In 1543 he set out the theory that the sun was the centre of the universe and the earth and other planets revolve around if. The theory faced stormy weather. It was then Galileo Galilei save the Copernican theory from extinction. Finally Sir Issac Newton dealth the last blow at Geocentric theory.

iii) MODERN THEORIES:-

a) BUFFON'S HYPOTHESIS:- In 1749, the French naturalist Comte De Buffon argued that the Planetary system orginated as a result of a collision between the sun and a huge cometi that come out from the depths of space. Due to this collision lot of matter was freed from the sun and this matter, on condensation, formed planets and sub – planets.

b) THE GASEOUS MASS THEORY:- In 1755 the German Philospher Immune kant suggested that the Earth and the other planets were condensed from a rotating nebular of gas centred in the sun. According to him, primordial matter was evenly distributed in the shape of small and cold particles. Due to gravitational attraction between them. They were pulled towards one another. This resulted into a collision which increased their "temperature" and produced "angular velocity" The temp. and the speed rose so high that the mass of the particles became gaseous, and began to emit light. Due to angular velocity "centrifugal force" (a force which pulls things away from its centre) increased so much that rings began to separate from the gaseous mass. These rings on cooling became planets. Some rings also separated from the gaseous mass of the planet and revolved around them as sub-plants. The remaining part of the original gaseous mass became the sun.

c) NEBULAR THEORY:- The French mathematician Marquis De Laplace supported the nebular hypothesis in 1796. He stated that primordial matter in the beginning existed in the form of intensely hot and rotating gaseous mass called Nebula. Due to rotation of Nebula the rings moved away and broke into many smaller rings. These rings, on cooling took the forms of planets and sub planets. The centre part of the nebula which remained behind became the sun.

d) METEORITE THEORY:- Lockyer, a British scientist adopted the laplace's theory in another way. According to him there were two meteors in the beginning. Tremendous heat was generated when these meteors collided with each other. The matter of the meteors melted into liquid. Many scattered bodies assembled on account of the gravitational pull between them and took the form of a spiral nebula. The rest of the hypothesis runs according to the laplace's hypothesis.

e)PLANETESIMAL THEORY:- In 1904 two American astronomers, T.C. Chamberlain and F.R. Moulton offered an altered version of Buffon's theory. They argued that a star (not a comet) passed by the sun and drew out the material that later condensed into planets.

f) TIDAL HYPOTHESIS :- This hypothesis was advocated by James Jeans and Jeffreys. According to this hypothesis, in the distant past a big star approached the sun so near that it raised tides in it. These tides gradually became so great that just under that approaching star the tidal matter shot off toward it. The matter that had already left the sun formed a long filament of gaseous matter which was set into motion by the gravitational pull of the receding star. This matter could not fall back into the sun, but rotates around the parent body or sun. As time passed the gaseous matter cooled down and formed the various planets. This theory is also known as "Hit and run theory" or "catastrophic theory" or "Tidal action theory".

g)INTER STELLER DUST HYPOTHESIS:- Otto Schmidst, a Russian Scientist (1943) believed that there was lot of dust particles in the space in addition to stars, planets etc. The dust particles being attracted by the sun about 6 billion years ago, began to revolve round the sun. In the beginning, these particles revolved in different and uncertain orbit but later they collided with one another and assumed the form of a saucer. Due to collision their speed decreased and the particles united to form planetesimals which later produced large planets. Some matter remained unconsolidated even after the planets were born. Sub planets were formed from this unconsolidated material and began to revolve round the planets. This theory is also called as gas-dust-cloud theory and is one of the most favoured.

h)BINARY STAR THEORY:- Russel and Lyttleton (1936) regarded the sun as a Binary star. At some time in the past there was another star called Compound star at a distance of 2900 million km from the present star. Both the stars revolved round the same centre. Due to some accident a third star happened to come as close as 5.5 to 4.5 million km to the companion star. As it was far away from the sun, it did not affect it, but it produced tides in the companion star. A lot of matter of the companion star in the form of tide was attracted towards the stars and began to revolve around it. The planets were formed from this matter. Tides must have been produced when the planets were in the liquid state.

i) THE FISSION THEORY:- Also known as Rossgunn's rotational and tidal theory seeks to combine the basic principles of the theories of Laplace and James Jeans.

THE EARTH'S EVOLUTION

The earth in the present form has reached through several hlases. From a ball of whirling dust and clouds, it passed through a molten stage. Light substances floated up from deep inside then they changed into hard rock's after cooling. These solid rocks make up most of the earth's crust. As the earth's interior continued to cool, it contracted and the outer crust wrinkled forming ridges and basins. Meanwhile, still lighter substances swarmed up above the earth's surface forming an atmosphere of gases. As the gaseous substance cooled in the atmosphere, enormous clouds emerged. They brought heavy rains for thousands years. This rain water collected in great basins and thus oceans came into being. For a long span of time, the planet earth remained life less. Then life took its shape in ocean. It is difficult to say what formed life but through some agency some molecules acquired the ability to duplicate emerged the wonderful world of plants and animals. Homospiens came into being about 5, 00,000 years ago.

Multiple choice questions

1. Match List I with List II and select the correct answer from the codes given below the lists:

List I	List II
A. Gaseous Mass Theory	1. Jeans and Jeffreys
B. Nebular Theory	2. Otto Schmidst
C. Tidal Hypothesis	3. Kant
D. Interstellar Dust Hypothesis	4. Laplace

Codes:

	A	B	C	D
a)	3	4	2	1
b)	2	4	1	3

c) 2 1 3 4
d) 3 4 1 2
2. The cigar shaped planetary system was hypothesized by:
a) Laplace
b) Jeans and Jeffreys
c) Hoyle and Littleton
d) Kepler
3. The gaseous mass theory about the formation of planets is attributed to:
a) Kant
b) Buffon
c) Lockyer
d) Chamberlain
4. Big Bang was an explosion that occurred?
(a) 10.0 Billion years ago
(b) 13.8 Billion years ago
(c) 20.4 Billion years ago
(d) 25.3 Billion years ago
5. Big Bang theory explains?
(a) Origin of Universe
(b) Origin of Sun
(c) Origin of Galaxies
(d) None of above
6. In support of his hypothesis on the origin of Earth which one of the following scholars said, “Give me matter and I will build a world out of it”?
(a) James Jeans
(b) T. C Chamberlin
(c) Immanuel Kant
(d) Laplace
7. The arrangement of planets with smallest on either ends and big planet in the middle, supports which one of the following theories of origin of the solar system?
(a) Big Bang theory
(b) Tidal hypothesis
(c) Binary Star theory
(d) Cepheid theory
8. The age of the earth is about:
(a) 10 Billion years
(b) 05 Billion years
(c) 08 Billion years
(d) 15 Billion years
9. Name the scientist who formulated the most favoured theory ‘Inter steller dust hypothesis’ explaining the origin of the solar system.
(a) Laplace
(b) Jeans and Jeffreys
(c) Hoyle and Littleton
(d) Otto Schmidst
10. Name the scientist who gave heliocentric theory regarding the origin of the solar system.
(a) Newton
(b) Nicolous Koppernigk
(c) Comet De Buffon
(d) Immanuel Kant