18. Observing space – Telescopes

EXTRA QUESTIONS

1. **Match the following.**

'A'	Ans	'B'
X rays	**Chandra**	GMRT
Optical telescope	**Hubble**	ISRO
Indian radio telescope	**GMRT**	Hubble
Artificial satellite	**ISRO**	Chandra

2. **Match the following.**

'A'	Ans	'B'
1Pm	**10^{-12}m**	More than 20 cm
1Nm	**10^{-9}m**	10raise to -12m
Gamma rays	**Less than 3Pm**	10`-9m
Radio waves	**More than 20 cm**	Less than 3Pm

3. Match the pairs.

'A'	Ans	'B'
Aryabhatt	**3-6m diameter**	Over area of 25km
Galileo	**4 satellites**	4 satellites
Parabola Shape	**Over area of 25km**	NASA
Hubble	**NASA**	3-6 m diameter

4. Select odd man out from the following:

NASA, ISRO, GMRT, ARIES

Ans - GMRT: It is the only telescope mentioned rest are space research institution.

5. Hubble, GMRT, Chandra, Astrosat

Ans: Astrosat: As it is the only artificial satellite rest are the telescopes.

6. Say whether the given statement is true or false

1) Light is an electromagnetic wave

Ans: True

2) The images formed by mirrors do not have errors of color.

Ans: True

3) The optical telescopes are made with only two types of lenses.

Ans: False: They are usually two or more no. of lenses

7. What is visible radiation?

Ans: Light is an electromagnetic wave. Every wave has a characteristic wavelength. Our eyes can see only that light which has wavelengths between 400 nm to 800 nm. Such light is called visible radiation

8. What is Radio telescope?

Ans: Many heavenly objects emit radio waves in addition to visible radiation. We cannot see this radiation with our eyes. Hence, a special type of telescope is used to receive these rays. It is called a radio telescope.

9. What is optical telescopes?

Ans: The telescope in which Mirrors and Lenses are used to collect the maximum amount of light coming from heavenly object is called as optical telescope

10. What is refracting telescope?

Ans: Light rays change their direction as they enter a lens from the atmosphere and again when they enter the atmosphere after passing through the lens. This is called refraction. Hence telescopes made by using refractive lens are called refracting telescopes

11. What is full name of ISRO?

Ans: Indian Space Research Organization (ISRO) is the Indian space research center

12. What is the difference between the sky and space?

Ans : On standing on surface of the earth , the part of Earth that can be seen by our naked eyes is called sky while the components of world that cannot be seen by our naked eyes eg. World, planets, Stars, etc constitute to the space.

13. Mention few names of artificial satellites and their functions:

Ans: INSAT and GSAT: Support our telecommunication network, television broadcasting and meteorological services

EDUSAT satellite in this series is used exclusively for education.

The IRS satellite series is used for the monitoring and management of natural resources as well as disaster management

Astrosat: This satellite has ultraviolet and X-ray telescopes and detectors

14. What is space observation?

Ans: Observing the stars, planets, comet's with the help of telescope in the space is called space observation. By observing the position of stars and planets in the space we can know the weather and season patterns, the high tide and low tide and rain forecast

15. Mention the names of other satellites in space

Ans: Black knight

Harshal space observatory

Purbhi gamma ray telescope

Integral

Spitzer space telescope

16. Write a note on Astrosat.

Ans: In 2015, Indian Space Research Organization (ISRO) launched an artificial satellite called Astrosat, in space. This satellite has ultraviolet and X-ray telescopes and detectors. Most of the parts used in this satellite are made in India. It is a unique system having different kinds of telescopes on a single satellite. Indian scientists are studying various aspects of the Universe using the data obtained with these telescopes

17. Why are optical telescopes are situated on top of mountains, at uninhabited places?

Ans: 1) The visible light coming from a heavenly body is absorbed by the atmosphere and the intensity of the light reaching the earth's surface decreases.

2) A second problem is caused by the changes in atmospheric pressure and temperature

3) During the night too city lights and cloudy weather can cause difficulties in observing the heavenly bodies.

4) To reduce these problems, optical telescopes are situated on top of mountains, at uninhabited places

18. Write in brief about Chandra telescope.

Ans: In 1999, the National Aeronautics and Space Administration launched an X-ray telescope named Chandra, in space, to study X-rays coming from heavenly objects. Special mirrors which can reflect X-rays were used in this telescope. Chandra has given us very useful information about stars and galaxies. The telescope is named after the famous Indian scientist Subramanian Chandrasekhar

19. Write a note on Hubble telescope

- 1. Hubble is an optical telescope
  2. NASA launched it in 1990
  3. It has a mirror of diameter 94 inches
  4. It orbits at 569 km from the surface of earth

20. Why can x-ray telescope not be based on earth?

- The X-ray telescope observes the celestial bodies that emit X-rays, but most of the X-rays coming from the celestial bodies return to space from the Earth's atmosphere. Therefore, for the study of these X-rays, the X-ray telescope cannot observe the earth properly. Hence, these telescopes have to be placed outside the earth's atmosphere

21. What are the difficulties faced by refracting telescope? How to overcome them?

- 1. As we saw above, if we wish to obtain a bright image of a source by collecting the maximum possible light from it, the objective lens must be made as large as possible. However, it is very difficult to make very large lenses. Also, large lenses are very heavy and tend to get distorted.

  2. As the objective and eyepiece are placed at the opposite ends of the telescope, the length of the telescope also increases with increase in the size of the lenses and the telescope becomes difficult to manage.

  3. The images formed by lenses have errors of colors. This is called chromatic aberration

  4. Reflecting telescopes are used to overcome these difficulties. It uses concave mirrors instead of lens. It is easier to make large mirrors instead of lens and there are no errors in the image obtained through the mirror

22. Write information about ISRO

- 1. Full form of ISRO is Indian Space Research Organization

  2. This institute was established in 1969 with the aim of developing technology for making and launching of artificial satellites. Till date, ISRO has successfully launched a large number of satellites

3. INSAT and GSAT series of satellites support our telecommunication network

4. The EDUSAT satellite in this series is used exclusively for education

5. The IRS satellite series is used for the monitoring and management of natural resources as well as disaster management

23. What is meant by GMRT? Describe in detail

- 1. A large radio telescope called the Giant Meter wave Radio Telescope (GMRT) has been erected at Narayangaon near Pune

2. This telescope is actually a collection of 30 dishes, each having a diameter of 45 m

3. It is called a giant telescope as the arrangement of the 30 dishes over an area which measures up to 25 km across

4. GMRT has been made by Indian scientists and engineers at minimum cost

5. It is a world standard research facility. Scientists study the solar system, solar winds, pulsars, supernova, and interstellar hydrogen clouds

24. There are different observatories in India, write their information

- 1. Udaipur Solar Observatory

2. Indian Astronomical Observatory Leh, Jammu and Kashmir

3. Madras Observatory, Chennai – Tamil Nadu

4. Mount Abu Infrared Wave Observatory, Rajasthan

5. Vainu Bappu Observatory Kavalur, Tamil Nadu

6. Kodaikanal Solar Observatory, Tamil Nadu

25. Why do we need different types of telescope?

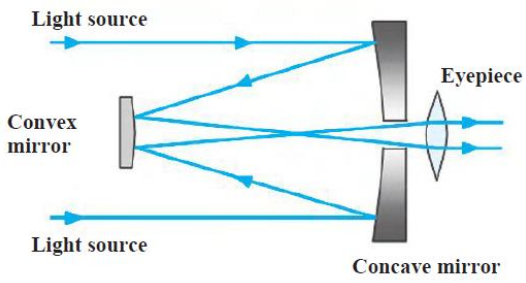
- 1. Our eyes are only capable of seeing the visible radiation. Thus, we use the visible radiation telescopes i.e. optical telescopes to see the visible radiation coming from the space
  2. However many heavenly bodies emit radiations like the X-ray, gamma-ray and radio waves other than the visible light
  3. Thus we need different types of telescopes to receive such radiation and to study their sources

26. ISRO launched 103 satellites, including CARTOSAT-2, from a single rocket. Find out more about it.

- ISRO launched 103 satellites, including CARTOSAT-2 on February 15, 2017. The launch was from Satish Dhawan Center, Sriharikota. These 104 satellites weighed 1378 kg. The 103 satellites include USA (96), Netherlands (1), Switzerland (1), Israel (1), Kazakhstan (1) and UAE (1)

27. Explain how you can see the enhanced image of the source in the Cassegrain telescope.

- The Cassegrain telescope also uses a concave mirror. However, here light rays, after reflection from the concave mirror, are reflected back towards it by a small convex mirror. They pass through a hole at the center of the concave mirror and then through the eyepiece situated at the back of the mirror. The eyepiece gives us a magnified image of the source



28. Write the method of making telescope using the material of concave mirror, flat mirror, convex mirror and lens

- 1. Newtonian telescope is made by using concave mirror and plane mirror and lens

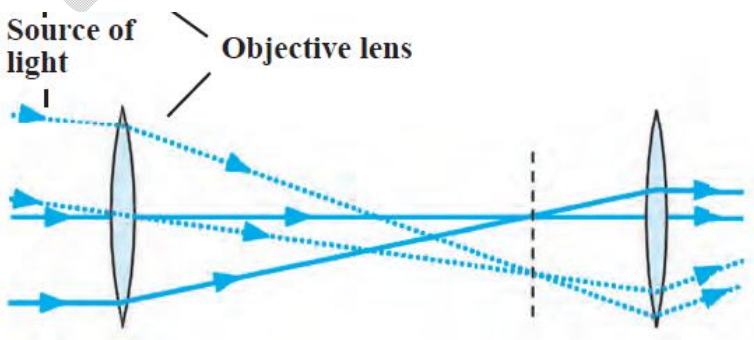
  2. Cassegrain telescope is made by using convex mirror, concave mirror and lens

  3. Refracting telescope is made by using only objective lens

29. Explain the working of Refracting Telescope.

- The first telescope made by Galileo was a refracting type telescope. In this telescope, there are two lenses. The image produced by the main objective lens is seen through the secondary small lens.

  To collect the maximum amount of light coming from a heavenly object, the objective lens should be made as large as possible. Using the light collected by the objective a smaller lens, called the eyepiece, and produces a large image of the source. Light rays change their direction as they enter a lens from the atmosphere and again when they enter the atmosphere after passing through the lens. This is called refraction. Hence such telescopes are called refracting telescopes.



30. Why is reflective telescope better than refractive telescope?

- 1. Reflective telescopes are made of mirrors and refractive telescopes are made of lens
  2. It is very difficult to make very large lenses. Also, large lenses are very heavy and tend to get distorted
  3. The length of the refracting telescope depends upon the eye-piece and lens, hence the length increases
  4. The handling of the refractive telescope is also difficult due to its size
  5. The images formed by lenses in refracting telescope have errors of colors
  6. In reflective telescope, concave mirrors are used which are easy to manufacture compared to lenses
  7. Also, there are no errors of colors in images formed by mirrors in reflective telescope
  8. The weight of reflective telescope is also less compared to refractive telescope
  Hence, for all these reasons, reflective telescope is better than refractive telescope

31. Describe construction of radio telescopes

➢ 1) Radio telescopes are used to receive the radio waves

2) It is made from one or more dishes of a particular parabolic shape.

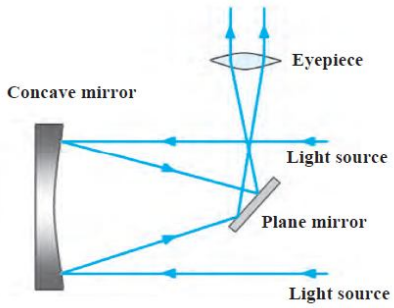
3) As in optical telescope the incident radio waves are reflected by these dishes and converge at the focus.

4) A radio receiver is placed at the focal point.

5) The information gathered by this receiver is passed on to a computer which analyses it and constructs an image of the source

32. Explain the functioning of Newtonian telescopes

➢ 1) In Newtonian telescope, the light rays coming from space are reflected by the concave mirror.



2) Before these reflected rays set the focus, they are deflected again by a small plane mirror.

3) Thus, they get focused at a point lying on the perpendicular to the axis of the telescope's cylinder.

4) As they pass through the eyepiece, we get a magnified image of the source.

33. Write in brief about x-ray telescopes.

➢ 1) Many heavenly bodies emit radiations other than the visible light. X-ray telescopes were invented to study such type of x ray radiation.

2) These telescopes are smaller in size thus easily launched in the space.

3) Each telescope is built upon different telescope.

4) As the x-rays come in contact with any object they collide with the electron and produce energy.

5) They are always attracted to the neutron in center while as they escape this force, they produce energy.

6) These waves can be measured with the help of photoelectric effect and depending upon no. Of electrons released, the intensity of x-rays can be determined.

34. Write about different ways and their wavelengths

➢ Type of radiation Wavelength

Radio waves	longer than about 20 cm
Micro waves	0.3 mm – 20 cm
Infrared waves	800 nm – 0.3 mm
Visible light rays	400 nm – 800 nm
Ultraviolet ray	300 pm – 400 nm
X-rays	3 pm – 300 pm
Gamma rays	Shorter than 3pm

35. Write about "Mangalyan" satellite launched by ISRO

➢ 1) Mangalyan is also known as MOM Mars orbiter Mission

2) This satellite is made entirely under guidance of ISRO

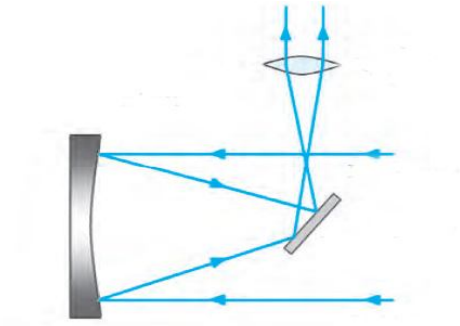
3) It was launched on 5th Nov 3 and was reached at Mars by24th September 2014

4) This mission is made in lowest expenditure while India is the first country to land such a successful mission

36. Observe the figure and answer the following questions

1) What type of satellite is shown in this figure?

- It is Newtonian type of telescope.



2) What is a, b, c, d in the figure?

a= concave mirror

b=Flat mirror

c=Light source

d=eyepiece

3) What type of mirrors are used in this satellite

- We use flat and concave mirrors in this type of satellite

4) Give example of satellite that uses same kind of mirrors?

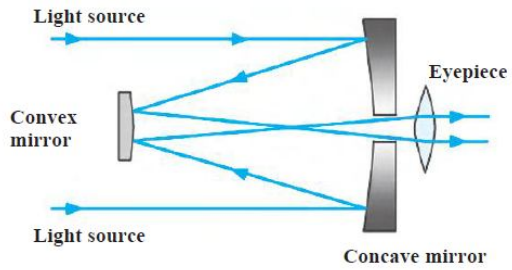
- Casserion satellites use same kind of mirrors

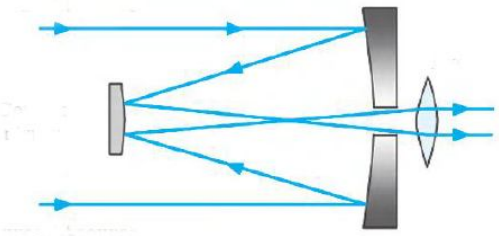
37. Write in brief about Galileo telescope.

➢ 1) In this type of telescope two types of mirrors are used. The light passed from a larger mirror is passed through smaller mirror.

2) The primary mirror is called light source while the secondary mirror is called eyepiece

3) For his first telescope he used a thin tube. At one end of the tube he used a concave mirror while at other end he used convex mirror





4) This telescope gave thrice multiplication later he made a telescope with 60 multiplication capacity

38. Why was discovery of telescopes important for mankind?

➢ 1) From early days, man has been curious about the sun as well as the moon and stars seen in the night sky. Using his imagination, he tried to understand the sky as observed by the naked eyes.

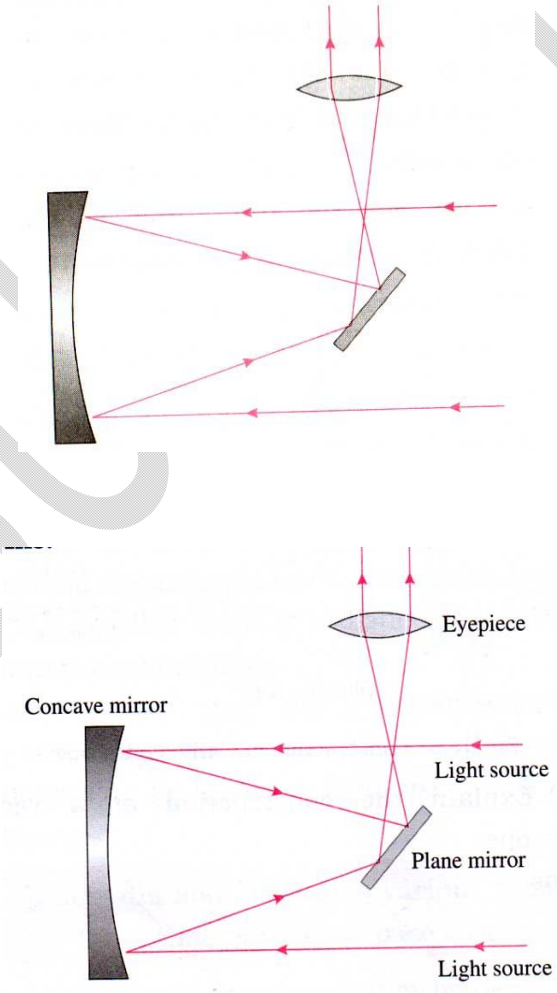
2) He noticed that the position of the stars changed with time and had something to do with the occurrence of seasons.

3) As the knowledge of the cycle of seasons was necessary for agriculture, sky watching began to prove useful to him.

4) The position of the constellations was also useful to sea goers for navigation. Thus man discovered telescopes

39. Name the following diagram:

Ans.-



40. Write properties of radio telescopes.

- 1) Radio telescopes can receive all the wavelengths except visible light.

2) They do not use any magnifying lens or mirrors

3) They use parabola type of mirrors

4) One large radio telescopes is made with any small radio telescopes

5) Radio telescopes can sustain any whether conditions e.g. rainy, sunny, and cloudy

41. Write in a sentence how mankind has solved following problems

- a) Inability to see space with naked eyes

- Discovery of telescopes

b) Except visible Wavelength other waves were not visible

- Discovery of radio telescopes

c) Difficulty in making telescope with large lens

- use of mirrors in telescope

d) Problems with telescope on earth

- Telescopes were sent into space

42. Give different types of radio telescopes

- a) X-ray telescopes

b) Gamma rays telescopes

c) GMRT

d) Infrared telescope

e) Inert telescope

43. Match the following.

A	**Answers**	**B**
Establishment of ISRO	**1969**	1609
Galileo telescope	**1609**	1990
Hubble	**1990**	2015
Astrosat	**2015**	1969

44. Write about different telescopes you know.

- -AGILE :This telescope holds gas radiation

-IRIS was given by NASA in the year 2013 .It carries inert waves

-WISE was given by NASA In the year Dec 2019; it carries infra-red radiation

-LISA PATHFINDER this satellite is launched by European country. It helps in studying gravitational force of earth

45. Write about Apollo 11, an artificial satellite

- 1) Apollo 11 satellite was launched by United States of America on 21st July 1956.

2) Neil Armstrong and Edwin Aldringham were the astronauts chosen for the mission.

3) Neil Armstrong was the human being to step on the moon.

4) He got the stone and soil from the moon for research

5) After researching they found that the moon is not favorable for human mankind to live

46. Which was the first country to launch animal in space? Write in brief about it

- Russia launched satellite sputnik 2 on Nov. 1957. Animal was sent by this satellite. The name of this animal was Leica

47. Give reason. Why large lens is used in optical telescope.

- 1) Light rays change their direction as they enter a lens from the atmosphere and again when they enter the atmosphere after passing through the lens

2) To collect the maximum amount of light coming from a heavenly object, the objective lens should be made as large as possible.

48. Why the light received from sun appears white in color.

- 1) Light is an electromagnetic radiation. Every waves in the spectrum has a particular Wavelength

  2) Wavelength is an important property of the light wave

  3) From the sunlight these waves usually fuse and thus form white color

  4) When this same light is passed through prism it spreads in 7 colors that is VIBGYOR I. E Violet, Indigo, Blue, Green, Yellow, Orange, Red. Suggesting sunlight is formed by combination of all these light waves Therefore sunlight appears white in color.

49. What is the difference n optical telescope and ratio telescope?

Optical telescope	**Radio telescope**
1) Optical telescope use polished mirrors or glass lenses to focus visible light as it reflectors and refractors.	1) Radio telescope are used to study much longer wavelengths than visible light
2) Reflecting telescope tend to be much larger use parabolic mirrors to focus light.	2) Radio telescope use a dish to focus the radio waves on to the receiver.

50. What is dispersion of light?

- 1) The light received from sun appears white in color.

2) They appear white in color as they fuse many colors

3) When this same light is passed through prism it spreads in 7 colors that are VIBGYOR I. E Violet, Indigo, Blue, Green, Yellow, Orange, and Red.

4) This spreading of light into many colors is called dispersion of light.

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