

## UNIT

## 3

## Universe



## TEXTBOOK EVALUATION

## I. Choose the correct answer.

- Which of the following statements is correct?
  - There are eight planets in our Solar System.
  - Except Mars, all other planets revolve around the Sun in elliptical orbits
 (a) A only                      (b) B only  
 (c) Both A and B    (d) None

**Ans: (a) A only**

- Who proposed the heliocentric model of the universe?
  - Tycho Brahe
  - Nicolaus Copernicus
  - Ptolemy
  - Archimedes

**Ans: (b) Nicolaus Copernicus**

- Which of the following is not a part of outer solar system?
  - Mercury
  - Saturn
  - Uranus
  - Neptune

**Ans: (a) Mercury**

- Ceres is a \_\_\_\_\_.
  - Meteor
  - Star
  - Planet
  - Astroid

**Ans: (d) Astroid**

- The period of revolution of planet A around the Sun is 8 times that of planet B. How many times is the distance of planet A as great as that of planet B?
  - 4
  - 5
  - 2
  - 3

**Ans: 2**

- The Big Bang occurred \_\_\_\_\_ years ago.
  - 13.7 billion
  - 15 million
  - 15 billion
  - 20 million

**Ans: (a) 13.7 billion**



## II. Fill in the blanks.

- The speed of Sun in km/s is \_\_\_\_\_.

**Ans: 250 km/s**

- The rotational period of the Sun near its poles is \_\_\_\_\_.

**Ans: 36 days**

- India's first satellite is \_\_\_\_\_.

**Ans: Aryabhata**

- The third law of Kepler is also known as the Law of \_\_\_\_\_.

**Ans: Harmonies**

- \_\_\_\_\_ is the only moon in the solar system that moves in the opposite direction to the direction in which its planet spins.

**Ans: Triton**

- The number of planets in our Solar System is \_\_\_\_\_.

**Ans: 8**

### III. True or false.

1. The distance between Saturn and Uranus is about 10 times as that between Earth and Mars.

**Ans: False,** The distance between Saturn and Uranus is about 20 times as that between Earth and Mars.

2. ISS is a proof for international cooperation.

**Ans: True**

3. Halley's comet appears after nearly 67 hours.

**Ans: False,** Halley's comet appears after nearly 76 years.

4. Satellites nearer to the Earth should have lesser orbital velocity.

**Ans: False,** Satellites nearer to the Earth should have higher orbital velocity.

5. Mars is called the red planet.

**Ans: True**

### IV. Match the following.

1. Jupiter	a. 17.2 hours
2. Mercury	b. 10.7 hours
3. Venus	c. 87.97 days
4. Saturn	d. 9 hours 55 min
5. Mars	e. 243 days
	f. 87.97 days
	g. 24 hours 37 min

**Ans:**

1. Jupiter	a. 9 hours 55 min
2. Mercury	b. 87.97 days
3. Venus	c. 243 days
4. Saturn	d. 10.7 hours
5. Mars	e. 24 hours 37 min

### V. Answer very briefly.

1. What is solar system?

The sun and celestial bodies which revolve around it forms the solar system.

2. What is a cosmic year?

The time taken by the sun to complete one revolution with a speed of 250km/second. The value of one cosmic year is 225 million years.

3. Define orbital velocity.

The horizontal velocity that has to be imparted to a satellite at a determined height so that it makes a circular orbit around a planet is called orbital velocity.

4. Define time period of a satellite.

The time taken by the satellite to complete one revolution around the earth is called time period

5. What is a satellite? What are the two types of satellites?

A body moving around a planet is called satellites.

Types:

1. Natural satellites
2. Artificial satellites

### VI. Answer in brief.

1. Write a note on the inner planets.

The first four planets which is very close to the solar system are called inner planets. They are **mercury**, **venus**, **earth** and **mars**.

2. Write about comets in brief.

i) Comets are lumps of dust and ice that revolve around the sun in highly elliptical orbits.

ii) Their period of revolution is long

iii) When approaching the sun a comet vapourizes and forms a head and tail

iv) Exmpl: Halley's comet

3. State Kepler's laws.

#### First Law – The law of Ellipses

The path of the planets about the sun is elliptical in shape, with the centre of the sun being located at one of the foci.

#### Second law – (The law of equal areas)

The imaginary line drawn from the centre of sun and centre of planet will sweep out equal areas in equal intervals of time.

**Third law- ( The law of harmonics)**

The ratio of the squares of the period of any two planets is equal to the ratio of the cube of their semi major axis from the sun.

## 4. Write short notes on Gaganyaan.

Gaganyaan is an Indian crewed orbital space craft intended to be the basis of the Indian human spaceflight programme. The space craft is being designed to carry three people with docking capability. The crewed vehicle is planned to be launched on ISRO's GSLV rocket in 2022.

## 5. What factors have made life on Earth possible?

The factors which made life possible on Earth are:

- i) Due to its right distance from the Sun it has the right temperature.
- ii) The presence of water.
- iii) Suitable atmosphere.
- iv) A blanket of ozone.

**VII. Answer in detail.**

## 1. Give an account of all the planets in the solar system.

i) Our solar system consists of eight planets such as Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.

ii) The first four planets Mercury, Venus, Earth and Mars are called inner planets since they are very close to the sun. The inner planets are called rocky or terrestrial planets.

iii) The planets Jupiter, Saturn, Uranus and Neptune are called outer planets since they are farther from the sun. The outer planets consist of hydrogen, helium and other gases in huge amounts.

iv) The outer planets have a dense atmosphere so they are called as gas giants or gaseous planets.

v) The outer planets have rings whereas the inner planets have no rings.

vi) Out of all the planets the only planet Earth has living factors. Due to the right distance from the sun it has a right temperature, Presence of water, Suitable atmosphere, A blanket of ozone supports for our life.

vii) Among the planets in the solar system all the planets have moon except Mercury and Venus.

## 2. Discuss the benefits of ISS.

Benefits of ISS:

i) Areas having water scarcity can gain access to advanced water filtration and purification systems.

ii) The eye tracking device built in it has proved ideal to be used in many laser surgeries.

iii) The eye tracking technology is also helping disabled people with limited movement and speech.

iv) Robotic arms developed for research in the ISS are providing significant help to the surgeons in removing inoperable tumours.

v) ISS is also very helpful in the development of improved vaccines, breast cancer detection and treatment, ultrasound machines for remote regions etc.

## 3. Write a note on orbital velocity.

**ORBITAL VELOCITY:**

i) The horizontal velocity that has to be imparted to a satellite at a determined height so that it makes a circular orbit around a planet is called orbital velocity.

ii) The orbital velocity of a satellite depends upon its altitude above the earth.

iii) The orbital speed and the distance permit the satellite to make one revolution in 24 hours.

iv) The orbital velocity can be calculated by the formula

$$v = \sqrt{\frac{GM}{(R+h)}} \text{ where}$$

G = Gravitational constant ( $6.673 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$ )

M = Mass of the Earth ( $5.972 \times 10^{24} \text{ kg}$ )

R = Radius of the Earth (6371 km)

h = Height of the satellite from the surface of the Earth.

### VIII. Conceptual questions

1. Why do some stars appear blue and some red?

Stars appear in different colour depending on their temperature. The hot stars are white or blue whereas the cooler stars are orange or red in colour.

2. Why are we able to see the Moon even though it is not a luminous body?

We are able to see the moon due to its reflection of sun light.

3. How is a satellite maintained in nearly circular orbit?

Due to gravitational force and centripetal force the satellite is maintained in the circular orbit.

4. Why are some satellites called geostationary?

These satellites are fixed at a particular position relative to a point on the earth's surface. This satellite stays over the same spot and revolves along with the earth's rotation.

5. A man weighing 60 kg on the Earth will weigh 1680 kg on the Sun. Why?

Since the acceleration due to gravity on the sun is 28 times the acceleration due to gravity on earth.

### IX. Numerical problems

1. Calculate the speed with which a satellite moves if it is at a height of 36,000 km from the Earth's surface and has an orbital period of 24 hr (Take R = 6370 Km)

[Hint: Convert hr into seconds before doing calculation]

$$r = 36000 \text{ Km}$$

speed = distance / time period

$$\text{distance} = 2\pi r$$

$$= 2 \times 3.14 \times 36000$$

$$= 226080 \text{ Km.}$$

$$\text{Time period} = 24 \text{ hr} = 86400 \text{ s}$$

$$\text{Speed} = 226080 / 86400 = 2.62 \text{ Km / s}$$

2. At an orbital height of 400 Km, find the orbital period of the satellite.

$$\text{speed, } V = \sqrt{GM/(R+h)}$$

$$= \sqrt{6.673 \times 10^{-11} \times 5.972 \times 10^{24} / (6371+400)}$$

$$= 0.0767 \times 10^5 \text{ m/s}$$

$$\text{ORBITAL PERIOD, } T = 2\pi(R+h)/v$$

$$= 2 \times 3.14 \times (6371 + 400) \times 10^3 / 0.0767 \times 10^5$$

$$= 5543.92 \text{ seconds}$$

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