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8th Standard | Term - I

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NOTE FROM PUBLISHER

It gives me great pride and pleasure in bringing to you **Sura's Science Guide** for **First Term** for **8th Standard**. It is prepared as per the New Syllabus and New Textbook for for the year 2019 - 20.

This guide encompasses all the requirements of the students to comprehend the text and the evaluation of the textbook.

♦ Additional questions have been provided exhaustively for clear understanding of the units under study.

♦ Chapter-wise Unit Tests with Answers.

In order to learn effectively, I advise students to learn the subject section-wise and practice the exercises given. It will be a teaching companion to teachers and a learning companion to students.

Though these salient features are available in this Guide, I cannot negate the indispensable role of the teachers in assisting the student to understand the subject thoroughly.

I sincerely believe this guide satisfies the needs of the students and bolsters the teaching methodologies of the teachers.

I pray the almighty to bless the students for consummate success in their examinations.

Subash Raj, B.E., M.S.
- Publisher
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All the Best

(ii)

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Unit 1

MEASUREMENT

Mind Map
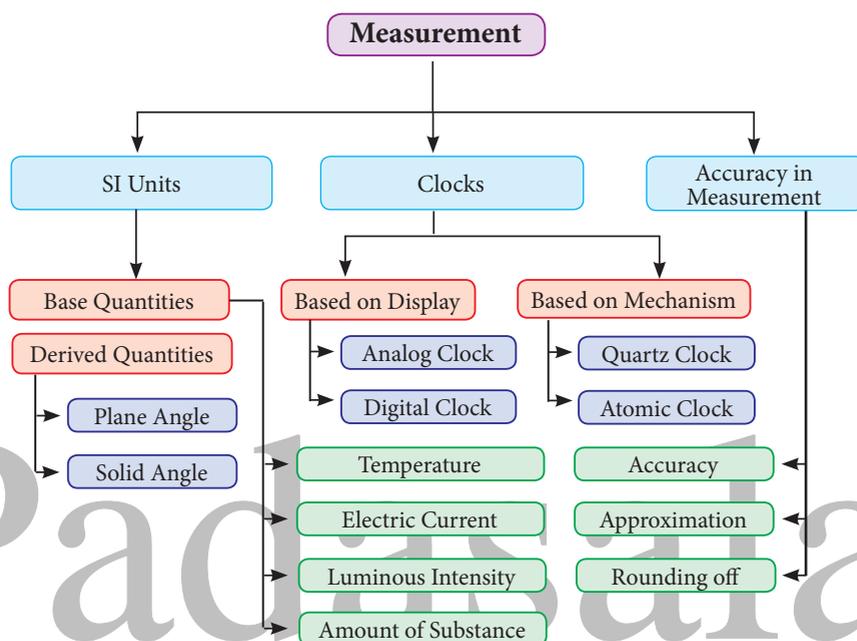
Definitions

Measurement	:	**Measurement** is the process of finding an unknown physical quantity by using a standard quantity.
Temperature	:	**Temperature** is a measure of the average kinetic energy of the particles in a system.
Electric Current	:	The magnitude of an **electric current** is the amount of electric charges flowing through a conductor in one second.
One ampere	:	**One ampere** is defined as one 'coulomb' of charge moving in a conductor in one second.
Amount of substance	:	**Amount of substance** is a measure of the number of entities (particles) present in a substance.
Mole	:	Th e SI unit of amount of substance is **mole** and it is denoted as **'mol'**.

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Luminous intensity	:	The measure of the power of the emitted light, by a light source in a particular direction, per unit solid angle is called as **luminous intensity**.
One candela	:	The light emitted from a common wax candle is approximately equal to one candela.
Luminous flux or iuminous power	:	**Luminous flux** or **luminous power** is the measure of the perceived power of light. Its SI unit is '**lumen**'.
One lumen	:	**One lumen** is defined as the luminous flux of the light produced by the light source that emits one candela of luminous intensity over a solid angle of one steradian.
Plane angle	:	It is the angle between the intersection of two straight lines or intersection of two planes.
Radian	:	**Radian** is the angle subtended at the centre of a circle by an arc whose length is equal to the radius of the circle.
Solid angle	:	It is the angle formed by three or more planes intersecting at a common point.
Steradian	:	**Steradian** is the solid angle at the centre of a sphere subtended by a portion whose surface area is equal to the square of its radius of the sphere.
Digital clock	:	A **digital clock** displays the time directly. It shows the time in numerals or other symbols. It may have a 12 hours or 24 hours display.
Analog clock	:	Clock which shows time with 3 moving motion and the clock face is marked from 1 to 12.
Quartz clock	:	These clocks are activated by 'electronic oscillations', which are controlled by a 'quartz crystal'.
Atomic clock	:	These clocks are making use of periodic vibrations occurring within the atom.
Piezo-electric property	:	Piezo-electric property means that when a pressure is applied along a particular axis of a crystal, an electric potential difference is developed in a perpendicular axis.
Accuracy	:	Accuracy is the closeness of a measured value to the actual value or true value.
Precision	:	Precision is the closeness of two or more measurements to each other.
Approximation	:	Approximation is the process of finding a number, which is acceptably close to the exact value of the measurement of a physical quantity.

Unit 1

Formulae to Remember

1.	The general formula for the conversion of scales of temperature	=	$\dfrac{C-0}{100} = \dfrac{F-32}{180} = \dfrac{K-273}{100}$
2.	Electric Current	=	$I = \dfrac{Q}{t}$ Electric Currnet $I = \dfrac{\text{Amount of electric charges (Q)}}{\text{time (t)}}$
3.	π radian	=	$180º$ 1 radian $= \dfrac{\pi}{180º}$
4.	Kelvin $= K$	=	$C + 273$ $C = K - 273$ $F = \dfrac{9C}{5} + 32$ $C = (F - 32) \times \dfrac{5}{9}$

Measurement

✎ TEXT BOOK EXERCISES

I. Choose the best answer :

1. Which one the following system of units is the British System of unit?
   (a) CGS   (b) MKS   (c) FPS   (d) SI   **[Ans. (c) FPS]**

2. Electric current belongs to _____ quantities
   (a) base   (b) supplementary   (c) derived   (d) professional **[Ans. (a) base]**

3. SI unit of temperature is
   (a) celsius   (b) fahrenheit   (c) kelvin   (d) ampere   **[Ans. (c) kelvin]**

4. Amount of substance is
   (a) directly proportional to the number of atoms
   (b) inversely proportional to the number of atoms
   (c) directly proportional to the square of number of atoms
   (d) inversely proportional to the square of number of atoms
   [Ans. (a) directly proportional to the number of atoms]

5. Luminous intensity is the intensity of
   (a) Laser light   (b) UV light
   (c) visible light   (d) IR light   **[Ans. (c) visible light]**

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6. Which one of the following devices is used to measure electric current

(a)

(b)

(c)

(d)   **[Ans. (b)]**
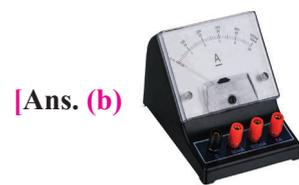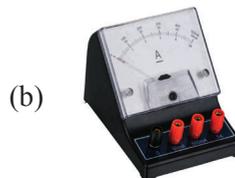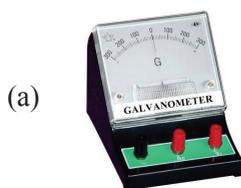
7. SI unit stands for
   (a) International system of units
   (b) Integrated System of units
   (c) International symbol of units
   (d) Integrated symbol of units **[Ans. (a) International system of units]**

8. Closeness of two or more measured values is called as
   (a) accuracy (b) precision
   (c) error (d) approximation **[Ans. (b) precision]**

9. Quantities other than base quantities are called as
   (a) supplementary quantities (b) derived quantities
   (c) professional quantities (d) energy quantities **[Ans. (b) derived quantities]**

10. Which of the following statements about approximation is wrong?
   (a) Approximation gives accurate value.
   (b) Approximation simplifies the calculation.
   (c) Approximation is very useful when little information is available.
   (d) Approximation gives the nearest value only.
   [Ans. (a) Approximation gives accurate value.]

II. Fill in the blanks :

1. The solid angle is measured in _____. **[Ans. steradian]**

2. _____ recognized the need of 'Standard Units' for physical quantities. **[Ans. Scientists]**

3. The coldness or hotness of a substance is expressed by ____. **[Ans. temperature]**

4. _____ is used to measure electric current. **[Ans. Ammeter]**

5. _____ of substance, contains $6.023 \times 10^{+23}$ atoms or molecules. **[Ans. One mole]**

6. Luminous Intensity is the amount of visible light, that is emitted in unit area per unit _____.
   [Ans. solid angle]

7. Quartz clock uses _____ oscillations. **[Ans. electronic]**

8. The uncertainty in measurement is called as _____. **[Ans. error]**

9. _____ is the closeness of the measured value to the original value. **[Ans. Accuracy]**

10. The intersection of two straight lines gives us_____. **[Ans. plane angle]**

Unit 1

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III. True or False :

1. SI units are metric system of units. **[Ans. True]**

2. Temperature is a measure of total kinetic energy of the particles in a system. **[Ans. False]**

Correct statement : Temperature is a measure of **average** kinetic energy of the particles in a system.

3. In thermometers, freezing point of water is taken as the Upper Fixed Point. **[Ans. False]**

Correct statement : In thermometers, **boiling point** of water is taken as the Upper Fixed Point.

4. One coulomb of charge flowing per minute is called 'ampere'. **[Ans. False]**

Correct statement : One coulomb of charge flowing per **second** is called 'ampere'.

5. Amount of substance gives the number of particles present in the substance. **[Ans. True]**

6. Intensity of light from a candle is approximately equal to one 'candela'. **[Ans. True]**

7. Angle formed at the top of a cone is an example of 'Plane Angle'. **[Ans. True]**

8. Quartz clocks are used in GPS Devices. **[Ans. False]**

Correct statement : Atomic clocks are used in GPS Devices.

9. Candela is used to express electric field intensity. **[Ans. False]**

Correct statement : Candela is used to express **luminous** intensity.

10. The number 4.582 can be rounded off as 4.58. **[Ans. True]**

IV. Match the following :

1.

	Column - A		Column - B
1.	Temperature	(a)	Closeness to the Actual Value
2.	Plane Angle	(b)	Measure of hotness or coldness
3.	Solid Angle	(c)	Closeness to two or more measurements
4.	Accuracy	(d)	Angle formed by the intersection of three or more planes
5.	Precision	(e)	Angle formed by the intersection of two planes

[Ans : 1 - b, 2 - e, 3 - d, 4 - a, 5 - c]

V. Assertion & Reason :
Direction: Mark the correct choice as

(a) If both assertion and reason are true and reason is the correct explanation of the assertion.

(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

(c) Assertion is true, but reason is false.

(d) Assertion is false, but reason is true.

1. Assertion : The SI system of units is the suitable system for measurements.
Reason : The SI unit of temperature is kelvin.

[Ans. (b) Both assertion and reason are true but reason is not the correct explanation of the assertion]

Correct explanation : In SI system the units are precisely defined and have the same value everywhere.

Measurement

2. **Assertion** : Electric current, amount of substance, Luminous Intensity are the fundamental physical quantities.

   Reason : They are independent of each other.

   [Ans. (a) Both assertion and reason are true and reason is the correct explanation of the assertion]

3. **Assertion** : The seconds hand of a clock is having least count of one second.

   Reason : Least count is the maximum measurement that can be measured accurately by an instrument.

   [Ans. (c) Assertion is true, but reason is false]

   Correct explanation : Least count is the minimum measurement that can be measured accurately by an instrument.

4. **Assertion** : Avogadro's number is the number of atoms in one mole of substance.

   Reason : Avogadro's number is a constant.

   [Ans. (a) Both assertion and reason are true and reason is the correct explanation of the assertion]

5. **Assertion** : Radian is the unit of solid angle.

   Reason : One radian is the angle subtended at the centre of a circle by an arc of length equal to its radius.

   [Ans. (d) Assertion is false, but reason is true]

   Correct explanation : Radian is the unit of plane angle.

VI. Answer in a word or two (Very Short Answer) :

1. **What is the unit of mass in FPS system?**

   Ans. Pound.

2. **How many base quantities are included in SI system?**

   Ans. Seven.

3. **Give the name of the instrument used for the measurement of temperature.**

   Ans. Thermometer.

4. **What is the 'Lower Fixed Point' of the Fahrenheit scale?**

   Ans. 32ºF.

5. **What is the SI unit of Luminous Intensity?**

   Ans. Candela (cd).

6. **What is the value of Avogadro's number?**

   Ans. 6.023×10^{23}.

7. **What type of oscillations are used in atomic clocks?**

   Ans. Periodic vibrations.

8. **Mention the types of clocks based on their display.**

   Ans. Analog clock and digital clock.

9. **How many times will the 'minute hand' rotate in one hour?**

   Ans. One time.

10. **How many hours are there in a minute?**

    Ans. 60 minutes = 1 hr

    1 minute   = $\dfrac{1}{60}$ = **0.0167** hours.

Unit 1

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VII. Answer the questions given below (Short Answer) :

1. What is measurement?

Ans. Measurement is the process of finding an unknown physical quantity by using a standard quantity.

2. Name some common systems of measurement.

Ans. **Some common systems of units are :**
  (i) FPS - System (Foot for length, Pound for mass and Second for time)
  (ii) CGS -System (Centimetre for length, Gram for mass and Second for time)
  (iii) MKS - System (Metre for length, Kilogram for mass and Second for time)

3. Define - Temperature.

Ans. Temperature is a measure of the average kinetic energy of the particles in a system.

4. Define - ampere.

Ans. One ampere is defined as one 'coulomb' of charge moving in a conductor in one second.

5. What is electric current?

Ans. The magnitude of an electric current is the amount of electric charges flowing through a conductor in one second.

6. What is luminous Intensity?

Ans. The measure of the power of the emitted light, by a light source in a particular direction, per unit solid angle is called as luminous intensity.

7. Define - mole.

Ans. Mole is defined as the amount of substance, which contains 6.023×10^{23} entities.

8. What are the differences between Plane angle and solid angle?

Ans. **Difference between Plane Angle and Solid Angle :**

Plane Angle	Solid Angle
Angle between the intersection of two lines or planes.	Angle between the intersection of three or more planes at a common point.
It is two dimensional	It is three dimensional.
Unit is radian.	Unit is steradian.

9. What are errors?

Ans. The value of every measurement contains some uncertainty. These uncertainties are called as 'Errors'.

VIII. Answer in detail :

1. List out the base quantities with their units.

Ans. **Base Quantities and Units :**

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Temperature	kelvin	K
Electric Current	ampere	A
Amount of Substance	mole	mol
Luminous Intensity	candela	cd

Measurement

2. **Write a short note on different types of clocks.**

Ans. **Types of clocks based on display :**

(i) Analog clocks

(ii) Digital clocks

(i) **Analog clocks :**   It looks like a classic clock. It has three hands to show the time.

(1) **Hours Hand :** It is short and thick. It shows 'hour'.

(2) **Minutes Hand :** It is long and thin. It shows 'minute'.

(3) **Seconds Hand :** It is long and very thin. It shows 'second'. It makes one rotation in one minute and 60 rotations in one hour.

Analog clocks can be driven either mechanically or electronically.

Analog Clock

(ii) **Digital clocks :**

(1) A digital clock displays the time directly. It shows the time in numerals or other symbols. It may have a 12 hours or 24 hours display.

(2) Recent clocks are showing Date, Day, Month, Year, Temperature etc.

(3) Digital clocks are often called as Electronic Clocks.

Different types of clocks based on working mechanism :

(i) **Quartz Clock :**

(1) These clocks are activated by 'electronic oscillations', which are controlled by a 'quartz crystal'.

(2) The frequency of a vibrating crystal is very precise. So, the quartz clock is more accurate than the mechanical clock.

(3) These clocks have an accuracy of one second in every 10^9 seconds.

Quartz Clock

(ii) **Atomic Clock :**

(1) These clocks are making use of periodic vibrations occurring within the atom.

(2) These clocks have an accuracy of one second in every 10^{13} seconds.

(3) Atomic clocks are used in Global Positioning System (GPS), Global Navigation Satellite System (GLONASS) and International time distribution services.

Atomic Clock

IX.   Higher Order Thinking Question :

1. **Your friend was absent yesterday. You are enquiring about his absence. He told, he was affected by a fever of 100ºC and went to a hospital for treatment. Is it possible of 100ºC fever? If it is wrong, try to make him to understand his mistake.**

Ans. (i) No. It is not possible of 100ºC fever. The normal temperature of human body is between 98.4ºF and 98.6ºF.

(ii) So, he should say that, he was affected by a fever of 100ºF and it is not 100ºC.

★ ★ ★ ★ ★

Additional Questions

I.   Choose the correct answer :

1. **The SI unit of length is the _____.**

(a) millimetre   (b) centimetre   (c) metre   (d) kilometre   **[Ans. (c) metre]**

2. The magnitude of a physical quantity consists of _____.
  (a) a unit   (b) a number and a unit
  (c) a number   (d) a unit and its symbol

  [Ans. (b) a number and a unit]

3. The SI unit of mass is _____.
  (a) milligram (b) gram   (c) quintal   (d) kilogram   **[Ans. (d) kilogram]**

4. Among the following, which is not an metric system?
  (a) CGS   (b) MKS   (c) FPS   (d) SI   **[Ans. (c) FPS]**

5. _____ is a physical quantity that expresses the degree of hotness or coldness of a substance.
  (a) Electric current   (b) Luminous intensity
  (c) Temperature   (d) none of the above   **[Ans. (c) Temperature]**

II. Fill in the Blanks :

1. _____ is the process of finding an unknown physical quantity by using a standard quantity.

  [Ans. Measurement]

2. The CGS, MKS and SI units are _____ system of units.   **[Ans. metric]**

3. FPS is a _____ system of units.   **[Ans. British]**

4. Temperature is a measure of the average _____ of the particles in a system

  [Ans. kinetic energy]

5. Melting point of pure ice ($0°$ C) is taken as _____ fixed point.   **[Ans. lower]**

III. True or False - if false give the correct statement :

1. The unit of length in FPS system is foot.   **[Ans. True]**
Ans. True.

2. The unit of mass in CGS system is kilogram.   **[Ans. False]**
  Correct statement: The unit of mass in CGS system is **gram**.

3. Heat is a physical quantity that expresses the degree of hotness or coldness of a substance.

  [Ans. False]

  Correct statement: Temperature is a physical quantity that expresses the degree of hotness or coldness of a substance.

4. Heat removed from a substance will lower its temperature.   **[Ans. True]**
Ans. True.

5. In thermometers, boiling point of water ($100°$ C) is taken as upper fixed point.**[Ans. True]**
Ans. True.

6. Normal temperature of the human body is between $98.4°$ C and $98.6°$ C.   **[Ans. False]**
  Correct statement: Normal temperature of the human body is between **$98.4°$ F and $98.6°$ F**.

7. Voltmeter is a device used to measure electric current.   **[Ans. False]**
  Correct statement: Ammeter is a device used to measure electric current.

8. The super conductors are used to levitate trains from the track.   **[Ans. True]**
Ans. True.

Measurement

IV. Match the following :

1.

1.	K – 273	(a)	Mars climate orbiter
2.	π radian	(b)	mol
3.	Base quantities	(c)	C
4.	Amount of substance	(d)	7
5.	Martian climate	(e)	180º

[Ans. (1 - c. 2 - e, 3 - d, 4 - b, 5 - a)]

2.

1.	80º C	(a)	Plane angle
2.	$\dfrac{Q}{t}$	(b)	Royal observatory
3.	GMT	(c)	353 K
4.	Two dimensional	(d)	Solid angle
5.	Three dimensional	(e)	I

[Ans. (1 - c. 2 - e, 3 - b, 4 - a, 5 - d)]

V. Assertion and Reason.
Mark the correct choice as :

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(b) If both assertion and reason are true, but the reason is not the correct explanation of the assertion.

(c) If the assertion is true, but the reason is false.

(d) If the assertion is false, but the reason is true.

1. **Assertion** : **The SI unit of temperature is kelvin.**

Reason : **Thermometers are calibrated with some standard scales like celsius, fahrenheit and kelvin.**

[Ans. (b) Both assertion and reason are true, but the reason is not the correct explanation of the assertion]

2. **Assertion** : **Temperature is a physical quantity.**

Reason : **Temperature is the degree of hotness or coldness of a body.**

[Ans. (a) Both assertion and reason are true and the reason is the correct explanation of the assertion]

3. **Assertion** : **Radian is the angle subtended at the centre of a circle by an arc whose length is equal to the radius of the circle.**

Reason : **1 radian = $\dfrac{180º}{\pi}$**

[Ans. (a) Both assertion and reason are true and the reason is the correct explanation of the assertion]

VI. Very short Answers :

1. **What is physics?**

Ans. Physics is the study of nature and natural phenomena.

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2. Name the British system of units.

Ans. FPS system.

3. How many base quantities are there?

Ans. Seven.

4. What is the symbol for unit of electric current?

Ans. A (ampere).

5. Mention the SI unit of luminous flux.

Ans. Lumen.

VII. Short Answers :

1. Mention the SI unit & symbol of temperature.

Ans. (i) The SI unit of Temperature is kelvin.
  (ii) It's symbol is 'K'.

2. Write any 2 applications of various thermometric scales.

Ans. (i) Physicians use 'clinical thermometers'. It is graduated in 'Fahrenheit Scale'
  (ii) Scientists are using thermometers with kelvin scale.

3. Define electric current. Write its formula and unit.

Ans. (i) The magnitude of an electric current is the amount of electric charges flowing through a conductor in one second.

$$\text{Electric current} = \frac{\text{Amount of electric charges (Q)}}{\text{time (t)}}$$

$$I = \frac{Q}{t}$$

  (ii) SI unit of electric current is 'ampere' and it is denoted as A.

4. Define super conductors.

Ans. At very low temperature, around 30 K (–243.2º C), some conductors conduct electric current without any loss. These conductors are known as 'SUPER CONDUCTORS'.

5. Define amount of substance. Mention its SI unit and symbol.

Ans. (i) Amount of substance is a measure of the number of entities (particles) present in a substance.
  (ii) The SI unit of amount of substance is mole and it is denoted as 'mol'.

6. What is luminous intensity? Mention its SI unit and symbol.

Ans. (i) The measure of the power of the emitted light, by a light source in a particular direction, per unit solid angle is called as luminous intensity.
  (ii) The SI unit of luminous intensity is candela and is denoted as 'cd'.

7. What are the rules for rounding off a number?

Ans. Rules for rounding off :
  (i) Decide which is the last digit to keep.
 **(ii)** Leave it the same, if the next digit is less than 5.
  (iii) Increase it by one, if the next digit is 5 or greater than 5.

8. Define one light year.

Ans. One light year is defined as the distance travelled by light in vacuum during the period of one year. 1 light year = 9.46×10^{15} m

Measurement

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VIII. Long Answers :

1. Write a note on accuracy and precision.

Ans. Accuracy in Measurements :

(i) Measurement is the base of all experiments in science and technology. The value of every measurement contains some uncertainty. These uncertainties are called as 'Errors'.

(ii) The difference between the real value and the observed value is called an error.

Accuracy : Accuracy is the closeness of a measured value to the actual value or true value.

Precision : Precision is the closeness of two or more measurements to each other.

Good accuracy
Good precision

Poor accuracy
Good precision

Poor accuracy
Poor precision

Accuracy and Precision
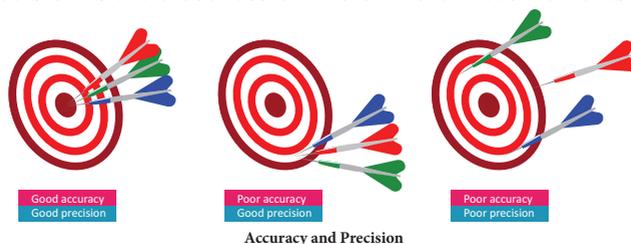
2. Explain the Greenwich mean time.

Ans. (i) Greenwich Mean Time (GMT) is the mean solar time at the Royal Observatory, located at Greenwich in London.

(ii) It is measured at the longitude of zero degree.

(iii) The Earth is divided into 24 zones, each of a width of 15 degree longitude.

(iv) These regions are called as 'Time Zones'. Time difference between two adjacent time zones is 1 hour.

3. Write a note on approximation.

Ans. (i) Approximation is the process of finding a number, which is acceptably close to the exact value of the measurement of a physical quantity.

(ii) It is an estimation of a number obtained by rounding off a number to its nearest place value.

(iii) When the data are inadequate, physicists are in need of an approximation to find the solution for problems.

(iv) Approximations are usually based on certain assumptions having a scientific background and they can be modified whenever accuracy is needed.

IX. Complete the given table :

1.

Types of scale	Lower fixed point	Upper fixed point	Number of divisions in thermometer
Celsius	**(i)** _____	100º C	**(ii)** _____
Fahrenheit	32º F	**(iii)** _____	180
Kelvin	273 K	**(iv)** _____	**(v)** _____

[Ans. (i) 0º C, (ii) 100, (iii) 212º F, (iv) 373 K, (v) 100]

X. Problems for practice :

1. Convert 36º C into kelvin.

Solution: K = C + 273 = 36 + 273
= **309 K**

2. **Convert 100 K into celsius.**

Solution: C = K – 273

C = 100 – 273

= **–173º C**

3. **When 5 coulomb of charge, flows through a circuit for 20 seconds. Calculate the current?**

Given: Charge Q = 5 C

Time t = 20 s

Solution: $I = \dfrac{Q}{t} = \dfrac{5}{20} = 0.25$ A

I = **0.25 A**

4. **Convert 90º C into radian.**

Given: $i = \dfrac{\pi}{180º}$

$90º = \dfrac{\pi}{\underset{2}{180}} \times \cancel{90}$

$= \dfrac{\pi}{2}$ **radian.**

5. **Round off the number 5.323 to two decimal places.**

Ans. **Step : 1** Identify the last digit to be kept. 2 is the last digit to be kept.

Step : 2 The following digit, (i.e.) 3 is less than 5. SI retain 2 as 2.

∴ The answer is 5.32.

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UNIT TEST ✎

Time : 60 min.   Marks : 25

I. **Choose the correct answer:**   (3×1 = 3)

1. **SI unit of temperature is**

(a) celsius   (b) fahrenheit (c) kelvin   (d) ampere

2. **Closeness of two or more measured values is called as**

(a) accuracy   (b) precision   (c) error   (d) approximation

3. **Heat given to a substance will _____ its temperature.**

(a) increase   (b) decrease   (c) remains same (d) none

II. **Fill in the blanks.**   (3 × 1 = 3)

4. _____ is used to measure electric current.

5. The SI unit of plane angle is _____.

6. _____ clocks are used in Global Positioning System.

Measurement

III. Match the following $(4 \times 1 = 4)$

7.	Quartz clock	(a)	periodic vibrations
8.	Atomic clock	(b)	ampere
9.	Electric current	(c)	coulomb
10.	Charge	(d)	10^9 seconds

IV. Answer in one word: $(4 \times 1 = 4)$

11. What is the SI unit of Luminous Intensity?

12. What type of oscillations are used in atomic clocks?

13. How many base quantities are there?

14. Round off the number 1.862 to two decimal places.

V. Answer the following in one or two sentences: (any 3) $(3 \times 2 = 6)$

15. What is measurement?

16. What are the differences between Plane angle and solid angle?

17. What are the rules for rounding off a number?

18. Define one light year.

19. Define super conductors.

VI. Answer the following in detail: $(5 \times 1 = 5)$

20. (a) Write a short note on different types of clocks.

(or)

(b) Write a note on accuracy and precision.

Unit 1

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Answer Key

I. 1. (c) kelvin   2. (b) precision   3. (a) increase

II. 4. Ammeter   5. radian   6. Atomic

III. 7 - d, 8 - a, 9 - b, 10 - c.

IV. 11. Candela (cd) 12. Periodic vibrations 13. Seven 14. 1.86

V. 15. Refer Sura's Guide, Textbook Q. No. VII - 1.

16. Refer Sura's Guide, Textbook Q. No. VII - 8.

17. Refer Sura's Guide, Additional Q. No. VII - 7.

18. Refer Sura's Guide, Additional Q. No. VII - 8.

19. Refer Sura's Guide, Additional Q. No. VII - 4.

VI. 20. a) Refer Sura's Guide, Textbook Q. No. VIII - 2.
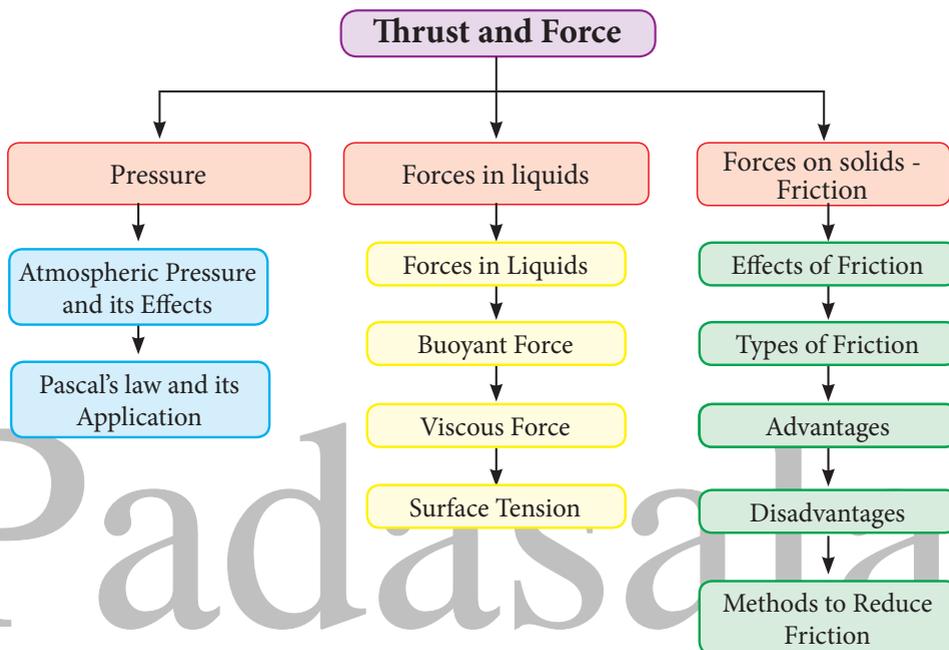
(or)

b) Refer Sura's Guide, Textbook Q. No. VIII - 1.

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Unit 2
FORCES AND PRESSURE

Mind Map

Thrust and Force

Pressure
- Atmospheric Pressure and its Effects
- Pascal's law and its Application

Forces in liquids
- Forces in Liquids
- Buoyant Force
- Viscous Force
- Surface Tension

Forces on solids - Friction
- Effects of Friction
- Types of Friction
- Advantages
- Disadvantages
- Methods to Reduce Friction

Definitions

Force	:	Force is that which changes or tends to change: (i) the state of rest or (ii) the state of uniform motion of a body or (iii) the direction of a moving body or (iv) the shape of a body.
Thrust	:	It is a force acting perpendicularly on any given surface area of a body. It is measured by the unit newton.
Pressure	:	It can be defined as the amount of force or thrust acting perpendicularly on a surface of area one square meter of a body.
Atmospheric pressure	:	The amount of force or weight of the atmospheric air that acts downward on unit surface area of the surface of the Earth is known as atmospheric pressure.

Buoyant force	:	**Buoyant force** is the upward force experienced by a body when placed inside a fluid. The phenomenon is known as buoyancy. Buoyant force is also called upthrust.
Pascal's law	:	The pressure applied at any point of a liquid at rest, in a closed system, will be distributed equally through all regions of the liquid.
Surface tension	:	**Surface tension** is the property of a liquid. The molecules of a liquid experience a force, which contracts the extent of their surface area as much as possible, so as to have the minimum value. Thus, the amount of force acting per unit length, on the surface of a liquid is called surface tension.
Viscosity	:	When a liquid is flowing, there is a frictional force between the successive layers of the liquid. This force which acts in order to oppose the relative motion of the layer is known as viscous force. Such a property of a liquid is called viscosity.
Friction	:	It is the force which opposes the relative motion between two surfaces in contact.
Static friction	:	The friction experienced by the bodies, which are at rest is called static friction.
Kinetic friction	:	Friction existing during the motion of bodies is called kinetic friction.
Sliding friction	:	When a body slides over the surface of another body, the friction acting between the surfaces in contact is called sliding friction.
Rolling friction	:	When a body rolls over another surface, the friction acting between the surfaces in contact is called rolling friction.

Unit 2

Formulae to Remember

1.	Pressure P	=	$\dfrac{\text{Thrust (or) Force (F)}}{\text{Area (A)}}$ $P = \dfrac{F}{A}$
2.	Force F	=	Pressure × Area
3.	Area A	=	$\dfrac{\text{Force}}{\text{Pressure}}$

✎ TEXT BOOK EXERCISES

I. Choose the correct answer for each of the following :

1. If we apply a force against the direction of motion of a body, then the body will
(a) stop moving
(b) move with an increased speed
(c) move with a decreased speed
(d) move in a different direction   **[Ans. (a) stop moving]**

2. Pressure exerted by a liquid is increased by
(a) the density of the liquid (b) the height of the liquid column
(c) Both (a) & (b)   (d) None of the above **[Ans. (c) Both (a) & (b)]**

3. Unit of pressure is
(a) pascal   (b) N m^{-2}
(c) poise   (d) Both (a) & (b)   **[Ans. (d) Both (a) & (b)]**

4. The value of the atmospheric pressure at sea level is
(a) 76 cm of mercury column
(b) 760 cm of mercury column
(c) 176 cm of mercury column
(d) 7.6 cm of mercury column   **[Ans. (a) 76 cm of mercury column]**

5. Pascal's law is used in
(a) hydraulic lift   (b) brake system
(c) pressing heavy bundles (d) All the above   **[Ans. (d) All the above]**

6. Which of the following liquids has more viscosity?
(a) Grease   (b) Water
(c) Coconut oil   (d) Ghee   **[Ans. (a) Grease]**

7. The unit of viscosity is
(a) N m^2 (b) poise   (c) kg m s^{-1} (d) no unit   **[Ans. (b) poise]**

II. Fill in the blanks :

1. The pressure of a liquid column _____ with the depth of the column.
[Ans. increases]

2. Hydraulic lift works under the principle of _____.   **[Ans. Pascal's Law]**

3. The property of _____ of a liquid surface enables the water droplets to move upward in plants.   **[Ans. surface tension]**

4. A simple barometer was first constructed by _____.   **[Ans. Torricelli]**

III. State whether the following statements are true or false :

1. Force acting on a given area is called pressure.   **[Ans. True]**

2. A moving body comes to rest due to friction alone.   **[Ans. True]**

Forces and Pressure

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3. A body will sink if the weight of the body is greater than the buoyant force.
[Ans. True]

4. One atmosphere is equivalent to 1,00,000 newton force acting on one square metre.
[Ans. True]

5. Rolling friction is slightly greater than the sliding friction. **[Ans. False]**
Correct statement: Rolling friction is **slightly lesser** than the sliding friction.

6. Friction is the only reason for the loss of energy. **[Ans. True]**

7. Liquid pressure decreases with the decrease of depth. **[Ans. True]**

8. Using barometers, one can measure the height of a building. **[Ans. False]**
Correct statement: Using barometers, one can measure the **atmospheric pressure**.

9. Surface tension causes the spherical nature of a water drop. **[Ans. True]**

10. Viscosity depends on the pressure of a liquid. **[Ans. True]**

IV. Arrange the following in the increasing order :

1. Rolling friction, static friction, sliding friction
Ans. Static friction, Rolling friction, Sliding friction.

2. Let a marble roll on the following surfaces. Arrange the choice of the material such that a marble moving over it covers a greater distance.
Cotton cloth, glass plate, paper, card board, silver plate
Ans. Glass plate, silver plate, paper, cotton cloth, card board.

V. Match the following :

1.

Match - I		
Column - I		**Column - II**
i.	Static friction	(a)	viscosity
ii.	Kinetic friction	(b)	least friction
iii.	Rolling friction	(c)	objects are in motion
iv.	Friction between the liquid layers	(d)	objects are sliding
v.	Sliding friction	(e)	objects are at rest

[Ans : i - e, ii - c, iii - b, iv - a, v - d]

2.

Match - II		
Column - I		**Column - II**
i.	Barometer	(a)	reduce friction
ii.	Increase friction	(b)	atmospheric pressure
iii.	Decrease friction	(c)	cause of friction
iv.	Lubricants	(d)	increasing area of contact
v.	Irregular surface	(e)	decreasing area of contact

[Ans : i - b, ii - d, iii - e, iv - a, v - c]

VI. Analogy :

1. Knot in a thread : _____ friction :: ball bearing : _____ friction
Ans. Rolling, Static.

Unit 2

2. Downward force : weight :: Upward force offered by liquid : _____

Ans. Buoyant force.

VII. Problems :

1. **A stone weighs 500 N. Calculate the pressure exerted by it if it makes a contact with a surface of area 25 cm^2.**

Ans. **Given :** Weight of a stone F = 500 N

Area A = 25 cm^2 = 25 × 10^{-4} m^2

To find : Pressure P = ?

Formula : Pressure P = $\dfrac{F}{A}$

$$= \dfrac{\overset{20}{\cancel{500}}}{\underset{1}{\cancel{25}} \times 10^{-4}}$$

Solution : Pressure P = **20 × 10^4 N/m2 (or) 20 × 10^4 Pa**

2. **In a hydraulic lift, the surface area of the input piston is 10 cm^2. The surface area of the output piston is 3000 cm^2. A 100 N force applied to the input piston raises the output piston. Calculate the force required to raise the output piston.**

Ans. **Solution :** Pressure input on piston,

P = $\dfrac{F}{A}$

= $\dfrac{10\cancel{0}}{1\cancel{0} \times 10^{-4}}$ = 10^5 N

According to Pascal's law

P = $\dfrac{F}{A}$

10^5 = $\dfrac{F}{3000 \times 10^{-4}}$ = $\dfrac{F \times 10^4}{3000}$

10^4 × F = 10^5 × 3000

F = 3000 × 10^1

= **3 × 10^4 N**

VIII. ASSERTION & REASON :

Mark the correct choice as :

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(b) If both assertion and reason are true, but the reason is not the correct explanation of the assertion.

(c) If the assertion is true, but the reason is false.

(d) If the assertion is false, but the reason is true.

1. **Assertion :** **Sharp knives are used to cut the vegetables.**

Reason : **Sharp edges exert more pressure.**

[Ans. (a) Both assertion and reason are true and the reason is the correct explanation of the assertion]

Forces and Pressure

2. **Assertion :** **Broad straps are used in bags.**
Reason : **Broad straps last for long life.**
[Ans. (b) Both assertion and reason are true, but the reason is not the correct explanation of the assertion]

Correct explanation: The weight of the bags falls on larger area of shoulder. So lesser pressure is produced.

3. **Assertion :** **Water strider slides easily on the surface of water.**
Reason : **Water strider experiences less buoyant force.**
[Ans. (b) If both assertion and reason are true, but reason is not the correct explanation of assertion]

Correct explanation : It is due to the surface tension of water.

IX. (A). Answer the following in one or two sentences (LOT):

1. **Give two examples to verify that a force changes the shape of a body.**

Ans. Force can change the static condition of a body.
    (i) If you squeeze a sponge, its shape changes.
    (ii) If you pull a rubber band, it becomes longer.

2. **Give two examples to verify that a force tends to change the static condition of a body.**

Ans. Force can change the static condition of a body.
    (i) A rest rubber ball begins to move, when a force applied on it.
    (ii) Player applies a force on the stationary football while taking a penalty kick is football match. The force applied by player makes the football move towards the goal.

3. **Taking out paste from a tooth paste tube is an example to highlight which physical property?**

Ans. Pascal's law.

4. **What do you feel when you touch a nail immediately after it is hammered into a wooden plank? Why?**

Ans. The nail becomes hot due to friction. Friction changes kinetic energy to heat.

5. **How does the friction arise between the surfaces of two bodies in relative motion?**

Ans. The force of friction is arised by the interlocking of the irregularities of the two surfaces.

6. **Name two instruments, which help to measure the pressure of a fluid.**

Ans. (i) Manometer
    (ii) Pressure gauge.

7. **Define one atmosphere.**

Ans. The pressure exerted by this mercury column is considered as the pressure of magnitude 'one atmosphere' (1 atm).

8. **Why are heavy bags provided with broad straps?**

Ans. Broader straps are provided on a back-pack for giving less pressure on the shoulders by providing a larger area of contact with the shoulder.

9. **How does surface tension help a plant?**

Ans. Water molecules rise up due to surface tension. Xylem tissues are very narrow vessels present in plants. Water molecules are absorbed by the roots and these vessels help the water to rise upward due to "capillarity action" which is caused by the surface tension of water.

10. **Which has greater viscosity, oil or honey? Why?**

Ans. Honey has greater viscosity.

Reason : Thicker liquids are more viscous than thinner liquids. As honey has greater viscosity, more frictional force will be acting on it.

X. Answer the following questions with a few sentences (MOT) :

1. **Define friction. Give two examples of the utility of friction in day to day life.**

Ans. **Friction :** Friction is a force that shows down moving objects or prevents stationary objects from moving.

Examples of the utility of friction in day to day life.

   (i) Cars and buses are able to move safely on the road because of friction between the treaded tyres and the surface of the road.

   (ii) We are able to write on paper only with the help of friction between the pencil or pen and paper.

2. **Write down three ways of minimising friction.**

Ans. **(i)** **By using lubricants :** These are applied to surfaces to reduce the friction between the surfaces.

     Ex : Oil, wax, grease and castor oil.

   (ii) **With the help of polishing the surface :**

     We sprinkle fine powder on the carrom board and then we polish its surface to make smooth so that the striker slides easily on the surface.

   (iii) **By using ball bearing :**

     We use leadshots in bearing of a cycle hub because rolling friction is smaller than sliding friction.

3. **How do sailors protect their ship during a heavy storm?**

Ans. During a heavy storm, sailors pour soap powder or oil into the sea near their ship to decrease the surface tension of sea water. This process reduces the impact of the violent water current against the wall of ship.

4. **Write down three applications of Pascal's law.**

Ans. **(i)** In an automobile service station, the vehicles are lifted upward using the hydraulic lift, which works as per Pascal's law.

   (ii) The automobile brake system works according to Pascal's law.

   (iii) The hydraulic press is used to make the compressed bundles of cotton or cloth so as to occupy less space.

5. **Why is a ball bearing used in a cycle hub?**

Ans. The rolling friction is smaller than sliding friction, sliding is replaced by rolling with the usage of ball bearings. So lead shots are used in the bearing of a cycle hub.

Forces and Pressure

XI. Answer the following questions in detail :

1. **"Friction is a necessary evil"- explain.**

Ans. Friction is a necessity in most of our day to day activities. It is desirable in most situations of our daily life.

(i) We can hold any object in our hand due to friction.

(ii) We can walk on the road because of friction. The footwear and the ground help us to walk without slipping.

(iii) Writing easily with a pen on paper is due to friction.

(iv) Automobiles can move safely due to friction between the tyres and the road. Brakes can be applied due to frictional resistance on brake shoes.

(v) We are able to light a matchstick, sew clothes, tie a knot or fix a nail in the wall because of friction.

Though it is giving a negative effect, in most of our day to day life friction helps us to make our life easy. So, it is called as "necessary evil".

Disadvantages of friction :

(i) Friction wears out the surfaces rubbing with each other, like screws and gears in machines or soles of shoes.

(ii) To overcome the friction an excess amount of effort has to be given to operate a machine. This leads to wastage of energy.

2. **Give the different types of friction and explain each with an example.**

Ans. Friction can be classified into two basic types:

(i) Static friction

(ii) Kinetic friction.

(i) **Static friction :** The friction experienced by the bodies, which are at rest is called static friction. (**E.g :** All the objects rigidly placed to be at rest on the Earth, a knot in a thread.)

(ii) **Kinetic friction :** Friction existing during the motion of bodies is called kinetic friction.

Further, kinetic friction can be classified into two:

(i) Sliding friction

(ii) Rolling friction.

(i) **Sliding friction :** When a body slides over the surface of another body, the friction acting between the surfaces in contact is called sliding friction.

(ii) **Rolling friction :** When a body rolls over another surface, the friction acting between the surfaces in contact is called rolling friction.

Rolling friction is less than sliding friction. That is why wheels are provided in vehicles, trolleys, suitcases etc.

3. **Describe an experiment to prove that friction depends on the nature of a surface.**

Ans. To understand about the frictional force between the layers of liquid in motion.

Materials required : Different kinds of liquid (coconut oil, honey, water, ghee), glass plates - 4 nos.

Procedure :

(i) Take a small quantity of different kinds of liquid like coconut oil, honey, water and ghee etc., in a cup.

(ii) Place one drop of each liquid on a separate glass plate.

(iii) Next, gently raise one end of the glass plate, one by one, so as to allow the liquid to slide down the smooth surface of the plate.

(iv) Observe the speed of each liquid.

Observation : Each liquid moves with a different speed. Water flows faster than other liquids. Coconut oil flows with a moderate speed. Ghee flows very slowly.

Inference : Between the layers of each liquid, in motion, there is a frictional force parallel to the layers of the liquid. This frictional force opposes the motion of the liquid layers while they are in motion.

4. **Explain how friction can be minimised.**

Ans. (i) **Using lubricants :**

(1) A substance, which reduces the frictional force, is called a lubricant.
E.g : Grease, coconut oil, graphite, castor oil, etc.

(2) The lubricants fill up the gaps in the irregular surfaces between the bodies in contact. This provides a smooth layer thus preventing a direct contact between their rough surfaces.

(ii) **Using ball bearing :**
Since, the rolling friction is smaller than sliding friction, sliding is replaced by rolling with the usage of ball bearings. We can see lead shots in the bearing of a cycle hub.

5. **Describe an experiment to prove that the pressure in a liquid increases with depth.**

Ans. Take a plastic bottle. Punch three holes on its side in the same direction, but at different heights. Now pour some water into it and let it flow through the holes. Observe the flow of water.

Inference : The water comes out from all the holes with a different force and falls on the table at points that are at variable distances from the bottle. Water from the lowest hole comes out with the greatest force and falls at a point that is at the maximum distance from the bottle. Water from the topmost hole comes out with the least force and falls at the point that is at the minimum distance from the bottle.

Reason : This activity confirms that the pressure in a liquid varies with the depth of the point of observation in it.
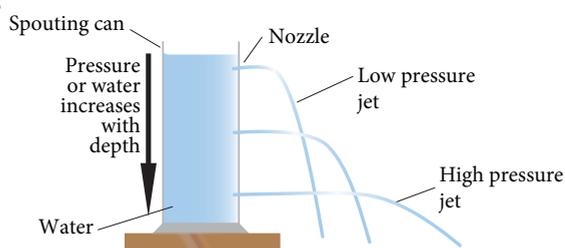
XII. Hot Corner :

1. **Why is it not advisable to take a fountain pen while travelling in an aeroplane?**

Ans. Fountain pens are built in such a way that the pressure inside them balances the atmospheric pressure at sea level. Since atmospheric pressure decreases with an

increase in height above sea level, the pressure inside the pen turns out to be much greater than the air pressure in an aeroplane and the pen starts leaking.

2. **Is there any possibility of making a special device to measure the magnitude of friction directly?**

Ans. Yes. Tribometer is a special device to measure the magnitude of friction directly.

3. **Vidhya posts a question: Mercury is costly. So, instead of mercury can we use water as a barometric liquid? Answer to Vidhya and explain, the difficulty of constructing a water barometer.**

Ans. (i) Mercury is commonly used in barometers because of its high density means the height of the column can be a reasonable size to measure atmospheric pressure.

(ii) A barometer using water, for instance, would need to be 13.6 times taller than a mercury barometer to obtain the same pressure difference.

(iii) This is because mercury is 13.6 times more dense than water.

4. **A bubble rises from the bottom of a pond to its surface by increasing its radius by 3 times its value when it was at the bottom. Calculate the depth of the pond. (Hint: Pressure depends on the depth of the pond. Volume is inversely related to pressure.) [Science Olympiad]**

Ans. Solution : From Boyle's law $P \times \dfrac{1}{V}$ (Pressure is inversely proportional to volume)

Initial pressure P_1 = Atmospheric pressure + Pressure of liquid column

$\therefore P_1$ = $h\rho g + H\rho g$

h = depth of the pond

H = 10 m of water

V_1 = $\dfrac{4}{3} \pi r^3$

P_2 = $H\rho g$

V_2 = $\dfrac{4}{3} \pi (3r)^3 = \dfrac{4}{3} \times 27 r^3 \times \pi$

Hence by substituting these values,

$P_1 V_1$ = $P_2 V_2$

$\dfrac{4}{3} \pi r^3 \rho g (h + 10)$ = $10 \rho g \times \dfrac{4}{3} \pi \times 27 r^3$

$\dfrac{4}{3} \pi r^3 \cdot \rho g (h + 10)$ = $10 \rho g \times \dfrac{4}{3} \pi \, 27 r^3$

$h + 10$ = 10×27

$h + 10$ = 270

h = $270 - 10$

h = **260 m**

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Unit 2

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Additional Questions

I. Choose the correct answer :

1. The SI unit of pressure is _____.

(a) $\dfrac{kg}{m^3}$ (b) $\dfrac{kg}{m^2}$ (c) Pascal   (d) Newton   **[Ans. (c) Pascal]**

2. The wear and tear in the machine part is due to _____.

(a) electrostatic force   (b) frictional force

(c) muscular force   (d) gravitational force   **[Ans. (b) frictional force]**

3. Which of the following increases friction?

(a) Lubricant   (b) Treads on a tyre

(c) Streamlining   (d) Polishing   **[Ans. (b) Treads on a tyre]**

4. The total force exerted by a body normal to the surface is called _____.

(a) pressure   (b) thrust

(c) force of gravity   (d) none of these   **[Ans. (b) thrust]**

5. The atmospheric pressure on the surface of the earth is about _____.

(a) $10^{-5}\ Nm^{-2}$ (b) $10^4\ Nm^{-2}$

(c) $10^5\ Nm^{-2}$ (d) $10^3\ Nm^{-2}$ **[Ans. (c) $10^5\ Nm^{-2}$]**

6. The SI unit of force is _____.

(a) dyne   (b) newton   (c) pascal   (d) newton second

[Ans. (b) newton]

II. Fill in the Blanks :

1. If the same force is made to act on a larger area, the pressure _____.

[Ans. decreases]

2. At the given depth, a liquid exerts _____ pressure in all directions. **[Ans. equal]**

3. The pressure exerted by the air around us is called _____ pressure.

[Ans. atmospheric]

4. At higher altitudes, atmospheric pressure is _____.   **[Ans. less]**

5. Friction depends on the _____ of two surfaces in contact.   **[Ans. nature]**

III. True or False - if false give the correct statement :

1. A push or pull on an object is called force.

Ans. True.

2. Pressure can be increased by decreasing the force.

Ans. False. Correct statement: Pressure can be increased by **increasing** the force.

3. All flowing substances such as liquids or gases are called fluids.

Ans. True.

4. The pressure exerted by air is called atmospheric pressure.

Ans. True.

Forces and Pressure

5. Pressure is directly proportional to the area of contact.

Ans. False. Correct statement: Pressure is **inversely** proportional to the area of contact.

6. The pressure in a liquid is the same at all depths.

Ans. False. Correct statement: The pressure in a liquid **increases** with depth.

IV. Match the following :

1.

	Column - I		Column - II
i	Friction produces	(a)	Ceiling fan
ii	Lubricants	(b)	Heat
iii	Soapy floor	(c)	Oil and grease
iv	Ball bearing	(d)	Rolling friction
v	Wheels	(e)	Less the friction

[Ans. (i - b, ii - c, iii - e, iv - a, v - d)]

2.

	Column - I		Column - II
i	Friction	(a)	Measuring force
ii	Spring balance	(b)	Reduce friction
iii	Shape of aeroplane	(c)	Nature of surface
iv	Lubricants	(d)	Drag
v	Fluid friction	(e)	Bird

[Ans. (i - c, ii - a, iii - e, iv- b, v - d)]

V. Analogy :

1. Liquid pressure : _____ :: Atmospheric Pressure : _____.

Ans. Manometer, Barometer.

2. Broader straps : _____ :: Thin needles : _____.

Ans. Lowers pressure, High pressure.

3. Pascal's law : _____ :: Surface tensin : _____.

Ans. Hydraulic brake, Capillary action.

4. Viscous force : _____ :: Buoyant force : _____.

Ans. Viscosity, Buoyancy.

5. Objects placed at rest on earth : _____ :: Bodies slide over the surface on other body : _____.

Ans. Static friction, Sliding friction.

VI. Assertion and Reason.

Mark the correct choice as :

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(b) If both assertion and reason are true, but the reason is not the correct explanation of the assertion.

(c) If the assertion is true, but the reason is false.

(d) If the assertion is false, but the reason is true.

1. Assertion : Force is defined as a push or pull acting on a body.

Reason : CGS unit of force is newton.

[Ans. (c) The assertion is true, but the reason is false]

2. Assertion : Friction always opposes the motion.

Reason : Whenever one surface moves or tries to move over another surface, the force of friction starts acting on the surfaces.

[Ans. (d) The assertion is false, but the reason is true]

3. Assertion : The pressure at the bottom of the sea is lesser than that near the surface.

Reason : The pressure exerted by a liquid depends upon the depth of the liquid and density of the liquid.

[Ans. (d) The assertion is false, but the reason is true]

4. Assertion : We can live very happily if friction is not present in nature.

Reason : Aeroplane shape is streamlined to reduce the effort of frictional force. [Ans. (d) The assertion is false, but the reason is true]

5. Assertion : There is danger of a vehicle skidding on a wet road.

Reason : The tyres of the vehicle lose their grip on the road due to increase in friction due to presence of water on the road.

[Ans. (c) The assertion is true, but the reason is false]

VII. Very short Answers:

1. Write the SI unit of force.

Ans. newton (N).

2. Write the SI unit of pressure.

Ans. pascal (Pa).

3. Mention the factors that the effect of a force depend.

Ans. (i) Magnitude of the force

(ii) The area over which it acts.

4. Name the material which is used to reduce friction.

Ans. Lubricant.

5. What is lateral pressure?

Ans. Liquid exerts pressure on the walls of the container also. This is called lateral pressure.

6. What is thrust?

Ans. The force acting normally on a surface is called thrust.

7. Name an instrument used to measure the difference in the liquid pressure.

Ans. Barometer.

8. Mention the two types of forces.

Ans. (i) Contact force

(ii) Non - contact force.

Forces and Pressure

9. **State whether the liquids and gases also exerts pressure.**

Ans. Yes, both the liquids and gases also exerts pressure.

10. **In 'tug of war' when two teams pull equally hard, then what happens?**

Ans. In 'tug of war' when two teams pull equally hard, then the rope does not move in any direction.

VIII. Short Answer :

1. **Define force. Mention its SI unit.**

Ans. Force is that which changes or tends to change:
- **(i)** The state of rest or
- **(ii)** The state of uniform motion of a body or
- **(iii)** The direction of a moving body or
- **(iv)** The shape of a body.

2. **Does the palm apply any force on the ball, when we place our palm in front of a moving ball?**

Ans. Yes, when we place our palm in front of a moving ball, then the palm apply a force on the moving ball and stop it.

3. **Briefly explain how do we experience force in our daily life.**

Ans. Since, there are many actions which give us the feeling of force like we hit or catch many objects in our regular routine. Most of the times, we see that the moving ball stops after sometime and it changes the direction of motion when it is hit by a bat also, when we compress a spring, its shape and size changes.

4. **Can you lift or push a book lying on a table without touching it?**

Ans. No, we cannot lift or push a book lying on a table without touching it, because it is a type of contact forces.

5. **Explain the effect on the pressure when area on which it is applied, decreases.**

Ans. As, we know that pressure is defined as the force acting on a unit area of a surface, then,

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

$$P = \frac{F}{A}$$

$$P \propto \frac{1}{A}$$

So, pressure is inversely proportional to the area on which force is applied. Therefore with the decrease in area the pressure increases.

6. **Explain the variation of the pressure exerted by liquid with respect to following factors.**

(i) Amount of liquid **(ii) Depth** **(iii) Shape and size of container**

Ans. The variation of pressure exerted by liquid with respect to the above factors can be given by,
- **(i)** Pressure in a liquid increases with the amount of liquid.
- **(ii)** Pressure in a liquid increases with depth.
- **(iii)** Pressure of liquid is independent of shape and size of container.

7. Give two examples to reduce friction.

Ans. (i) Drops of oil are poured on the hinges of a door to move the door smoothly.

(ii) Fine powder are sprinkled on the carrom board to reduce friction.

8. Explain why the cutting instruments are sharpened.

Ans. Cutting instruments have very small area of cross - section, which lead to the increase in pressure. So they can easily penetrate the surface (pressure is inversely proportional to area). That's why cutting instruments are usually very much sharpened.

9. Cooking in a place located at a higher attitude is difficult. Why?

Ans. At a higher altitude, due to the lack of atmospheric pressure the boiling point of a substance reduces. So, the water boils even at 80º C. At this temperature, the thermal energy that is produced is not sufficient enough for baking or cooking. So, cooking is difficult at higher altitude.

10. Write about buoyant force.

Ans. (i) An upward force is exerted by water on a floating or a partly submerged body. This upward force is called buoyant force. The phenomenon is known as "buoyancy".

(ii) This force is not only exerted by liquids, but also by gases. Liquids and gases together are called fluids.

(iii) This upward force decides whether an object will sink or float. If the weight of the object is less than the upward force, then the object will float. If not, it will sink.

IX. Long Answer :

1. Explain the advantages and disadvantages of friction.

Ans. Advantages of friction :

Friction is a necessity in most of our day to day activities. It is desirable in most situations of our daily life.

(i) We can hold any object in our hand due to friction.

(ii) We can walk on the road because of friction. The footwear and the ground help us to walk without slipping.

(iii) Writing easily with a pen on paper is due to friction.

(iv) Automobiles can move safely due to friction between the tyres and the road. Brakes can be applied due to frictional resistance on brake shoes.

(v) We are able to light a matchstick, sew clothes, tie a knot or fix a nail in the wall because of friction.

Though it is giving a negative effect, in most of our day to day life friction helps us to make our life easy. So, it is called as "necessary evil".

Disadvantages of friction :

(i) Friction wears out the surfaces rubbing with each other, like screws and gears in machines or soles of shoes.

(ii) To overcome the friction an excess amount of effort has to be given to operate a machine. This leads to wastage of energy.

(iii) Friction produces heat, which causes physical damage to the machines.

Forces and Pressure

2. Define Pascal's law. Explain the applications of Pascal's law in our daily life.

Ans. Pascal's law :

The pressure applied at any point of a liquid at rest, in a closed system, will be distributed equally through all regions of the liquid.

Application of Pascal's law :

Some of the following examples highlight their working according to Pascal's law.

(i) In an automobile service station, the vehicles are lifted upward using the hydraulic lift, which works as per Pascal's law.

(ii) The automobile brake system works according to Pascal's law.

(iii) The hydraulic press is used to make the compressed bundles of cotton or cloth so as to occupy less space.

3. What is surface tension? Explain the applications of surface tension.

Ans. Surface tension is the property of a liquid. The molecules of a liquid experience a force, which contracts the extent of their surface area as much as possible, so as to have the minimum value. Thus, the amount of force acting per unit length, on the surface of a liquid is called surface tension.

Application of surface tension :

(i) Water molecules rise up due to surface tension. Xylem tissues are very narrow vessels present in plants. Water molecules are absorbed by the roots and these vessels help the water to rise upward due to "capillarity action" which is caused by the surface tension of water.

(ii) For a given volume, the surface area of a sphere is the minimum. This is the reason for the liquid drops to acquire a spherical shape.

(iii) Water strider insect slides on the water surface easily due to the surface tension of water.

(iv) During a heavy storm, sailors pour soap powder or oil into the sea near their ship to decrease the surface tension of sea water. This process reduces the impact of the violent water current against the all of ship.

4. Briefly explain the concept of variation of atmospheric pressure.

Ans. (i) Atmospheric pressure vary from place to place and from time to time due to variation in temperature. Even, the density of air decreases with the increase in temperature.

(ii) So, as a result, the atmospheric pressure also decreases. The atmospheric pressure at a place is because of the weight of air above it.

(iii) So, if we go higher above the earth surface, the atmospheric pressure decreases, thus at mountain top the pressure is less. The atmospheric pressure at sea level is considered as standard pressure.

X. Thinking Corner : HOTS

1. Why dams are made stronger and thicker at the bottom that at the top?

Ans. This is because the pressure of the water is much greater deeper down and the dam needs to be thick at the bottom so that is strong enough to withstand this larger pressure.

2. **Why do scuba divers wear a special suit while they go into deep sea levels?**

Ans. Pressure deep under the sea is so high that if the divers don't wear specially designed suits, the water pressure will crush their body.

3. **Why are rain drop spherical in nature?**

Ans. (i) Surface tension is responsible for the shape of liquid droplets. Although easily deformed, droplets of water tend to be pulled into a spherical shape by the cohesive force of the surface layer.

(ii) In the absence of other force including gravity drops of virtually all liquids would be approximately spherical.

4. **A liquid flowing out of a very small opening of a tube or tap comes out in the form of fine drops and not as a continuous stream. Why?**

Ans. For a given volume, the surface area of a sphere is the minimum. This is the reason for the liquid drops to acquire a spherical shape.

5. **Trees are greenish. They are greenish at the tip too. How does the water rise upward in a tree or plant against the force of gravity?**

Ans. (i) Water can travel to great heights inside plants. Water moves up the xylem through a process called capillary action.

(ii) During transpiration, water evaporates from holes in the surface of leaves into the air. As water molecules evaporate from plant leaves, they attract the water molecules still in the plant, helping to pull water up through the stems from the roots.

XI. Problems for practice :

1. **Determine the pressure when a force of 200 N acts on area**

(i) **20 m^2**

(ii) **8 m^2**

Ans. (i) Pressure P $= \dfrac{F}{A}$

$\qquad$ F $=$ 200 N, A = 20 m^2

$\qquad$ P $= \dfrac{200}{20} = 10$ N/m^2 or 10 Pa

(ii) A $=$ 8 m^2

$\qquad$ P $= \dfrac{200}{8} =$ **25 N/m^2 or 25 Pa**

2. **A force of 20 N acts over an area of 4 cm^2. Find the value of pressure? (in Nm^{-2})**

Ans. Given : Pressure $= \dfrac{F}{A}$

$\qquad$ F $=$ 20 N

$\qquad$ A $=$ 4 cm^2 = 4 × 10^{-2} m

Forces and Pressure

Solution : $\quad P = \dfrac{F}{A} = \dfrac{20}{4 \times 10^{-2}} = 5 \times 10^2$

$\qquad\qquad\qquad = $ **500 Nm^{-2} (or) 500 Pa**

3. **What will be the force required to exert a pressure of 20,000 Pa on an area of 1 cm^2.**

Ans. Given : $\quad$ P $=$ 20,000 Pa

$\qquad\qquad$ A $=$ 1 cm^2 = 1 × 10^{-4} m^2

Formula : $\quad P = \dfrac{F}{A}$

$\qquad\qquad$ F $=$ P × A

Solution : $\qquad = $ 20,000 × 10^{-4}

$\qquad\qquad\qquad = $ 2 × 10^4 × 10^{-4}

$\qquad\qquad\qquad = $ **2 N**.

4. **Calculate the area of a 1500 N object that exerts a pressure of 500 Pa.**

Ans. Given : $\quad$ P $=$ 500 Pa

$\qquad\qquad$ F $=$ 1500 N

Formula : $\quad P = \dfrac{F}{A}$

$\qquad\qquad$ A $= \dfrac{F}{P}$

Solution : $\qquad = \dfrac{1500}{500} = $ **3m^2**

XII. Cross word puzzle :

Across :

1. The mixture of gases that surrounds the Earth or some other celestial body.
3. A force acting normal to a surface.
5. The pressure exerted by air.
7. Something that causes a body to move, change its speed or direction, or distorts its shape.
9. The upward force that fluids exert on all matter.

Down :

2. A unit used to measure pressure.
4. A unit used to measure force.
6. Amount of force applied per unit area.
8. An instrument for measuring atmospheric pressure.
10. The pressure exerted at any point on a enclosed liquid is transmitted equally and undiminished in all directions.

Ans. Across :

1. ATMOSPHERE $\qquad\qquad$ 3. THRUST
5. ATMOSPHERIC PRESSURE $\quad$ 7. FORCE

9. UPTHRUST

Down :

2. PASCAL   4. NEWTON
6. PRESSURE   8. BAROMETER
10. PASCALS LAW

A(1)	T	M	O	S	P(2)(10)	H	E	R	E							
					A										
	A(5)	T	M	O	S	P	H	E	R	I	C	P(6)	R	E	S	S	U	R	E
					C							R				
					A							E				N(4)
					L							S				E
					S			B(8)				S				W
					L			A				U(9)	P	T(3)	H	R	U	S	T
					A			R				R				O
					W		F(7)	O	R	C	E					N
								M							
								E							
								T							
								E							
								R							

Forces and Pressure

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UNIT TEST ✍

Time : 60 min.   **Marks : 25**

I.   Choose the correct answer: **(3×1 = 3)**

1.   Unit of pressure is
(a) pascal   (b) N m–2   (c) poise   (d) Both (a) & (b)

2.   A _____ is used to measure liquid pressure.
(a) manometer   (b) barometer (c) thermometer (d) voltmeter

3.   If the weight of the object is less than the upward force, then the object will _____.
(a) sink   (b) float   (c) fly   (d) none

II. Fill in the blanks: **(3 × 1 = 3)**

4.   A simple barometer was first constructed by _____.

5.   Friction is called a _____ evil.

6.   A drinking straw works on the existence of _____ pressure.

III. Match the following: (4 × 1 = 4)

7.	Barometer	(a)	Upward force
8.	Buoyant force	(b)	Atmospheric pressure
9.	Manometer	(c)	A substance that can flow
10.	Fluid	(d)	A device used for measuring liquid pressure

IV. Answer in one word: (4 × 1 = 4)

11. Taking out paste from a tooth paste tube is an example to highlight which physical property?

12. Write the SI unit of force.

13. Name the material which is used to reduce friction.

14. Name an instrument used to measure the difference in the liquid pressure.

V. Answer the following in one or two sentences: (any 3) (3 × 2 = 6)

15. Define friction. Give two examples of the utility of friction in day to day life.

16. How do sailors protect their ship during a heavy storm?

17. Define force. Mention its SI unit.

18. Give two examples to reduce friction.

19. Explain why the cutting instruments are sharpened.

VI. Answer the following in detail: (5 × 1 = 5)

20. (a) What is surface tension? Explain the applications of surface tension.

(or)

(b) Explain how friction can be minimised.

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Answer Key

I. 1. (d) Both (a) & (b)   2. (a) manometer   3. (b) float

II. 4. Torricelli   5. necessary   6. atmospheric

III. 7 - b, 8 - a, 9 - d, 10 - c.

IV. 11. Pascal's law

12. newton (N).

13. Lubricant.

14. Barometer

V. 15. Refer Sura's Guide, Textbook Q. No. X - 1.

16. Refer Sura's Guide, Textbook Q. No. X - 3.

17. Refer Sura's Guide, Additional Q. No. VIII - 1.

18. Refer Sura's Guide, Additional Q. No. VIII - 7.

19. Refer Sura's Guide, Additional Q. No. VIII - 8.

VI. 20. a) Refer Sura's Guide, Additional Q. No. IX - 3.

(or)

b) Refer Sura's Guide, Textbook Q. No. XI - 4.

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Unit 2

Unit 3

LIGHT

Mind Map
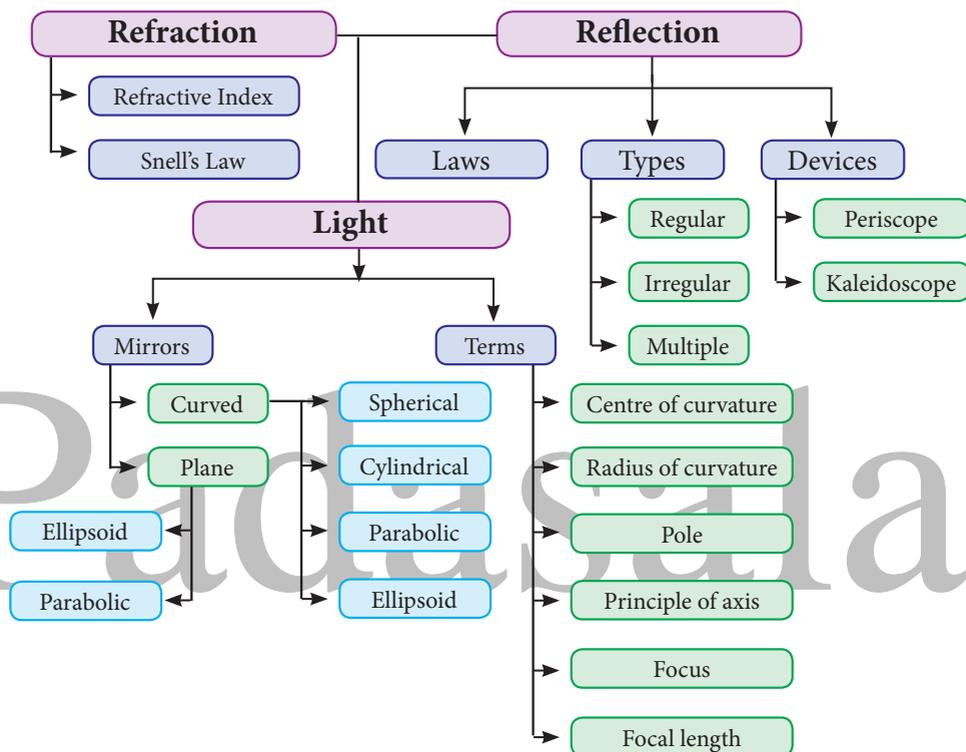
Definitions

Mirrors	:	A shiny surface which reflect almost the light falling on it.
Spherical mirrors	:	Spherical mirrors are one form of curved mirrors. If the curved mirror is a part of a sphere, then it is called a **spherical mirror**.
Concave mirrors	:	A spherical mirror, in which the reflection of light occurs at its concave surface, is called a **concave mirror**.
Convex mirrors	:	A spherical mirror, in which the reflection of light occurs at its convex surface, is called a **convex mirror**.

Unit 3

Parabolic mirrors	:	A **parabolic mirror** is one type of curved mirror, which is in the shape of a parabola. It has a concave reflecting surface and this surface directs the entire incident beam of light to converge at its focal point.
Center of Curvature	:	It is the center of the sphere from which the mirror is made. It is denoted by the letter C in the ray diagrams.
Pole	:	It is the geometric centre of the spherical mirror. It is denoted by the letter P.
Radius of Curvature	:	It is the distance between the center of the sphere and the vertex. It is shown by the letter R in ray diagrams.
Principal Axis	:	The line joining the pole of the mirror and its center of curvature is called **principal axis**.
Focus	:	When a beam of light is incident on a spherical mirror, the reflected rays converge (concave mirror) at or appear to diverge from (convex mirror) a point on the principal axis. This point is called the 'focus' or 'principal focus'.
Focal length	:	The distance between the pole and the principal focus is called **focal length** (f) of a spherical mirror.
Reflection	:	The bouncing back of the light rays as they fall on the smooth, shiny and polished surface is called reflection.
Laws of reflection	:	(i) The incident ray, the reflected ray and the normal at the point of incidence, all lie in the same plane. (ii) The angle of incidence and the angle of reflection are always equal.
Regular reflection	:	When a beam of light falls on a smooth surface, it gets reflected. After reflection, the reflected rays will be parallel to each other. This is called **regular reflection**.
Irregular reflection	:	When a beam of light falls on a rough surface, the light rays are reflected at different angles. This kind of reflection is called **irregular reflection**.
Multiple reflection	:	It is the reflection of light back and forth several times between reflecting surfaces. If a reflected light ray is reflected again on being incident on another surface, it is termed multiple reflections.
Kaleidoscope	:	It is a device, which functions on the principle of multiple reflection of light, to produce numerous patterns of images.
Periscope	:	It is an instrument which functions on the principle of multiple reflection of light, for viewing bodies or ships, which are over and around another body or a submarine.

Refraction	:	The phenomenon of bending of light on passing from one medium to another is called refraction of light.
Refractive index of a medium	:	The refractive index of a medium is the ratio of the speed of light in vacuum to the speed of light in that medium.
Snell's law of refraction	:	Refraction of light rays, as they travel from one medium to another medium, obeys two laws, which are known as Smell's law of refraction. Thye are : (i) The incident ray, the refracted ray and the normal at the point of intersection, all lie in the same plane. (ii) The ratio of the sine of the angle of incidence (i) to the sine of the angle of refraction (r) is equal to the refractive index of the medium, which is a constant.

Formulae to Remember

1.	Focal length (f)	=	$\dfrac{\text{Radius of curvature (R)}}{2}$
2.	Refractive index (μ)	=	$\dfrac{\text{Speed of light in air (c)}}{\text{Speed of light in the medium (v)}}$
3.	Refractive index (μ)	=	$\dfrac{\sin i}{\sin r}$
4.	Number of images formed N	=	$\dfrac{360º}{\theta} - 1$
5.	Speed of light in medium (v)	=	$\dfrac{\text{Refractive index (μ)}}{\text{Speed of light in air (c)}}$
6.	Speed of light in air (c)	=	$\dfrac{\text{Refractive index (μ)}}{\text{Speed of light in medium (v)}}$

✍ TEXT BOOK EXERCISES

I.   Choose the best answer :

1. **Mirrors having a curved reflecting surface are called as**
  (a) plane mirrors   (b) spherical mirrors
  (c) simple mirrors   (d) None of the above **[Ans. (b) spherical mirrors]**

2. **The spherical mirror with a reflecting surface curved inward is called**
  (a) convex mirror   (b) concave mirror
  (c) curved mirror   (d) None of the above **[Ans. (b) concave mirror]**

Light

3. **The centre of a sphere of which the reflecting surface of a spherical mirror is a part is called**
   (a) pole
   (b) centre of curvature
   (c) cradius of curvature
   (d) aperture   **[Ans. (b) centre of curvature]**

4. **The spherical mirror used as a rear view mirror in the vehicle is**
   (a) concave mirror
   (b) convex mirror
   (c) plane mirror
   (d) None of the above **[Ans. (b) convex mirror]**

5. **The imaginary line passing through the centre of curvature and pole of a spherical mirror is called**
   (a) centre of curvature
   (b) pole
   (c) principal axis
   (d) radius curvature   **[Ans. (c) principal axis]**

6. **The distance from the pole to the focus is called**
   (a) Pole length
   (b) focal length
   (c) principal axis
   (d) None of the above   **[Ans. (b) focal length]**

7. **Focal length is equal to half of the**
   (a) centre of curvature
   (b) axis
   (c) radius of curvature
   (d) None of the above

   [Ans. (c) radius of curvature]

8. **If the focal length of a spherical mirror is 10 cm, what is the value of its radius of curvature?**
   (a) 10 cm   (b) 5 cm   (c) 20 cm   (d) 15 cm   **[Ans. (c) 20 cm]**

9. **If the image and object distance is same, then the object is placed at**
   (a) infinity
   (b) at F
   (c) between f and P
   (d) at C   **[Ans. (d) at C]**

10. **The refractive index of water is**
    (a) 1.0   (b) 1.33   (c) 1.44   (d) 1.52   **[Ans. (b) 1.33]**

II. Fill in the blanks :

1. The spherical mirror used in a beauty parlour as make-up mirror is _____.
   [Ans. concave mirror]

2. Geometric centre of the spherical mirror is _____.   **[Ans. pole]**

3. Nature of the images formed by a convex mirror is _____.
   [Ans. smaller, virtual and erect]

4. The mirror used by the ophthalmologist to examine the eye is _____.
   [Ans. concave mirror]

5. It the angle of incidence is 45°, then the angle of reflection is _____. **[Ans. 45°]**

6. Two mirrors are parallel to each other, then the number of images formed is _____.   **[Ans. infinite]**

Unit 3

III. Match the following :

A.

1.	Convex mirror	(a)	Radio telescopes
2.	Parobolic mirror	(b)	wall
3.	Regular reflection	(c)	rear – view mirror
4.	Irregular reflection	(d)	Plane mirror

[Ans : 1 - c, 2 - a, 3 - d, 4 - b]

B.

1.	Snell's law	(a)	Kaleidoscopce
2.	Dispersion of light	(b)	$\dfrac{\sin i}{\sin r} = \mu$
3.	Refractive index	(c)	Rainbow
4.	Multiple reflection	(d)	$\dfrac{c}{v} = \mu$

[Ans : 1 - b, 2 - c, 3 - d, 4 - a]

IV. Answer in brief :

1. What is called a spherical mirror?

Ans. Spherical mirrors are one form of curved mirrors. If the curved mirror is a part of a sphere, then it is called a 'spherical mirror'.

2. Define focal length.

Ans. The distance between the pole and the principal focus is called focal length (f) of a spherical mirror.

3. The radius of curvature of a spherical mirror is 25 cm. Find its focal length.

Ans. Given : Radius of curvature = 25 cm

To find : f = ?

Solution : $f = \dfrac{R}{2} = \dfrac{25}{2}$

f = **12.5 cm**

4. Give two applications of a concave and convex mirror.

Ans. Concave mirrors :

(i) Concave mirrors are used while applying make-up or shaving, as they provide a magnified image.

(ii) They are used in torches, search lights and head lights as they direct the light to a long distance.

Convex mirrors :

(i) Convex mirrors are used in vehicles as rear view mirrors because they give an upright image and provide a wider field of view as they are curved outwards.

(ii) They are found in the hallways of various buildings including hospitals, hotels, schools and stores. They are usually mounted on a wall or ceiling where hallways make sharp turns.

Light

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Sura's ○ Science ○ 8th Std ○ Term - I

5. **State the laws of reflection.**

Ans. (i) The incident ray, the reflected ray and the normal at the point of incidence, all lie in the same plane.

(ii) The angle of incidence and the angle of reflection are always equal.

6. **If two plane mirrors are inclined to each other at an angle of 45°, find the number of images formed.**

Ans. Given : Angle of inclination $=$ 45°

To find : Number of images formed $= \dfrac{360°}{angle} - 1$

Solution : $= \dfrac{360°}{45°} - 1$

$= 8 - 1 = $ **7 images**

7. **Define the refractive index of a medium.**

Ans. The amount of refraction of light in a medium is denoted by a term known as refractive index of the medium, which is the ratio of the speed of light in the air to the speed of light in that particular medium.

8. **State the Snell's law of refraction.**

Ans. Refraction of light rays, as they travel from one medium to another medium, obeys two laws, which are known as Snell's laws of refraction. They are:

(i) The incident ray, the refracted ray and the normal at the point of intersection, all lie in the same plane.

(ii) The ratio of the sine of the angle of incidence (i) to the sine of the angle of refraction (r) is equal to the refractive index of the medium, which is a constant.

$$\frac{\sin i}{\sin r} = \mu$$

V. Answer in detail :

1. **Explain the images formed by a concave mirror?**

Ans.

Position Of The Object	Position Of The Image	Image Size	Nature of the Image
At infinity	At F	Highly diminished	Real and inverted
Beyond C	Between C and F	Diminished	Real and inverted
At C	At C	Same size as the object	Real and inverted
Between C and F	Beyond C	Magnified	Real and inverted
At F	At infinity	Highly magnified	Real and inverted
Between F and P	Behind the mirror	Magnified	Virtual and erect

2. **What is reflection? Write short notes on regular and irregular reflection?**

Ans. A ray of light, falling on a body having a shiny polished and smooth surface alone is bounced back. This bouncing back of the light rays as they fall on the smooth, shiny and polished surface is called **reflection**.

Unit 3

Regular reflection :

(i) When a beam of light (collection of parallel rays) falls on a smooth surface, it gets reflected.

(ii) After reflection, the reflected rays will be parallel to each other. Here, the angle of incidence and the angle of reflection of each ray will be equal.

(iii) Hence, the law of reflection is obeyed in this case and thus a clear image is formed. This reflection is called 'regular reflection' or 'specular reflection'.

Irregular reflection :

(i) In the case of a body having a rough or irregular surface, each region of the surface is inclined at different angles.

(ii) When light falls on such a surface, the light rays are reflected at different angles.

(iii) In this case, the angle of incidence and the angle of reflection of each ray are not equal.

(iv) Hence, the law of reflection is not obeyed in this case and thus the image is not clear. Such a reflection is called 'irregular reflection' or 'diffused reflection'.

3.   Explain the working of a periscope.

Ans. Periscope :

(i) It is an instrument used for viewing bodies or ships, which are over and around another body or a submarine.

(ii) It is based on the principle of the law of reflection of light.

(iii) It consists of a long outer case and inside this case mirrors or prisms are kept at each end, inclined at an angle of 45°.

(iv) Light coming from the distant body, falls on the mirror at the top end of the periscope and gets reflected vertically downward.

(v) This light is reflected again by the second mirror kept at the bottom, so as to travel horizontally and reach the eye of the observer.

(vi) In some complex periscopes, optic fibre is used instead of mirrors for obtaining a higher resolution.

(vii) The distance between the mirrors also varies depending on the purpose of using the periscope.

4.   What is dispersion? Explain in detail.

Ans. (i) Splitting of white light into its seven constituent colours (wavelength), on passing through a transparent medium is known as **dispersion of light**.

(ii) Dispersion occurs because, light of different colours present in white light have different wavelength and they travel at different speeds in a medium.

(iii) Refraction of a light ray in a medium depends on its speed.

(iv) As each coloured light has a different speed, the constituent coloured lights are refracted at different extents, inside the prism. *Moreover, refraction of a light ray is inversely proportional to its wavelength*.

5.   Speed of light in air is 3×10^8 m s^{-1} and the refractive index of a medium is 1.5. Find the speed of light in the medium.

Ans. Given :   Speed of light in air c   = 3×10^8 ms^{-1}

                              Refractive index of a medium μ   =   1.5

        To find :   Speed of light in medium v   =   ?

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Formula :

$$\mu = \frac{c}{v}$$

Solution :

$$1.5 = \frac{3\times10^8}{v}$$

$$v = \frac{3\times10^8}{1.5}$$

$$v = 2\times10^8 \text{ ms}^{-1}$$

∴ Speed of light in medium v = **2 × 10⁸ ms⁻¹**

★★★★★

Additional Questions

I. Choose the correct answer :

1. Which object use the reflection of light?
   (a) Kaleidoscope (b) Plane mirror
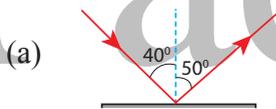   (c) Convex mirror (d) All of these   **[Ans. (d) All of these]**

2. Which surface will not reflect most of the light falling on them?
   (a) Rough surface (b) Smooth surface
   (c) Shining surface (d) Opaque surface   **[Ans. (a) Rough surface]**

3. Which of the following demonstrates the law of reflection?
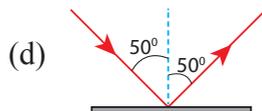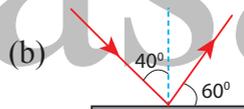
[Ans. (d)]

4. The ENT doctor uses a _____.
   (a) plane mirror (b) concave mirror
   (c) convex mirror (d) convex lens   **[Ans. (b) concave mirror]**

5. In dispersion, the colour of light that will bend more is _____.
   (a) red (b) yellow (c) green (d) violet   **[Ans. (d) violet]**

6. Reflection by a looking mirror is called _____.
   (a) regular reflection (b) irregular reflection
   (c) regular and irregular reflection
   (d) none of these   **[Ans. (a) regular reflection]**

7. The velocity of light in vacuum is 3×10^8 ms⁻¹ and in glass is 2×10^8 ms⁻¹. The refractive index of glass is _____.
   (a) 2 (b) 1.5 (c) 1.8 (d) 1.33   **[Ans. (b) 1.5]**

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8. Incident angle of a ray of light is 30º. The angle between the incidend ray and the reflected ray is _____.

(a) 50º   (b) 90º   (c) 60º   (d) 15º   **[Ans. (c) 60º]**

9. In the head lights of motor vehicles, _____ mirrors are used as reflectors.

(a) plane mirrors   (b) concave lenses

(c) convex mirrors   (d) concave mirrors   **[Ans. (d) concave mirrors]**

10. The phenomenon of light passing through the object is called _____.

(a) reflection   (b) refraction

(c) dispersion   (d) total internal reflection   **[Ans. (b) refraction]**

II. Fill in the Blanks :

1. The bouncing back of light from a surface is called _____.   **[Ans. reflection]**

2. _____ mirrors make things look larger when objects are placed close to it   **[Ans. Concave]**

3. Convex mirror always forms _____ and _____ image.   **[Ans. virtual and erect]**

4. The incident ray, _____ ray and the _____ at the point of incidence, all lie on the same plane.   **[Ans. reflected, normal]**

5. A ray of light incident along normal to the mirror _____ its path.   **[Ans. retraces]**

6. When light passes from one medium to another the ray gets bent. This property of light is called _____.   **[Ans. refraction]**

7. Spherical mirrors are one form of _____ mirrors.   **[Ans. curved]**

8. _____ mirrors magnify the object placed close to them.   **[Ans. Concave]**

9. The image formed by convex mirrors is _____ than the object   **[Ans. smaller]**

10. _____ mirrors form the perfect image of an object.   **[Ans. Plane]**

11. The _____ of a mirror determines the type of image it forms.   **[Ans. shape]**

12. The _____ is an optical device with a polished surface that reflects the light falling on it.   **[Ans. mirror]**

III. True or False - if false give the correct statement :

1. We can see things around us only when the light reflected by them reaches our eyes.
Ans. True.

2. Light is a form of energy and it travels in a straight line.
Ans. True.

3. The periscope is an optical device with a polished surface that reflects the light falling on it.
Ans. False. Correct statement: The **mirror** is an optical device with a polished surface that reflects the light falling on it.

4. Curved mirrors have surfaces that are spherical, cylindrical, parabolic and ellipsoid.
Ans. True.

Light

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5. Curved mirrors form the perfect image of an object.

Ans. False. Correct statement: Plane mirrors form the perfect image of an object.

6. Curved mirrors produce images that are either enlarged or diminished.

Ans. True.

7. A thin layer of molten aluminium or silver is used for coating glass plates that will then become mirrors.

Ans. True.

8. The most common example of a convex mirror is the make-up mirror.

Ans. False. Correct statement: The most common example of a **concave** mirror is the make-up mirror.

IV. Match the following :

1.

i	Real image	(a)	Distance between pole and centre of curvature.
ii	Virtual image	(b)	Centre of the sphere of which the mirror is a part.
iii	Focus	(c)	Line passing through the pole and focus.
iv	Principal axis	(d)	Erect
v	Centre of curvature	(e)	Inverted

[Ans. (i - e. ii - d, iii - a, iv - c, v - b)]

2.

i	The ray that enters the transparent medium	(a)	Violet
ii	The ray that comes out from a transparent medium into air	(b)	$0°$
iii	Speed of light in vacuum	(c)	Emergent ray
iv	The angle of incidence for normal incidence	(d)	Incident ray
v	The colour that deviates the most	(e)	$3 × 10^8$ m/s

[Ans. (i - d. ii - c, iii - e, iv - b, v - a)]

3.

i	Mirror	(a)	Used by dentists to see enlarged image of teeth.
ii	Virtual image	(b)	Can be taken on a screen.
iii	Real image	(c)	Cannot be taken on a screen.
iv	Convex mirror	(d)	An optical device which produces reflection.
v	Concave mirror	(e)	Can form image of objects speed over a larger area

[Ans. (i - d. ii - c, iii - b, iv - e, v - a)]

V. Assertion and Reason.

Mark the correct choice as :

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(b) If both assertion and reason are true, but the reason is not the correct explanation of the assertion.

Unit 3

(c)	If the assertion is true, but the reason is false.

(d)	If the assertion is false, but the reason is true.

**1.	Assertion :	A ray incident along normal to the mirror retraces its path**

**Reason	:	In reflection, angle of incidence is always equal to angle of reflection.**

[Ans. (a) Both assertion and reason are true and the reason is the correct explanation of the assertion]

**2.	Assertion :	Convex mirrors are used as rear view mirror in vehicles for observing traffic at our back.**

**Reason	:	A convex mirror has a much larger field of view.**

[Ans. (a) Both assertion and reason are true and the reason is the correct explanation of the assertion]

**3.	Assertion :	The mirrors used in search lights are parabolic and not concave spherical.**

**Reason	:	In concave spherical mirror the image formed is always virtual.**

[Ans. (c) The assertion is true, but the reason is false]

Correct explanation : In search lights, we need an intense parallel beam of light. If a source is placed at the focus of a concave spherical mirror only paraxial rays are rendered parallel. Due to large aperture of mirror, marginal rays give a divergent beam. But in case of parabolic mirror, when source is at the focus, beam of light produced over the entire cross - section of the mirror is a parallel beam.

**4.	Assertion :	We can see the rainbow in the sky when the rain starts falling after a spell of bright sunlight.**

**Reason	:	The rainbow is formed due to the dispersion of light.**

[Ans. (d) The assertion is false, but the reason is true]

Correct explanation : The rainbow is formed when the light passes through the water droplets in air after it rains and gets dispersed into seven colours.

## VI.	Very short Answers :

**1.	How does the light travel?**

Ans. The light travels along straight lines.

**2.	What is reflection of light?**

Ans. The bouncing back of light when it falls on smooth surface is called reflection.

**3.	What is mirror?**

Ans. The mirror is an optical device with a polished surface that reflects the light falling on it.

**4.	What type of image is formed by a concave mirror?**

Ans. Real and inverted image. If the object is placed very close to the mirror then the image is virtual and erect.

**5.	What is rainbow?**

Ans. The rainbow is seen as a large area in the sky with many colours.

Light

6. **Name the triangular piece of glass that splits white light into different colours.**

Ans. Prism.

7. **What is the composition of sunlight?**

Ans. Sunlight is a mixture of seven colours.

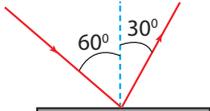**8.** **Light bends as it passes from one medium to another. What is this phenomenon called?**

Ans. Refraction of light.

9. **Name the two types of spherical mirrors.**

Ans. (i) Concave mirror
(ii) Convex mirror.

10. **The angle between incident ray and reflected ray is 60º. What is the value of angle of incidence?**

Ans. since angle of incidence = angle of reflection.
So, angle of incidence = 30º.

VII. Short Answer :

1. **Light travels fastest in vacuum. Why?**

Ans. Light travels fastest in vacuum than any other medium because there is no obstruction to the passage of light in vacuum.

2. **Distinguish between real and virtual images.**

Ans.

Real image	Virtual image
Type of image which can be obtained on a screen is called a real image	An image which cannot be obtained on a screen is called a virtual image.

3. **State any two uses of concave mirrors.**

Ans. (i) It is used as a reflector in torches, light houses, head lights of vehicles, etc., as it diverges the rays of light.
(ii) A dentist uses a concave mirror to obtain a magnified image of the teeth of the patient.

4. **A convex rear view mirror is preferred over a plane mirror in a car. Why?**

Ans. Since convex mirror forms a smaller and virtual image, it can be used to see a much larger area than the area visible by a plane mirror.

5. **What type of image is formed by a concave mirror?**

Ans. The image formed by a concave mirror is real and inverted. If the object is placed very rear to the mirror then the image formed is virtual and erect.

6. **Why do we need a shiny surface for reflection?**

Ans. The extent of reflection depends upon the shine and smoothness of the surface. More is the shine and smoothness of the surface more will be the reflection.

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7. **The radius of curvature of a spherical mirror is 18 cm. What is the focal length of this mirror?**

Ans. $f = \dfrac{R}{2}$

$R = 18$ cm

$f = \dfrac{18}{2} = $ **9 cm**.

8. **What happens to light when it gets dispersed? Give an example.**

Ans. Light is splitted into its constituent colours, when it gets dispersed.

Ex : Rainbow formation is due to the dispersion of white light after passing through water droplets.

9. **If two mirrors are placed at an inclination of 30° then how many images can be seen?**

Ans. **Formula :** Number of images $N = \dfrac{360°}{\theta} - 1$

Given : $\theta = 30°$

Solution : $N = \dfrac{360°}{30°} - 1$

$= 12 - 1 = $ **11 images**.

10. **What is the speed of light in diamond if its refractive index is 2.41?**

Ans. **Formula :** Refractive index $\mu = \dfrac{\text{Speed of light in air (c)}}{\text{Speed of light in the medium (v)}}$

Given : $\mu = 2.41$

Solution : $c = 3 \times 10^8 \text{ ms}^{-1}$

$\mu = \dfrac{c}{v}$

$v = \dfrac{3 \times 10^8}{2.41}$

Speed of light in diamond $v = $ **$1.24 \times 10^8 \text{ ms}^{-1}$**

11. **A light ray moves from glass ($V_{glass} = 2.0 \times 10^8 \text{ ms}^{-1}$) to diamond ($V_{diamond} = 1.25 \times 10^8 \text{ ms}^{-1}$). What is the refractive index of diamond with respect to glass?**

Ans. Refractive index of diamond with respect to glass

$\mu_{dg} = \dfrac{\text{Velocity of light in glass } (V_g)}{\text{Velocity of light in diamond } (V_d)}$

Solution : $= \dfrac{2.0 \times 10^8}{1.25 \times 10^8} = \dfrac{200}{125} = $ **1.60 (No unit)**.

Light

12. Find the refractive index of water with respect to glass if the refractive index of water is $\dfrac{4}{3}$ and the refractive index of glass is $\dfrac{3}{2}$.

Ans.

Refractive index of water with respect to glass μ_{wg} $=$ $\dfrac{\text{Refractive index of water } (\mu_w)}{\text{Refractive index of glass } (\mu_g)}$

$$\mu_{wg} = \dfrac{\mu_{water}}{\mu_{glass}}$$

Solution : $= \dfrac{4}{3} \times \dfrac{2}{3} = \dfrac{8}{9}$

Thus, refractive index of water with respect to glass $= \dfrac{8}{9}$ **(No unit)**.

13. The speed of light in air is 3×10^8 ms^{-1} and that in water is 2.25×10^8 ms^{-1}. Find the absolute refractive index of water.

Ans. Refractive index $\mu = \dfrac{\text{Speed of light in air } (c)}{\text{Speed of light in the medium } (v)}$

Solution : $\mu = \dfrac{3 \times 10^8}{2.25 \times 10^8}$

$\mu = $ **1.333 (No unit)**.

VIII. Long Answer :

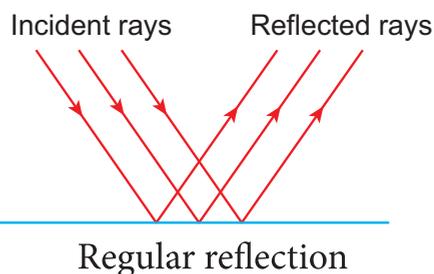**1.** **Differentiate between regular and irregular reflection.**

Ans. Regular reflection :

(i) When a beam of light (collection of parallel rays) falls on a smooth surface, it gets reflected. After reflection, the reflected rays will be parallel to each other.

(ii) Here, the angle of incidence and the angle of reflection of each ray will be equal.

(iii) Hence, the law of reflection is obeyed in this case and thus a clear image is formed.

(iv) This reflection is called 'regular reflection' or 'specular reflection'.

Example : Reflection of light by a plane mirror and reflection of light from the surface of still water.
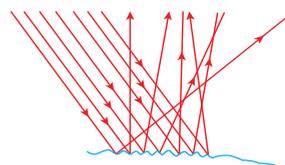

Regular Reflection

Incident rays   Reflected rays

Regular reflection

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Irregular reflection :

(i) In the case of a body having a rough or irregular surface, each region of the surface is inclined at different angles.

(ii) When light falls on such a surface, the light rays are reflected at different angles. In this case, the angle of incidence and the angle of reflection of each ray are not equal.

(iii) Hence, the law of reflection is not obeyed in this case and thus the image is not clear. Such a reflection is called 'irregular reflection' or 'diffused reflection'.
Example : Reflection of light from a wall.

Irregular reflection

2. **Explain the construction and working of kaleidoscope.**

Ans. **Construction :**

(i) Take three equal sized plane mirror strips and arrange them in such a way that they form an equilateral triangle.

(ii) Cover the sides of the mirrors with a chart paper. With the help of a chart paper cover the bottom of the mirrors also.

(iii) Put some coloured things such as pieces of bangles and beads inside it.

(iv) Now, cover the top portion with the chart paper and make a hole in it to see.

(v) You can wrap the entire piece with coloured papers to make it attractive.

(vi) Now, rotate it and see through its opening. You can see the beautiful patterns.

3. **Explain the construction, working of periscope with a neat labelled diagram.**

Ans. (i) It is an instrument used for viewing bodies or ships, which are over and around another body or a submarine.

(ii) It is based on the principle of the law of reflection of light. It consists of a long outer case and inside this case mirrors or prisms are kept at each end, inclined at an angle of 45°.

(iii) Light coming from the distant body, falls on the mirror at the top end of the periscope and gets reflected vertically downward.

(iv) This light is reflected again by the second mirror kept at the bottom, so as to travel horizontally and reach the eye of the observer.

(v) In some complex periscopes, optic fibre is used instead of mirrors for obtaining a higher resolution.

(vi) The distance between the mirrors also varies depending on the purpose of using the periscope.
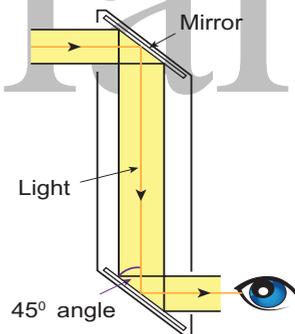
4. **Explain the uses of periscope.**

Ans. (i) It is used in warfare and navigation of the submarine.

(ii) In military it is used for pointing and firing guns from a 'bunker'.

(iii) Photographs of important places can be taken through periscopes without trespassing restricted military regions.

(iv) Fibre optic periscopes are used by doctors as endoscopes to view internal organs of the body.

Light

5. **Explain the images formed by a convex mirror for different position of the object.**

Ans.

Position Of The Object	Position Of The Image	Image Size	Nature of the Image
At infinity	At F	Highly diminished, point sized	Virtual and erect
Between infinity and the pole (P)	Between P and F	Diminished	Virtual and erect

6. **Explain some phenomena which occur due to refraction of light in our daily life.**

Ans. (i) A pencil placed in water in a glass appear to be bent at the surface of separation.

(ii) The base of a swimming pool appears to be raised due to refraction of light.

(iii) We should look straight down into the river while catching fish. If observed obliquely, the fish appears to be closer to the surface of the water than it actually is.

(iv) Stars look like tiny dots when viewed from earth, because they are far away from us. The light from the stars has to travel a long distance through the atmosphere before it reaches us. The atmosphere has various layers of different refractive indices. Light is refracted through each of them. These layers are turbulent. Every time one of the layers shifts, the thickness and refractive indices of air change and the light is refracted differently, creating a twinkling effect.

IX. **Complete the given table :**

1.

Name of the mirror	Position of the object	Position of the image	image size	Nature of the image
Concave mirror	At infinity	**(i)** _____	Highly diminished	Real and inverted
	Beyond C	Between C and F	**(ii)** _____	Real and inverted
	(iii) _____	At C	Same size as the object	Real and inverted
	Between C and F	Beyond C	**(iv)** _____	Real and inverted
	Between F and P	Behind the mirror	Magnified	**(v)** _____

Ans. (i) At F   **(ii)** Diminished   **(iii)** At C

(iv) Magnified   **(v)** Virtual and erect

X.   Draw the following :

1.   Concave mirror.

Ans.   concave mirror

V   F   C   Principal axis
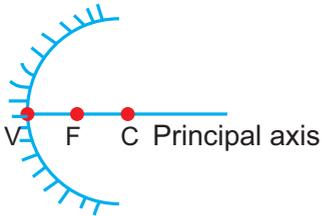
2.   Convex mirror.
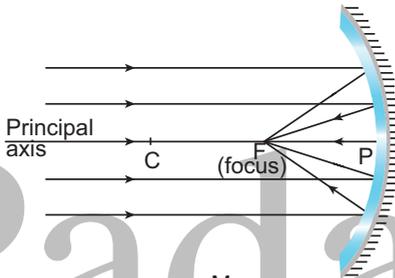
convex mirror

Principal axis   C   F   V
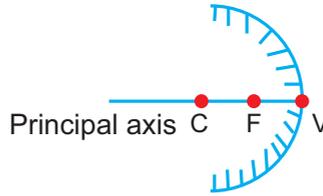
3.   Draw the ray diagram and write the characteristics of the image formed when an object is placed
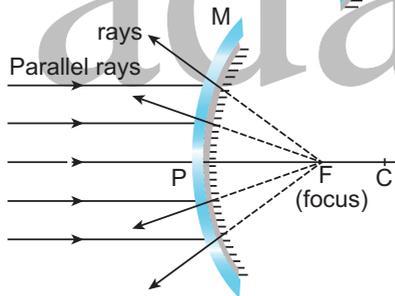
(i)   At infinity in front of a concave mirror.

(ii)   At infinity in front of a convex mirror.

Ans. (i)

Principal axis   C   F (focus)   P

Position of the image   :   At F

Image size   :   Highly diminished

Nature of the image   :   Real and inverted

(ii)

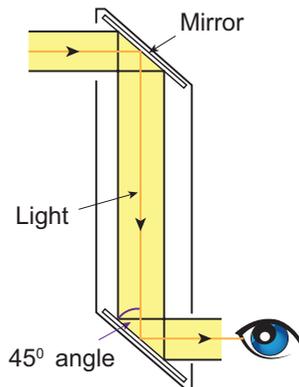rays   M

Parallel rays

P   F (focus)   C

Position of the image   :   At F

Image size   :   Highly diminished, point sized

Nature of the image   :   Virtual and erect.

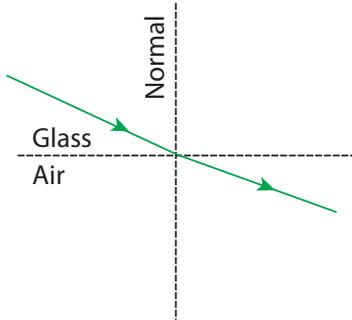**4.   Draw a neat labelled diagram of a periscope.**

Ans.

Mirror

Light

45^0 angle

Light

5. **Draw a ray diagram to show a light ray travels from denser medium (glass) to rarer medium (air).**
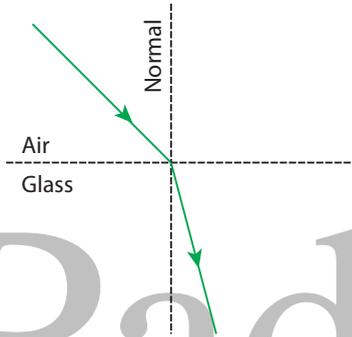
Ans.

When a light ray travels from denser medium to rarer medium, it speeds up and refracts away from the normal.

6. **Draw a ray diagram to show a light ray travels from rarer medium (air) to denser medium (water).**

Ans.

When a light ray travels from rarer to denser medium, it bends towards the normal.

Unit 3

XI. **Cross word puzzle :**

Across :

3. The geometrical centre of a spherical mirror.
6. Centre of the sphere from which the mirror is made.
7. An optical device with a polished surface that reflects the light falling on it.
8. Image which can be formed on a screen.
9. Image which cannot be formed on a screen.
10. The bending of a light ray when it passes from one medium to another medium of different density.

Down :

1. Mirror which converges a parallel beam of light passing through it.
2. Imaginary line passing through the centre of curvature of the mirror.
4. Mirror which diverges a parallel beam of light passing through it.
5. The formation of rainbow is an example of _____.

Ans. **Across :**

3. POLE
6. CENTRE OF CURVATURE
7. MIRROR
8. REAL
9. VIRTUAL
10. REFRACTION

Down :

1. CONCAVE
2. PRINCIPAL AXIS
4. CONVEX
5. DISPERSION

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Sura's ○ Science ○ 8th Std ○ Term - I

Across :
3. POLE
6. CENTRE OF CURVATURE
7. MIRROR
8. REAL
9. VIRTUAL
10. REFRACTION

Down :
1. CONCAVE
2. PRINCIPAL AXIS
4. CONVEX
5. DISPERSION

XII. Creative questions : HOTS

1. **Imagine that parallel rays are incident on an irregular surface. Are the rays reflected from the surface parallel to each other?**

Ans. No, the reflected rays from irregular surface are in different direction.

2. A safety vest helps to keep the workers who are working by the roadside safe. This especially so during the nights. Why?

Ans. The reflectors on the safety vest reflect light into the motorists eyes.

This help to alert the motorists of the wearer's presence on the road.

3. What is the difference between virtual images of an object formed by a concave mirror and a convex mirror?

Ans. The virtual image of an object formed by a concave mirror is always magnified one but the image formed by a convex mirror is always diminished one.

4. What is a virtual image? Give one situation where a virtual image is formed.

Ans. The image formed by the plane mirror appears behind it. We cannot however touch it. Also, the image of the object cannot be obtained on a screen, whether it is held in front of the mirror or behind it. Such type of images are not real. They are virtual images.

5. If all objects around us were to reflect light in a regular way, what problem might we face?

Ans. (i) Irregular reflection is what makes us see all the objects and everything around us.

(ii) If light were to get regularly reflected then every object would act like a mirror and our surroundings would be illuminated.

(iii) This would have a blinding effect on eyes making it harder for us to see.

6. Car rear view mirrors carry a warning message that "objects in the rear view mirror are closer than they appear". Why do you think this is so?

Ans. (i) Convex mirrors used in vehicles as rear-view mirrors are labeled with the safety warning: 'Objects in the mirror are closer than they appear' to warn the drivers. This is because inside the mirrors, vehicles will appear to be coming at a long distance.

(ii) Convex mirrors form erect and smaller images of the objects.

(iii) This does not give us the exact idea how far the vehicle is from us.

(iv) Thus, to avoid accidents, car view mirrors carry a warning message.

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Unit 3

UNIT TEST ✍

Time : 60 min.   **Marks : 25**

I. Choose the correct answer: (3×1 = 3)

1. The refractive index of water is
   - (a) 1.0
   - (b) 1.33
   - (c) 1.44
   - (d) 1.52

2. In the head lights of motor vehicles, _____ mirrors are used as reflectors.
   - (a) plane mirrors
   - (b) concave lenses
   - (c) convex mirrors
   - (d) concave mirrors

3. If we mix lights of the colours of the rainbow, we will get _____.
   - (a) pink light
   - (b) brown light
   - (c) colourless light
   - (d) black light

II. Fill in the blanks: (3 × 1 = 3)

4. Geometric centre of the spherical mirror is _____.
5. _____ mirrors magnify the object placed close to them.
6. _____ is a form of energy and it travels in straight line.

III. Match the following: (4 × 1 = 4)

7.	1.	Convex mirror	(a)	Radio telescopes
8.	2.	Parobolic mirror	(b)	wall
9.	3.	Regular reflection	(c)	rear – view mirror
10.	4.	Irregular reflection	(d)	Plane mirror

IV. True or False - if false give the correct statement: (4 × 1 = 4)

11. Light is a form of energy and it travels in a straight line.
12. Focus is the geometric centre of the spherical mirror.
13. Refractive index is a ratio of two similar quantities and so, it has no unit.
14. Reflection from a rough surface is called diffused reflection.

V. Answer the following in one or two sentences: (3 × 2=6)

15. Define focal length.
16. Light travels fastest in vacuum. Why?
17. If two plane mirrors are inclined to each other at an angle of 45°, find the number of images formed.
18. State the Snell's law of refraction.
19. Why do we need a shiny surface for reflection?

VI. Answer the following in detail: (5 × 1 = 5)

20. (a) What is dispersion? Explain in detail.

                             (or)

    (b) Explain the uses of periscope.

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Answer Key

I. 1. (b) 1.33 2. (d) concave mirrors 3. (c) colourlesslight

II. 4. pole 5. Concave 6. Light

III. 7 - c, 8 - a, 9 - d, 10 - b.

IV. 11. True

12. False. Correct statement: Pole is the geometric centre of the spherical mirror.

13. True

14. True

V. 15. Refer Sura's Guide, Textbook Q. No. IV - 2.

16. Refer Sura's Guide, Additional Q. No. VII - 1.

17. Refer Sura's Guide, Textbook Q. No. IV - 6.

18. Refer Sura's Guide, Textbook Q. No. IV - 8.

19. Refer Sura's Guide, Additional Q. No. VII - 6.

VI. 20. a) Refer Sura's Guide, Textbook Q. No. V - 4.

(or)

b) Refer Sura's Guide, Additional Q. No. VIII - 4.

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Unit 3

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Unit 4

MATTER

Mind Map

Matter

Solids — **Liquids** — **Gases**

Solids:
- Metals
- Non Metals
  - Br
- Fe
- Au
- Cu
- Liquid Metal
  - Hg
- Example
  - H_2O
  - HCL
- Compounds in Solids
  - Rigid and Hard
  - Definite Volume
  - Do not Flow
  - Example → $CaCO_3$, SO_2, NaCl

Liquids:
- Compound in Liquid
  - No Definite Shape
  - Les Tightly Packed
  - No Definite Volume they take the shape of containing vessel

Gases:
- O_2, N_2, H_2
- Compound in Gases
  - No Definite Shape
  - No Definite Volume
  - Can be Compressed
  - No Free Surface
- Example → CO_2, SO_2

Definitions

Matter	:	Anything which occupies space and has mass is called **matter**.
Compound	:	The molecule of a substance that contains two or more atoms of different elements combined together in a definite ratio, is said to be a **molecule of a compound**.
Solid	:	Material which has a definite shape and definite volume at room temperature with any number of free surfaces is called **solid**.
Liquid	:	Material which has a definite volume, but no definite shape and has one free surface, is called **liquid**.
Gases	:	Material which has neither definite shape nor definite volume, is easily compressible and has no free surface is called **gas**.