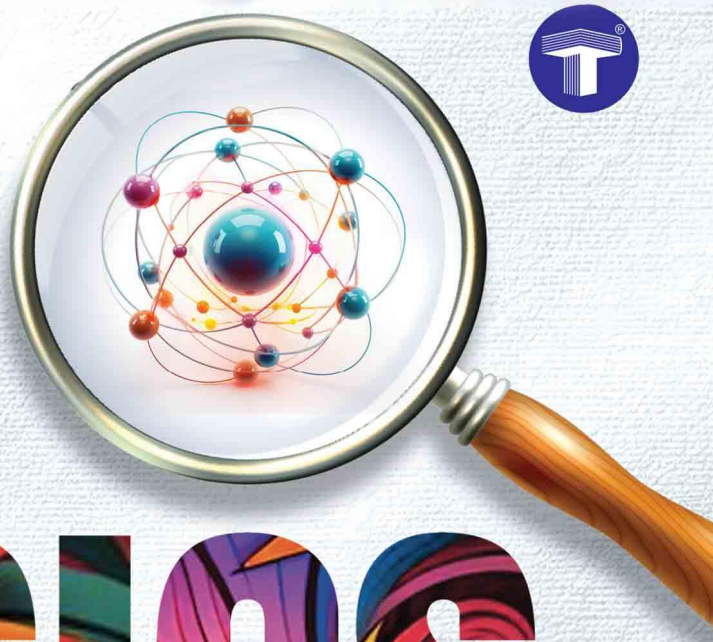
SAMPLE CONTENT



FOCUS PHYSICS

BASED ON THE LATEST TEXTBOOK OF MAHARASHTRA STATE BOARD

Build Powerful Concepts

- Quick Review
- Important Formulae
- Complete Coverage of Textual and Intext Questions
- Aligned with the latest paper pattern

Ms. Ketki Deshpande
M.Sc.

Mr. Varun Subramanian
M.Sc. (Instrumentation Science),
M.Sc. (Scientific Instrumentation)

STD XI

Target Publications® Pvt. Ltd.

Written as per the latest textbook prescribed by the Maharashtra State Bureau of Textbook Production and Curriculum Research, Pune.

FOCUS

PHYSICS

Std. XI Sci.

Printed at: **Print to Print,** Mumbai

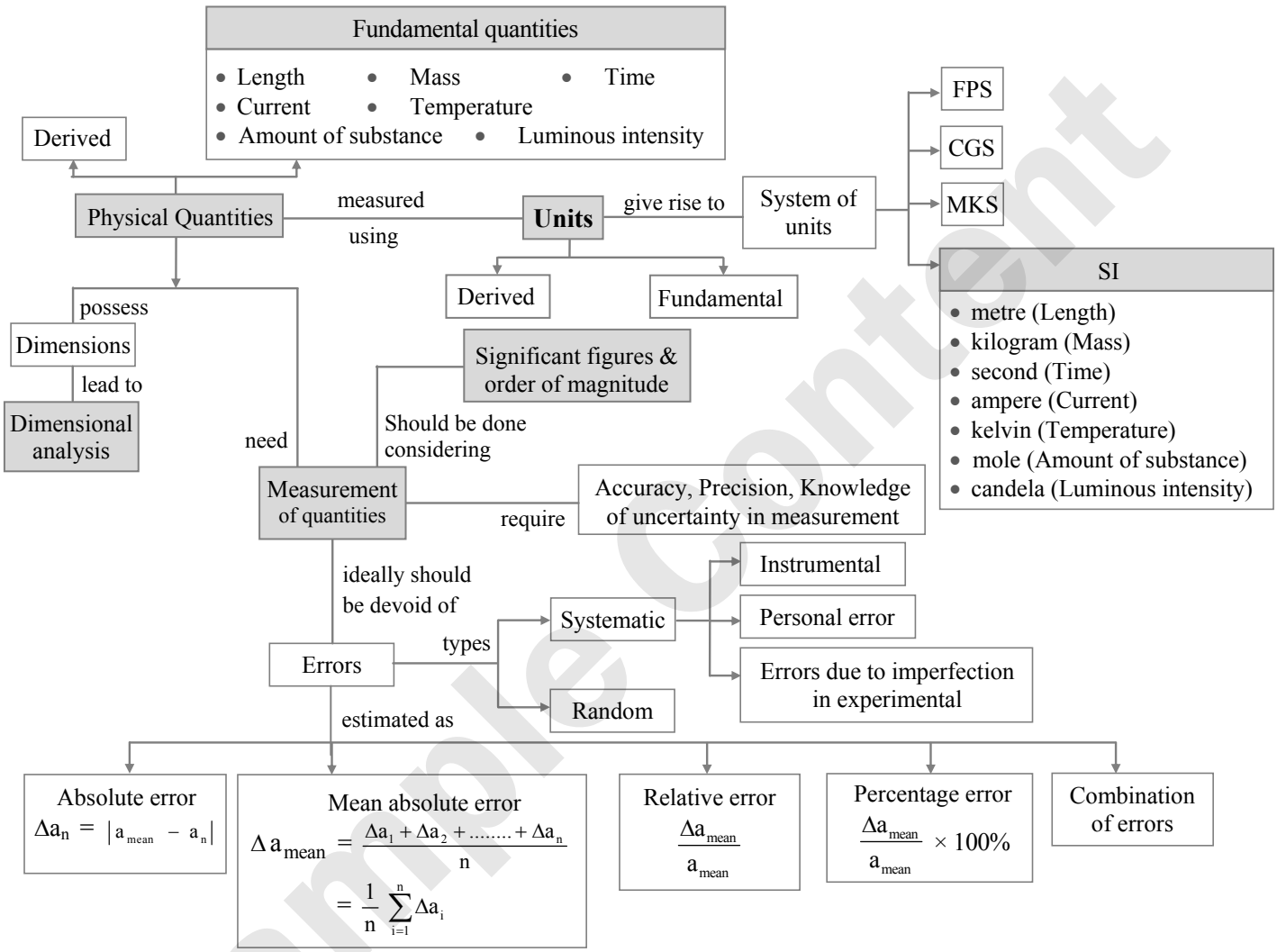
Balbharati Registration No.: 2018MH0022 **TEID: 3717** P.O. No. 13365

CONTENTS

[Reference: Maharashtra State Board of Secondary and Higher Secondary Education, Pune - 04**]**

1 Units and Measurements

Quick Review



Important Formulae

1. **Measure of physical quantity:**
   $M = nu$
   where, n = numerical value, u = unit

2. **Relation between numerical value and size of unit:**
   $n_1u_1 = n_2u_2$

3. **Conversion factor of a unit in two system of units:**
   $$n = \left[\frac{M_1}{M_2}\right]^a \left[\frac{L_1}{L_2}\right]^b \left[\frac{T_1}{T_2}\right]^c$$

4. **Plane angle:** $d\theta = \frac{ds}{r}$

5. **Solid angle:** $d\Omega = \frac{dA}{r^2}$

6. **Parallax angle:** $\theta = \frac{b}{D}$

7. **Diameter of planet/star:** $d = \alpha D$.

8. **Average value or mean value:**
   $$a_{mean} = \frac{a_1 + a_2 + a_3 + .. + a_n}{n} = \frac{1}{n}\sum_{i=1}^{n} a_i$$

9. Absolute error
= | Average value – Measured value |
$|\Delta a_n| = |a_{mean} - a_n|$

10. Mean absolute error:
$$\Delta a_{mean} = \frac{\Delta a_1 + \Delta a_2 + ... + \Delta a_n}{n} = \frac{1}{n}\sum_{i=1}^{n}\Delta a_i$$

11. Relative (fractional) error = $\frac{\Delta a_{mean}}{a_{mean}}$

12. Percentage error = $\frac{\Delta a_{mean}}{a_{mean}} \times 100\,\%$

13. If $Z = A \pm B$, then maximum error:
$\Delta Z = \pm (\Delta A + \Delta B)$

14. If $Z = AB$ or $Z = \frac{A}{B}$ then,
$$\frac{\Delta Z}{Z} = \pm\left(\frac{\Delta A}{A} + \frac{\Delta B}{B}\right)$$

15. If $Z = A^m \times B^n$, then error in measurement:
$$\frac{\Delta Z}{Z} = \frac{m\Delta A}{A} + \frac{n\Delta B}{B}$$

Various prefixes to express a physical quantity:

Prefix	Symbol	Power of 10	Prefix	Symbol	Power of 10
Tera	T	10^{12}	micro	μ	10^{-6}
Giga	G	10^{9}	nano	n	10^{-9}
Mega	M	10^{6}	angstrom	Å	10^{-10}
Kilo	k	10^{3}	pico	p	10^{-12}
milli	m	10^{-3}	femto	f	10^{-15}

1.1 Introduction

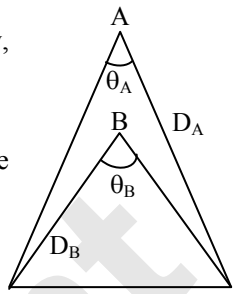
Q.1. Can you recall? *(Textbook page no. 1)*
i. What is a unit?
ii. Which units have you used in the laboratory for measuring
a. length b. mass
c. time d. temperature?
iii. Which system of units have you used?
Ans:
i. *The standard measure of any quantity is called the unit of that quantity.*
ii.

Physical quantity	Length	Mass	Time	Temperature
Units	millimetre, centimetre, metre	gram, kilogram	seconds minutes	Degree celsius degree fahrenheit

iii. MKS or SI system is used mostly. At times, even CGS system is used.

1.3 Measurement of Length

***Q.2. Star A is farther than star B. Which star will have a large parallax angle?**
Ans:
i. Parallax angle is given by,
$$\theta = \frac{b}{D}$$
ii. Here, 'b' is constant for the two stars.
$$\therefore \quad \theta \propto \frac{1}{D}$$
iii. As star A is farther i.e., $D_A > D_B \Rightarrow \theta_A < \theta_B$.
Hence, star B will have larger parallax angle than star A.



***Q.3. When the planet Jupiter is at a distance of 824.7 million kilometres from the Earth, its angular diameter is measured to be 35.72″ of arc. Calculate the diameter of the Jupiter.**
Solution:
Given: Angular diameter (α) = 35.72″
$= 35.72'' \times 4.847 \times 10^{-6}$ rad
$\approx 1.73 \times 10^{-4}$ rad
Distance from Earth (D)
= 824.7 million km
$= 824.7 \times 10^6$ km $= 824.7 \times 10^9$ m.
To find: Diameter of Jupiter (d)
Formula: $d = \alpha D$
Calculation: From formula,
$d = 1.73 \times 10^{-4} \times 824.7 \times 10^9$
$= 1.428 \times 10^8$ m
$= \mathbf{1.428 \times 10^5}$ **km**
Ans: Diameter of Jupiter is $\mathbf{1.428 \times 10^5}$ **km.**

1.6 Dimensions and Dimensional Analysis

***Q.4. What are the dimensions of the quantity** $l\sqrt{l/g}$, l **being the length and g the acceleration due to gravity?**

Ans: Quantity $= l \times \sqrt{\frac{l}{g}}$ ....(i)

Gravitational acceleration,
$$g = \frac{\text{velocity}}{\text{time}}$$
$$\therefore \quad g = \frac{\text{distance}}{\text{time} \times \text{time}}$$
Substituting in equation (i),
$$\text{Quantity} = l \times \sqrt{\frac{l \times \text{time}^2}{\text{distance}}}$$

Page no. **3** to **7** are purposely left blank.

To see complete chapter buy **Target Notes** or **Target E-Notes**

Calculation: From formula (i),

$A = 4.234 \times 1.005$

$= \text{antilog}[\log(4.234) + \log(1.005)]$

$= \text{antilog}[0.6269 + 0.0021]$

$= \text{antilog}[0.6288]$

$= \mathbf{4.254\ m^2}$

From formula (ii),

$V = 4.234 \times 1.005 \times 0.0201$

$= \text{antilog}[\log(4.234) + \log(1.005) + \log(0.0201)]$

$= \text{antilog}[0.6269 + 0.0021 + \bar{2}.3032]$

$= \text{antilog}[0.6288 + \bar{2}.3032]$

$= \text{antilog}[\bar{2}.9320]$

$= \mathbf{8.551 \times 10^{-2}\ m^3}$

Rounding off to correct significant figures (i.e., least of all the quantities used)

$V = \mathbf{8.55 \times 10^{-2}\ m^3}$

Ans: i. Area of largest surface of sheet to correct significant figures is $\mathbf{4.254\ m^2}$.

ii. Volume of sheet to correct significant figures is $\mathbf{8.55 \times 10^{-2}\ m^3}$.

***[Note:** Ideally for a rectangular sheet of finite thickness, area of the sheet comprises of area of all the 6 faces. Thus,*

$A = 2(lb + bt + tl)$

$= 2(4.234 \times 1.005 + 1.005 \times 0.0201 + 0.0201 \times 4.234)$

$= \mathbf{8.72\ m^2}$

*Also, the volume is calculated considering the values of all quantities in the same system of units.**]***

***Q.25. Nuclear radius R has a dependence on the mass number (A) as $R = 1.3 \times 10^{-16} A^{1/3}$ m. For a nucleus of mass number A = 125, obtain the order of magnitude of R expressed in metre.**

Ans: $R = 1.3 \times 10^{-16} \times A^{1/3}$ m

For A = 125

$R = 1.3 \times 10^{-16} \times (125)^{1/3}$

$= 1.3 \times 10^{-16} \times 5$

$= 6.5 \times 10^{-16}$

$= 0.65 \times 10^{-15}$ m

$\therefore$ Order of magnitude = –15

[Note:** Taking the standard value of nuclear radius $R = 1.3 \times 10^{-15}$ m, the order of magnitude comes to be 10^{-14} m.**]

***Q.26. A large ball 2 m in radius is made up of a rope of square cross section with edge length 4 mm. Neglecting the air gaps in the ball, what is the total length of the rope to the nearest order of magnitude?**

Ans: Volume of ball = Volume enclosed by rope.

$\frac{4}{3}\pi\,(\text{radius})^3$ = Area of cross-section of rope $\times$ length of rope.

$\therefore$ length of rope $l = \dfrac{\frac{4}{3}\pi r^3}{A}$

Given: r = 2 m and

Area = $A = 4 \times 4 = 16\ \text{mm}^2$

$= 16 \times 10^{-6}\ \text{m}^2$

$\therefore$ $l = \dfrac{4 \times 3.142 \times 2^3}{3 \times 16 \times 10^{-6}} = \dfrac{3.142 \times 2}{3} \times 10^6$ m

$\approx 2 \times 10^6$ m.

$\therefore$ Total length of rope to the nearest order of magnitude = $\mathbf{10^6\ m = 10^3\ km}$

Multiple Choice Questions

*1. Which of the following is not a fundamental unit?
(A) cm (B) kg
(C) centigrade (D) volt

*2. Light year is a unit of
(A) time (B) mass
(C) distance (D) luminosity

*3. $[L^1M^1T^{-2}]$ is the dimensional formula for
(A) velocity (B) acceleration
(C) force (D) work

*4 Dimensions of kinetic energy are the same as that of
(A) force (B) acceleration
(C) work (D) pressure

*5. The error in the measurement of the sides of a rectangle is 1%. The error in the measurement of its area is
(A) 1%
(B) 1/2%
(C) 2%
(D) None of the above.

Answers to Multiple Choice Questions

1. (D) 2. (C) 3. (C) 4. (C)
5. (C)

Hints to Multiple Choice Questions

5. $A = l \times b$

$\therefore$ $\dfrac{\Delta A}{A} = \dfrac{\Delta l}{l} + \dfrac{\Delta b}{b} = 1\% + 1\% = 2\%$

Give your XIth exam preparation the TECHNOLOGY BOOST!

Practice more than 4,500 MCQs for just ₹499/-

Use Coupon Code
QUILLPADHAI2023

Also available for Xth, XIIth, MHT-CET, NEET & JEE

- Practice chapter-wise & full syllabus MCQs in test format
- Get instant verification of your answer
- Detailed analysis of every test on completion
- Option to save questions for future reference

Scan QR Code to download the app

Visit our website to know more about our range of books for Xth, XIIth, MHT-CET, NEET & JEE

Visit Our Website

Published by:

TarGet Publications® Pvt. Ltd.
Transforming lives through learning

Explore our range of **STD. XI** Books

B2, 9th Floor, Ashar, Road No. 16/Z, Wagle Industrial Estate, Thane (W)-400604 | 88799 39712 / 14 | 88799 39713 / 15
www.targetpublications.org mail@targetpublications.org