NDA-CDS 2 2024

GS

LIVE

PHYSICS

CLASS 1

NAVJYOTI SIR

SSBCrack EXAMS

01 July 2024 Live Classes Schedule

8:00AM	01 JULY 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	01 JULY 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:00AM	ONLINE COURSE INTRODUCTION	ANURADHA MA'AM

NDA 2 2024 LIVE CLASSES

11:30AM	GK - MODERN HISTORY - CLASS 3	RUBY MA'AM
1:00PM	GS - PHYSICS - CLASS 1	NAVJYOTI SIR
2:30PM	GS - CHEMISTRY MCQS - CLASS 6	SHIVANGI MA'AM
4:00PM	MATHS - INDEFINITE & DEFINITE INTEGRATION - CLASS 3	NAVJYOTI SIR
5:30PM	ENGLISH - ORDERING OF SENTENCES - CLASS 1	ANURADHA MA'AM

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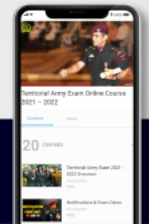
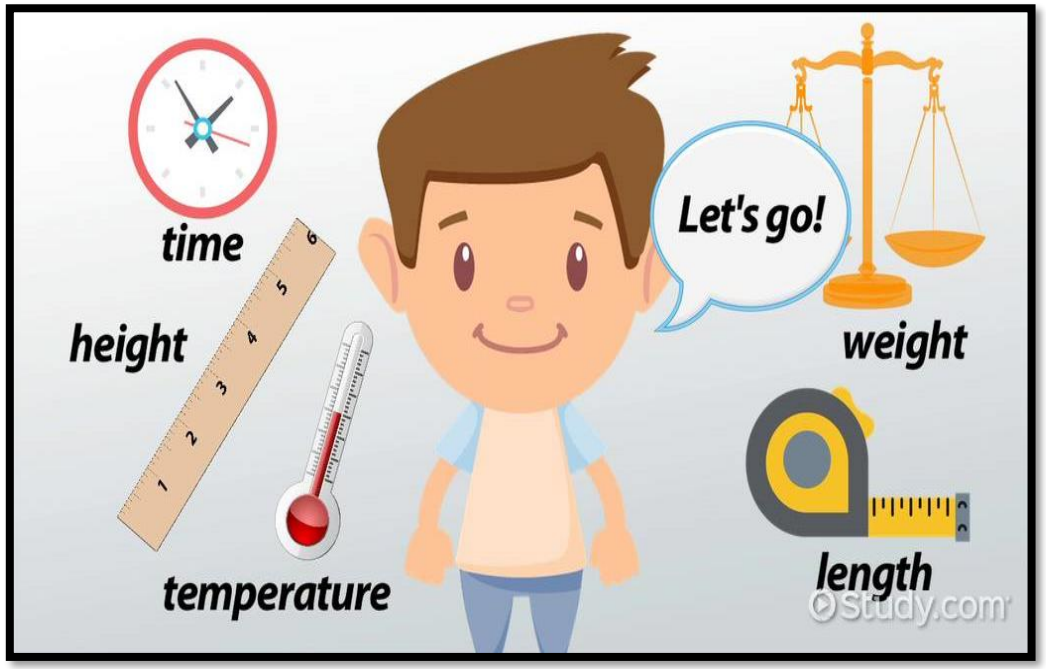


UNITS AND MEASUREMENT



WHAT WILL WE STUDY ?

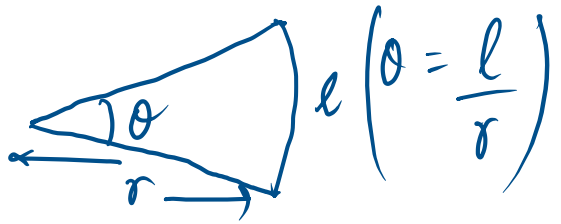
- Fundamental Quantities
- Derived Quantities
- Units
- Systems of Units
- Precision and Accuracy

Fundamental Quantities

- **Those physical quantities which do not depend on other quantities.**

1. Mass
2. Length
3. Time,
4. Temperature,
5. Electric current
6. Amount of substance.
7. Luminous Intensity

7 + 2 (supplementary)



- **Plane angle and Solid angle are two supplementary Fundamental Quantities.**

Fundamental Units

SSBCrack EXAMS

1. Mass — kilogram (kg)
2. Length — metre (m)
3. Time, — seconds (s)
4. Temperature, — Kelvin (K) — (°C + 273) | 0°C = 273 K
5. Electric current — Ampere (A)
6. Amount of substance. — mole (mol) — 6.023×10^{23} particles
7. Luminous Intensity — candela (cd)

Dimensions

1. Mass — [M]
2. Length — [L]
3. Time — [T]
4. Temperature — [K]
5. Electric current — [A]
6. Amount of substance — [mol]
7.

Derived Quantities

SSBCrack EXAMS

The physical quantities which depend on fundamental quantities.

Example – Speed , Force , Voltage , Density etc.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{[L]}{[T]}$$

$$\text{Dimensions of speed} = [LT^{-1}]$$

$$\text{Force} = \text{Mass} \times \text{accln.}$$

(accln. = change in vel. / Time)

$$= [M] \times \left[\frac{LT^{-1}}{T}\right]$$

$$= [MLT^{-2}]$$

$$\text{Voltage} = \frac{\text{Work done}}{\text{Quantity of charge}} = \frac{W}{Q} = \frac{[ML^2T^{-2}]}{[AT]}$$

$$= [ML^2T^{-3}A^{-1}] - kg\,m^2s^{-3}A^{-1}$$

volts

work = Force x displacement

$$= [MLT^{-2}] \times [L]$$

$$= [ML^2T^{-2}]$$ (Dimensions of work)

$kg\,m^2s^{-2}$ Joule

Quantity of charge = Q = current x time

$$= [A][T]$$

As coulombs

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{[M]}{[L^3]} = \frac{[ML^{-3}]}{}$$

kgm^{-3}

UNITS

- A Standard Amount of a Physical Quantity Chosen to Measure the Physical Quantity of The Same Kind.
- It Should Be Easily Reproducible, Internationally Accepted.

Derived Units

1. Speed
2. Momentum — $p = mass \times velocity$
3. Voltage — $[MLT^{-1}]$ $kgms^{-1}$
4. Density , etc.

SYSTEM OF UNITS

	LENGTH	MASS	TIME
1. CGS	cm	gram	seconds
2. FPS	foot	pounds	seconds
3. MKS	metre	kilogram	seconds
4. SI	metre	kilogram	seconds

PRACTICAL UNITS

SSBCrack EXAMS

- **Length :**

(i) 1 fermi = 10^{-15} m

(ii) 1 X-ray unit = 10^{-13} m

(iii) 1 astronomical unit = 1.49×10^{11} m (average distance between sun and earth)

1 AU

(iv) 1 light year = 9.46×10^{15} m (distance travelled by light in 1 year)

(v) 1 parsec = 3.08×10^{16} m = 3.26 light year

PRACTICAL UNITS

SSBCrack EXAMS

- **Mass / Weight :**

1 quintal = 10^2 kg — 100 kg

1 metric ton = 10^3 kg — 1000 kg

1 atomic mass unit (amu) or dalton = 1.66×10^{-27} kg

1 pound = 0.4537 kg

PRACTICAL UNITS

SSBCrack EXAMS

- **Time :**

1 solar day = 86400 sec.
1 year = 365¼ solar days
1 lunar month
= 27.3 solar days
Tropical year = It is the year in which total solar eclipse occurs.
Leap year = It is the year in which the month of February is of 29 days.

24 x 60 x 60 s

366 days

PREFIXES USED

(Metric ⟶ SI)

Prefix	Symbol	Multiplier
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	m	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

deca	da	10^{1}
hecto	h	10^{2}
kilo	k	10^{3}
mega	M	10^{6}

CONVERSIONS BETWEEN UNITS

- **Measurement Of Physical Quanity = Numerical Value (Number) × Unit**
- **If u_1 And u_2 Are The Units Of A Physical Quantity In Two Different System Of Units And, n_1 And n_2 Are Their Numerical Values Then,**

$$n_1 \times u_1 = n_2 \times u_2$$

$14\ cm = ?\ m$

$14 \times cm = x \times m$

$x = \frac{14 \times cm}{m} = \frac{14 \times 1\ cm}{100\ cm} = 0.14\ m$

$0.2\ g\ cm^{-3} = ?\ kg\ m^{-3}$

$x = \frac{0.2 \times g \times cm^{-3}}{kg\ m^{-3}}$

$= 0.2 \times g \times \frac{m^3}{cm^3} \times \frac{}{kg}$

$0.2\ g\ cm^{-3} = ?\ kg\ m^{-3}$

$$x = \frac{0.2\ g\ cm^{-3}}{kg\ m^{-3}} = \frac{0.2\ g}{1000\ g} \times \left(\frac{m}{cm}\right)^3$$

$1\ g\ cm^{-3} = 1000\ kg\ m^{-3}$

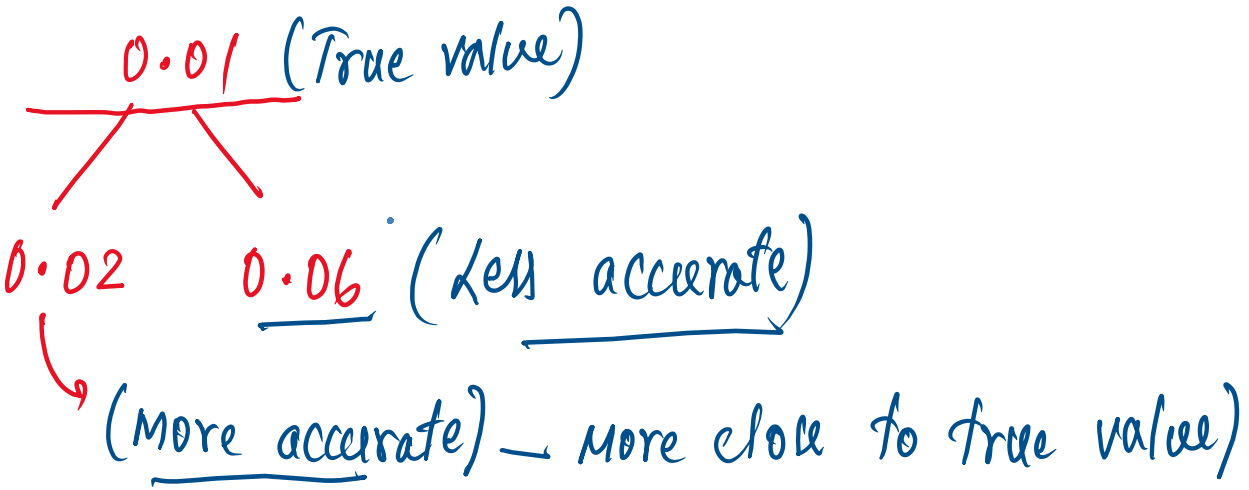
$$= \frac{0.2}{10^3} \times \left(\frac{100\ cm}{cm}\right)^3$$

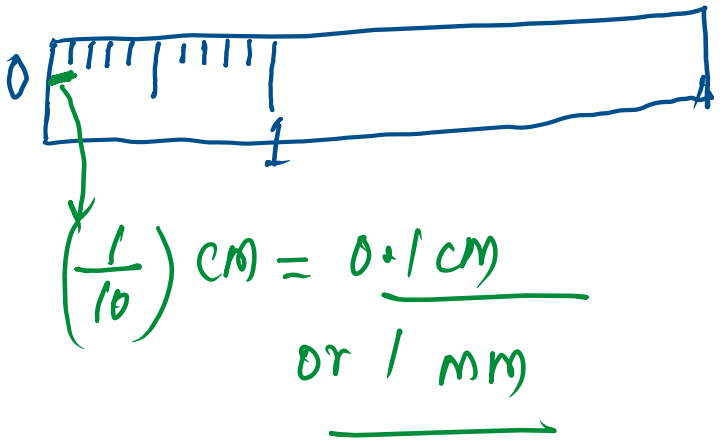
$$= \frac{0.2}{10^3} \times 10^6 = 0.2 \times 10^3$$

$$= 200\ kg\ m^{-3}$$

PRECISION AND ACCURACY

- **The Accuracy Of A Measurement System Is The Degree Of Closeness Of Measurements Of A Quantity To That Quantity's True Value.**
- **The Precision Of A Measurement System, Is The Degree To Which Repeated Measurements Under Unchanged Conditions Show The Same Results .**
  - **Least Count of Instruments – Minimum length that can be measured.**





SUMMARY

- Fundamental Quantities And Units
- Derived Quantities And Units
- Practical Units
- Prefixes And Conversions
- Precision , Accuracy And Least Count

1. **Which Of The Following Is The Fundamental Unit Of Thermodynamic Temperature ?**

A. K

B. ° C

C. ° F

D. None of the Above

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A. K

B. ° C

C. ° F

D. None of the Above

2. The Symbol To Represent Amount Of Substance Is

A. K

B. A

C. Cd

D. mol

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A. K

B. A

C. Cd

D. mol

3. The Smallest Value Which Is Measured Using An Instrunment Is Known As

A. Absolute Count

B. Precision

C. Accurate Count

D. Least Count

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4. Which of the following is not a Physical Quantity ?

A. Density

B. Momentum

C. Work

D. Kilogram

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A. Density

B. Momentum

C. Work

D. Kilogram

5. Which among the following is a Supplementary Fundamental Unit?

A. Ampere

B. Second

C. Kilogram

D. Radian

plane angle — 'radian'

solid angle — 'steradian'

5. Which among the following is a Supplementary Fundamental Unit?

A. Ampere

B. Second

C. Kilogram

D. Radian

6. Which Of The Following Is A System Of Unit ?

A. SMS ✗

B. MKP ✗

C. CJS ✗

D. FPS ✓

System of units

CGS

FPS

MKS

6. Which Of The Following Is A System Of Unit ?

A. SMS

B. MKP

C. CJS

D. FPS

7. The SI unit of Work is

A. Joules — work

B. ergs — CGS unit for energy → $[ML^2T^{-2}]$

gcm^2s^{-2} → 1 ergs

C. volt — voltage

D. Ampere — current

7. The SI unit of Work is

A. **Joules**

B. ergs

C. volt

D. Ampere

8. Work is said to be 1 J when a force of

A. 1 N moves an object by 1 cm.

B. 2 N moves an object by 1 m.

C. 4 N moves an object by 25 cm.

D. 1 N moves an object by 50 cm

$1N \times \left(\frac{1}{100}\right)m = 0.01\,J$ ✗

$2N \times 1\,m = 2\,J$ ✗

$4N \times \left(\frac{25}{100}\right)m = 4N \times \frac{1}{4}m$

$= 1\,J$ ✓

W = Force × disp.

$1\,J = 1\,(1N)\,(1m)$

(SI) (SI) (SI)

$1N \times \left(\frac{50}{100}\right)m = \frac{1}{2}\,J = 0.5\,J$ ✗

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A. 1 N moves an object by 1 cm.

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C. 4 N moves an object by 25 cm.

D. 1 N moves an object by 50 cm

9. Which of the following is not a unit of time ?

A. Solar Day

B. Leap Year

C. Lunar Month

D. Parallactic Second

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A. Solar Day

B. Leap Year

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10. One pico Farad is equal to

A. 10^{-24} Farad

B. 10^{-12} Farad

C. 10^{-18} Farad

D. 10^{-6} Farad

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A. 10^{-24} Farad

B. 10^{-12} Farad

C. 10^{-18} Farad

D. 10^{-6} Farad

11. What is the unit of Force / Energy ?

A. second

B. m^{-1}

C. Kg

D. M^{2}

11. What is the unit of Force / Energy ?

A. second

B. m^{-1}

C. Kg

D. m^{2}

12. The Smallest Unit Of Length Is

A. Micrometre

B. Angstrom

C. Nanometre

D. Fermimetre

12. The Smallest Unit Of Length Is

A. Micrometre

B. Angstrom

C. Nanometre

D. Fermimetre

13. Dimensions Of Kinetic Energy Is The Same As

A. Acceleration

B. Velocity

C. Work

D. Force

13. Dimensions Of Kinetic Energy Is The Same As

A. Acceleration

B. Velocity

C. Work

D. Force

14. Unit Of Specific Resistance Is

A. ohm-m^2

B. ohm-m^3

C. ohm / m

D. ohm-m

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A. ohm-m^2

B. ohm-m^3

C. ohm / m

D. ohm-m

15. What Is The Unit Of Luminous Intensity ?

A. mol

B. kg

C. Cd

D. m

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A. mol

B. kg

C. Cd

D. m

16. Select the pair having the same dimensions ,

A. Kinetic Energy and Surface Tension

B. Torque and Potential Energy

C. Momentum and Force

D. Pressure and Energy / Time

16. Select the pair having the same dimensions ,

A. Kinetic Energy and Surface Tension

B. Torque and Potential Energy

C. Momentum and Force

D. Pressure and Energy / Time

17. What Is The Unit Of Force In CGS Units ?

A. kg ms^{-2}

B. g ms^{-2}

C. g cms^{-2}

D. None of the Above

17. What Is The Unit Of Force In CGS Units ?

A. kg ms^{-2}

B. g ms^{-2}

C. g cms^{-2}

D. None of the Above

18. The Density Of A Cubic Material Is SI Units Is 128 Kgm^{-3}. In Certain Units, The Edge Length Is 25 cm And Mass Is 50 g , Then The Numerical Value Of The Density Of Material In This System Of Units Is

A. 40

B. 640

C. 16

D. 410

18. The Density Of A Cubic Material Is SI Units Is 128 Kgm^{-3}. In Certain Units, The Edge Length Is 25 cm And Mass Is 50 g , Then The Numerical Value Of The Density Of Material In This System Of Units Is

A. 40

B. 640

C. 16

D. 410

19. Electron Volt is the unit of

A. Luminosity

B. Force

C. Frequency

D. Energy

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20. Light year is a unit for measurement of

(a) age of universe

(b) very small time intervals

(c) very high temperature

(d) very large distance

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Answer: (D)

21. The unit of the ratio between thrust and impulse is same as that of

(a) frequency

(b) speed

(c) wavelength

(d) acceleration

21. The unit of the ratio between thrust and impulse is same as that of

(a) frequency

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Answer: (A)

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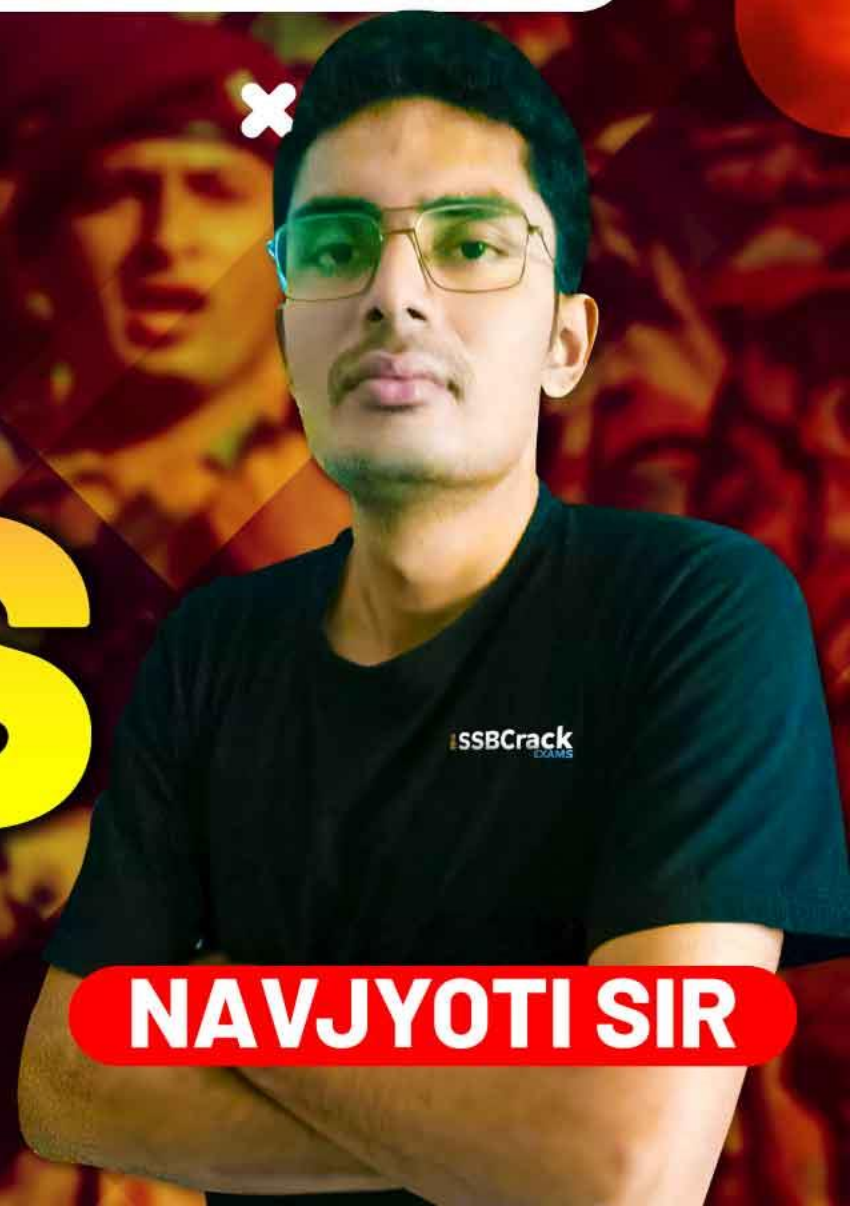
GS

LIVE

PHYSICS

CLASS 2



NAVJYOTI SIR

SSBCrack EXAMS