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Objective Question Bank

GENERAL SCIENCE

PREPARATION BOOSTER for

UPSC IAS, State PSCs, SSC, CDS, NDA, CPO, CISF Assistant Commandant, SCRA, Railway, B.Ed.
& Other Competitive Examinations

With **More than 100 Tables** in between the Chapters Summarizing Important Information

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PREFACE

Analysing the recent pattern of competitive exams like SSC, CDS, NDA, Assistant Commandant, CPO, UPSC & State Level PSCs, etc it is evident that General Science has taken an important dimension. General Science has always been a problematic section for aspirants. They find it difficult to prepare for this section because it has no prescribed syllabus and coverage area. Moreover, there are also a good number of students preparing for general competitions who are not from science background. As a result, they find it even more difficult.

Hence, the need arises for a book that can provide the complete contents of General Science in an organised and easy to comprehend manner which can be studied by all the students including the students from the non-science background too. Consequently, it will make them ready to face the questions on General Science.

Considering this, the book Objective Question Bank in General Science has been prepared keeping the importance of the subject in mind. It covers all the sections of General Science like Physics, Chemistry, Biology and Computer Awareness, etc.

In this book, we have tried to simplify the complexities of some of the topics so that the non-science students feel no difficulty while studying General Science.

Special Features

- *Selective Collection of more than 5000 Highly Useful Questions.*
- *With Previous Years' Examination Questions up to 2014.*
- *Inclusion of One Liner Facts as extra Knowledge Booster.*
- *To Facilitate Step-Wise Learning, Division of Questions is done as per Preliminary and Advanced Level in each chapter.*
- *More than 100 Tables are amalgamated in between the chapters to summarise important information.*
- *With Hints and Explanations of difficult questions.*

Although, we have put our best efforts in preparing this book, if any error or whatsoever has been skipped out, we will try to rectify those in coming editions.

Authors

CONTENTS

PHYSICS

1. Measurement and Errors 1-6
2. Motion 7-14
3. Force and Laws of Motion 15-23
4. Gravitation 24-30
5. Work, Energy and Power 31-37
6. Rotational Motion and Centre of Mass 38-41
7. Mechanical Properties of Matter 42-53
8. Simple Harmonic Motion 54-58
9. Temperature, Heat and Thermodynamics 59-68
10. Wave Motion 69-80
11. Light- Ray Optics 81-93
12. Electric Charge: Electric Field and Electric Potential 94-97
13. Current Electricity and Its Effects 98-106
14. Magnetic Effects of Current, Magnetism and Electromagnetic Induction 107-113
15. Nuclear Physics 114-119
16. Semiconductor 120-125
17. Communication 126-130

CHEMISTRY

1. Some Basic Concepts of Chemistry 131-136
2. Atomic Structure 137-145
3. Chemical Reactions 146-152
4. Chemical Bonding 153-158
5. Acids, Bases and Salts 159-165

6. Solutions and Colloids 166-171
7. Energetics and Kinetics 172-178
8. Electrochemistry 179-184
9. Periodic Classification of Elements 185-190
10. Metallurgy 191-197
11. Hydrogen and Its Compounds 198-203
12. Metals and Their Compounds 204-214
13. Non-Metals and Their Compounds 215-224
14. Flame and Fuel 225-230
15. Organic Compounds 231-243
16. Food Chemistry 244-250
17. Chemistry in Everyday Life 251-262

BIOLOGY

1. Biology and Its Branches 263-267
2. Diversity in Living Organisms 268-285
3. Cell : Structure and Functions 286-293
4. Cell Cycle and Cell Division 294-298
5. Plant Tissues 299-305
6. Animal Tissues 306-312
7. Plant Nutrition 313-319
8. Animal Nutrition 320-325
9. Plant System 326-333
10. Reproduction in Organisms 334-338
11. Digestive System in Humans 339-344
12. Respiratory System 345-349
13. Circulatory System 350-354
14. Excretory System 355-359
15. Skeletal System in Humans 360-364
16. Control and Coordination 365-370
17. Reproductive System 371-375
18. Genetics 376-382

19. Heredity and Evolution 383-389
20. Human Health and Diseases 390-398
21. Biotechnology 399-405
22. Environment and Its Issues 406-413
23. Ecology and Ecosystem 414-422
24. Agriculture Science 423-428
25. Animal Husbandry 429-433
26. Economic Zoology 434-437
27. Economic Botany 438-441

COMPUTER AWARENESS

1. Introduction to Computer 442-446
2. Computer Organisation and Memory 447-452
3. Data Representation 453-457
4. Software 458-462
5. Data Communication Networking 463-467
6. Internet and Computer Security 468-473

- **Practice Test 1** 477-479
- **Practice Test 2** 480-482
- **Practice Test 3** 483-486
- **Practice Test 4** 487-490
- **Practice Test 5** 491-496

Physics

1

Measurement and Errors

ONE LINE APPROACH

- Can there be a physical quantity which has no units and no dimensions? *Yes, e.g., Strain*
- Name a scalar and a vector quantity which have same dimension. *Speed and velocity*
- Are all constants dimensionless? *No, e.g., Gravitational constant*
- Can a quantity have dimensions, but still have no units? *No*
- Can a quantity have units, but still be dimensionless? *Yes, e.g., Angle*
- Does the magnitude of a quantity depend on system of units used? *Yes, e.g.,* $1\text{N} = 10^5$ dyne
- Does a quantity have different dimension in different system of units? *No*
- What are the dimensions of mass per unit length? *Mass/length* $= [\text{ML}^{-1}]$
- What type of quantity is Avogadro's number? *Dimensionless constant*
- Do all physical quantities have dimensions? *No*
- Name three physical quantities which have same dimensions. *Work, Energy, Torque*
- Name the physical quantity which is measured in the unit 'u'. *Mass*
- Name the physical quantity which is measured in the unit 'ly'. *Distance*
- What are the two complementary fundamental quantities? *Angle, Solid angle*
- What is the SI unit of solid angle? Steradian
- How is a light year related to metre? $1\text{ ly} = 9.46 \times 10^{15}$ m
- How is a parsec related to metre? $1\text{ parsec} = 3.08 \times 10^{16}$ m
- What is the mass of the Sun (solar mass)? 2×10^{30} kg
- How many weeks are there in a lunar month? 4
- Give the SI unit of luminous intensity and amount of substance. Candela (cd) and mole (mol)
- State the number of significant figures in 2.64×10^{24} kg. 3
- State the number of significant figures in 0.0006032. 4
- How would the error affected, if a research worker takes 100 observations in an experiment and then repeats the same experiment by taking 500 observations? *Error reduces to* $\left(\frac{1}{5}\right)$th
- Which principle is used to check the accuracy of formulae? *Principle of homogeneity*

Multiple Choice Questions

Preliminary Level

1. A physical quantity is one which
a. cannot be measured *b.* can be measured
c. is a scalar quantity *d.* is a vector quantity

2. Fundamental physical quantities
a. depend on the other physical quantities
b. do not depend on the other physical quantities
c. are derived from other physical quantities
d. are the simple ratio of their physical quantities

3. If a physical quantity is expressed in terms of two or more fundamental units, then this unit is called
a. fundamental *b.* scalar
c. vector *d.* derived

4. The physical quantities which has magnitude only and whose direction is not considered is called
a. vector *b.* scalar
c. fundamental *d.* derived

5. Which of the following is not a vector quantity?
a. Speed *b.* Velocity
c. Torque *d.* Displacement

6. Kelvin is the unit of
a. length *b.* temperature
c. time *d.* mass

Fundamental Units

Physical Quantities	SI Units	Symbols
Length	Metre	m
Mass	Kilogram	kg
Time	Second	s
Electric current	Ampere	A
Temperature	Kelvin	K
Luminous intensity	Candela	cd
Amount of substance	Mole	mol

7. Masses of the Stars and the Galaxies are usually expressed in terms of
a. neutron mass *b.* the Earth's mass
c. solar mass *d.* lunar mass

Different Units of Mass

1 ounce-oz = 28.35 g
1 pound-lb = 16 oz = 453.59 g
1 kg = 2.205 lb = 1000 g
1 quintal = 100 kg
1 metric ton = 1000 kg

8. Which of the following is not the unit of time?
a. Parallactic second *b.* Micro second
c. Leap year *d.* Solar day

Different Units of Time

1 min = 60 s
1 h = 60 min = 3600 s
1 day = 24 h
1 week = 7 days
1 lunar month = 28 days = 4 weeks
1 solar month = 30 or 31 days
= 28 or 29 days (Feb)
1 year = 13 lunar month 1 day
= 12 solar month = 365 days
1 leap year = 366 days

9. Bar is a unit of which one of the following? **CDS 2010**
a. Force *b.* Energy
c. Pressure *d.* Frequency

Some Important Physical Quantities with their Units

Physical Quantities	SI Units
Force	Newton (N)
Pressure	Pascal (Pa) or Bar
Work/Energy	Joule (J)
Power	Watt (W)
Angle	Radian (Rad)
Frequency	Hertz (Hz)
Charge	Coulomb (C)
Inductance	Henry (H)
Magnetic flux	Weber (Wb)
Magnetic induction	Tesla (T)
Resistance	Ohm (Ω)
Capacitance	Farad (F)
Luminous flux	Lumen (Lm)
Illuminance	Lux or phot
Power of lens	Dioptre (D)

✔ **KEY** Zone

1. *b* 2. *b* 3. *d* 4. *b* 5. *a* 6. *b* 7. *c* 8. *a* 9. *c*

10. Which one of the following pairs of physical quantities may be represented in the same unit?
a. Temperature and mole *b.* Heat and work
c. Heat and temperature *d.* Specific heat and heat

11. Kilowatt-hour is the unit of **NDA 2011**
a. potential difference *b.* electric power
c. electric energy *d.* electric potential

12. The SI unit of electric charge is **SSC 2010**
a. ampere *b.* coulomb
c. ESU *d.* kelvin

13. Which one of the following is the unit of activity of a radioactive source?
a. Lux *b.* Becquerel
c. Tesla *d.* Siemens

14. What is the SI unit of Young's modulus of elasticity?
a. Dyne-cm *b.* N/m
c. N/m^2 *d.* m^2/s

15. Which of the following physical quantity has no unit?
a. Efficiency *b.* Flux
c. Power *d.* Tension

Table for Unitless or Dimensionless Physical Quantities

Specific gravity	Ratio of density
Strain	Relative change in length $\left(\frac{\Delta l}{l}\right)$
Refractive index	Ratio of trigonometric ratios
Trigonometric ratio	Ratio of sides of right angle triangle
Efficiency	Ratio of work done by heat supplied
Dielectric constant /Relative permittivity	Ratio relative to the permittivity of vacuum
Magnification	Ratio of height of image with the height of object

16. The value of one light year is
a. 9.46×10^{-15} m *b.* 9.46×10^{15} m
c. 9.46×10^{-13} m *d.* 9.46×10^{13} m

17. One astronomical unit is the average distance between
a. the Earth and the Sun *b.* the Earth and the Moon
c. the Jupiter and the Sun *d.* the Pluto and the Sun

Different Units of Length or Distance

1 km = 1000 m, 1 mile = 1.60934 km
1 NM (nautical mile) = 1.852 km
1 AU = 1.495×10^{11} m
1 ly = 9.46×10^{15} m
= 63278 AU
1 parsec = 3.08×10^{16} m = 3.26 ly

18. How many cubic centimetres (cm^3) are in a cubic metre (m^3)? **NDA (NA) 2014**
a. 10^3 *b.* 10^6
c. 10^9 *d.* 10^{12}

19. A micron is equal to **SSC 2012**
a. 0.1 mm *b.* 0.01 mm
c. 0.001 mm *d.* 0.0001 mm

Various Exponents of 10

Exponents of 10	Prefixes	Symbols
10^{24}	Yotta	Y
10^{21}	Zetta	Z
10^{18}	Exa	E
10^{15}	Peta	P
10^{12}	Tera	T
10^{9}	Giga	G
10^{6}	Mega	M
10^{3}	Kilo	k
10^{2}	Hecto	h
10^{1}	Deca	da
10^{-1}	Deci	d
10^{-2}	Centi	c
10^{-3}	Milli	m
10^{-6}	Micro	μ
10^{-9}	Nano	n
10^{-12}	Pico	p
10^{-15}	Femto/Fermi	f
10^{-18}	Atto	a
10^{-21}	Zepto	z
10^{-24}	Yocto	y

✔ **KEY** Zone
10. *b* 11. *c* 12. *b* 13. *b* 14. *c* 15. *a* 16. *b* 17. *a* 18. *b* 19. *c*

20. A... of a physical quantity are the powers (or exponents) to which the units of base quantities are raised to represent a derived unit of that quantity.
a. unit
b. measurement
c. dimension
d. error

21. The dimensions $[MLT^{-2}]$ correspond to **SSC 2013**
a. force
b. work done
c. acceleration
d. velocity

22. Which of the following physical quantities have the same dimensions?
a. Momentum and impulse
b. Power and Young's modulus
c. Energy and angular momentum
d. Force constant and moment of inertia

23. Which of the following pairs of physical quantities does not have same dimensional formula?
a. Work and torque **NCERT Exemplar**
b. Angular momentum and Planck's constant
c. Tension and surface tension
d. Impulse and linear momentum

24. Which of the following physical quantity has no dimension?
a. Power
b. Mass
c. Angle
d. Temperature

Dimensional Formula for Fundamental Physical Quantities

Physical Quantities	Dimensions
Length	[L]
Mass	[M]
Time	[T]
Electric current	[A]
Temperature	[K]
Luminous intensity	[cd]
Amount of substance	[mol]
Angle	Dimensionless

25. The difference in the true value and the measured value of a quantity is
a. dimension ***b.*** approximation
c. error ***d.*** None of these

26. *Q* of a measurement is a measure of how close the measured value is to the true value of the quantity. Here *Q* refer to
a. accuracy ***b.*** error
c. approximation ***d.*** none of these

27. *P* of an instrument is the smallest value that can be measured by a measuring instrument. Here *P* refers to
a. approximation ***b.*** error
c. least count ***d.*** None of these

28. The number of significant figures in 0.06900 is **NCERT Exemplar**
a. 5 ***b.*** 4 ***c.*** 2 ***d.*** 3

✔ **KEY** Zone
20. *c* 21. *a* 22. *a* 23. *c* 24. *c* 25. *c* 26. *a* 27. *c* 28. *b*

Advance Level

1. Consider the following statements
I. The magnitude of vector is always a scalar.
II. The total path length is always equal to the magnitude of the displacement vector of a particle.
III. The average speed of a particle is either greater or equal to the magnitude of the average velocity of the particle over the same interval of time.
IV. Three vectors not lying in a plane can never added up to give a null vector.
Which of the statement(s) above is/are correct?
a. I, II and IV ***b.*** I, III and IV
c. II, III and III ***d.*** I, II, III, and IV

2. Match List I (Quantities) with List II (Units) and select the correct answer using the codes given below the lists.

	List I		List II
A.	High speed	1.	Mach 5
B.	Wavelength	2.	Angstrom
C.	Pressure	3.	Pascal
D.	Energy	4.	Joule

Codes

	A	B	C	D
a.	2	1	4	3
c.	1	2	4	3

	A	B	C	D
b.	2	1	3	4
d.	1	2	3	4

✔ **KEY** Zone
1. *b* 2. *d*

3. Momentum of a body is
I. a vector quantity.
II. a conserved quantity in an isolated system.
III. same as force in linear motion.

Select the correct answer using the codes given below
a. I and III ***b.*** II and III **NDA 2011**
c. I and II ***d.*** I, II and III

4. Consider the following statements and choose the correct option
I. Both distance and displacement are scalar quantity.
II. CGS, FPS and MKS, all are systems of unit.
III. Physical quantities, which are ratio of two same physical quantities have no dimension.
a. I, II, III are true
b. I and II are true
c. II and III are true
d. I and III are true

5. Match List I with List II and select the correct answer using the codes given below.

	List I		List II
A.	Joule	1.	Henry-ampere/sec
B.	Watt	2.	Farad-volt
C.	Volt	3.	Coulomb-volt
D.	Coulomb	4.	Oersted-cm
		5.	Amp-gauss
		6.	Amp^2-ohm

Codes

	A	B	C	D
a.	1	6	5	4
c.	3	6	1	5

	A	B	C	D
b.	3	6	1	2
d.	2	6	1	3

6. Match List I with List II and select the correct answer from the codes given below.

	List I		List II
A.	Acceleration	1.	Joule
B.	Force	2.	Newton second
C.	Work done	3.	Newton
D.	Impulse	4.	Metre per $second^2$

Codes

	A	B	C	D
a.	1	2	3	4
c.	4	3	1	2

	A	B	C	D
b.	2	3	4	1
d.	3	4	1	2

7. Which one of the following pairs does not have the same dimension? **NDA 2010**
a. Potential energy and kinetic energy
b. Density and specific gravity
c. Focal length and height
d. Gravitational force and frictional force

8. If the density of water is 1 g cm^{-3} in CGS system. Its value in MKS system is
a. 1 kg/m^3
b. 10^3 kg/m^3
c. 10^{-3} kg/m^3
d. 10^{-6} kg/m^3

9. Fahrenheit and Celsius are the two scales used for measuring temperature. If the numerical value of a temperature recorded in both the scales is found to be same, what is the temperature? **NDA 2014**
a. −40° ***b.*** +40°
c. +72° ***d.*** −72°

✔ KEY Zone

3. *c* 4. *c* 5. *b* 6. *c* 7. *b* 8. *b* 9. *a*

Hints & Explanations

Preliminary Level

7. The solar mass is a standard unit of mass in astronomy which is used to indicate the masses of other Stars and the Galaxies. It is equal to the mass of the Sun.
$M = (1.9885 \pm 0.00025) \times 10^{30}$ kg

8. Parallactic second (parsec) is the unit of distance *i.e.,* largest unit of distance among all the astronomical units of distance and

$$1 \text{ parsec} = 3.08 \times 10^{16} \text{ m}$$

12. The SI unit of an electric charge is the coulomb, which is equivalent to about $6.242 \times 10^{18}\, e^-$ (e^- is the charge of an electron). Hence, the charge of an electron is approximately -1.602×10^{-19} C. The coulomb is defined as the quantity of charge that has passed through the cross-section of an electrical conductor carrying one ampere within one second.

16. One light year (1 ly) is the distance covered by the light in vacuum in 1 yr. We know that light travels a distance of 3×10^8 m in vacuum in 1 s.

Therefore,

$1 \text{ ly} = (3 \times 10^8 \text{ ms}^{-1}) \times (365 \times 24 \times 60 \times 60) \text{ s} = 9.46 \times 10^{15} \text{m}$

18. 1 m = 100 cm

$1\text{m}^3 = (100)^3 \text{cm}^3 = 10^6 \text{cm}^3$

19. 1 micron = 10^{-6} m

$\because \quad 1\text{m} = 10^3$ mm

$\therefore \quad 10^{-6}$ m (or 1 micron) $= 10^3 \times 10^{-6} = 10^{-3}$ mm or 0.001 mm

21. The dimensions $[MLT^{-2}]$ correspond to force. Force is the product of mass of the body and its acceleration.

22. Momentum = Mass × Velocity = $[M][LT^{-1}]$
$= [MLT^{-1}]$
Impulse = Force × Time = $[MLT^{-2}][T]$
$= [MLT^{-1}]$

28. Significant figures is the number of digits which are known reliably plus the first uncertain digit, *i.e.,* 0 . 0 6 9 0 0 has 4 significant figures as marked. It is important to note that trailing zeroes in a number containing a decimal point are significant.

Advance Level

3. Momentum ($p = mv$) is a vector quantity and is a conserved quantity in an isolated system, according to the law of conservation of linear momentum and angular momentum.

7. Potential energy and kinetic energy = $[ML^2T^{-2}]$

Density = $[ML^{-3}]$

$$\text{Specific gravity or relative density} = \frac{\text{Density of the body}}{\text{Density of water}}$$

So, it has neither unit nor dimension.

Focal length and height = [L]

Gravitational force and frictional force = $[MLT^{-2}]$

So, option *b* is correct.

9. Relation between Fahrenheit and Celsius scales is

$$\frac{C - 0°}{100} = \frac{F - 32}{180}$$