

## Unit - I :- Essentials of Mathematics

- 1) Express the following in the Modulus Amplitude Form  
(a)  $\sqrt{3} - i$     b)  $-1 - i\sqrt{3}$     c)  $\frac{1+i}{1-i}$
- 2) Find the Modulus of the complex Numbers  
a)  $(3-4i)(4+3i)$     b)  $\frac{3-4i}{5+7i}$
- 3) Find the additive and multiplicative inverse of the Complex Numbers  
a)  $(2+i)(-4+6i)$     b)  $(3+2i)(1+2i)$
- 4) Find the value of  
i)  $\sin 150^\circ$     ii)  $\sec 240^\circ$     iii)  $\tan 300^\circ$     iv)  $\sin 120^\circ$   
v)  $\cos 135^\circ$     vi)  $\tan 150^\circ$     vii)  $\sin 15^\circ$     viii)  $\cos 15^\circ$
- 5) Calculate a)  $\tan 15^\circ + \cot 15^\circ$     b)  $\tan 75^\circ$
- 6) If  $x = \cos \theta + i \sin \theta$  then find the value of  
 $x^6 + \frac{1}{x^6}$

7) Prove that  $\sin^2 52 \frac{1}{2} - \sin^2 22 \frac{1}{2} = \frac{\sqrt{3}+1}{4\sqrt{2}}$

8) Prove that  $\cos 10^\circ \cos 50^\circ \cos 70^\circ = \frac{\sqrt{3}}{8}$

9) If  $A+B = 45^\circ$ , show that  $(1+\tan A)(1+\tan B) = 2$

10) Prove that  $\sin x \sin(60^\circ - x) \sin(60^\circ + x) = \frac{1}{4} \sin 3x$

11) Find  $\sin 2A$  if i)  $\sin A = \frac{4}{5}$  and  $A$  is Acute

ii)  $\cos A = \frac{1}{\sqrt{2}}$  and  $A$  is Acute

iii)  $\sin A + \cos A = 1$ .

12) If the position vectors of  $A, B, C$  are  $-2\bar{i} + \bar{j} - \bar{k}$ ,  $-4\bar{i} + 2\bar{j} + 2\bar{k}$ ,  $6\bar{i} - 3\bar{j} - 13\bar{k}$  and  $\overline{AB} = \lambda \overline{AC}$ . Find  $\lambda$ .

13) If  $ABCDEF$  is a regular hexagon, and  $O$  is its center, then prove that  $\overline{AB} + \overline{AC} + \overline{AD} + \overline{AE} + \overline{AF} = 3\overline{AD} = 6\overline{AO}$ .

14) If  $a, b, c$  are non-coplanar vectors, then prove that the four points  $-a+4b-3c$ ,  $3a+2b-5c$ ,  $-3a+8b-5c$ ,  $-3a+2b+c$  are coplanar.

15) If  $\vec{a} = \vec{i} + \vec{j} + \vec{k}$ ,  $\vec{b} = 2\vec{i} + \vec{j} + 3\vec{k}$  then find the unit vectors perpendicular to the plane generated by  $\vec{a}, \vec{b}$ .

16) If  $\vec{a} = 2\vec{i} + 3\vec{j} + 4\vec{k}$ ,  $\vec{b} = \vec{i} + \vec{j} - \vec{k}$ ,  $\vec{c} = \vec{i} - \vec{j} + \vec{k}$  then verify that  $\vec{a} \times (\vec{b} \times \vec{c})$  is perpendicular to  $\vec{a}$ .

17) Find the Mean of the following frequencies Distribution.

class Interval	0-10	10-20	20-30	30-40	40-50
No. of Workers	7	10	15	8	10

18) Find the Median of the following Frequencies Distribution

Weekly Wages	60-69	70-79	80-89	90-99	100-109	110-119
No of Days	5	15	20	30	20	8

19) Calculate the Median from the following Distribution

Class	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
Frequencies	5	6	15	10	5	4	2	2

20) The following table shows the ages of the Patients admitted in a hospital during a year

Age (in Years)	5-15	15-25	25-35	35-45	45-55	55-65
No. of Patients	6	11	21	23	14	5



## Unit - II : Essentials of Physics

- 1) Define Physics. Explain its Scope.
- 2) Discuss about Measurements and Units.
- 3) Discuss about Motion of Objects.
- 4) Discuss about Newtonian Mechanics.
- 5) Discuss about Relativistic Mechanics Perspective.
- 6) Discuss about the Laws of Thermodynamics and its significance.
- 7) Discuss about Electromagnetic Waves.
- 8) Discuss about Behaviour of Atomic and Nuclear Particles.
- 9) Discuss about Wave Particle Duality.
- 10) Discuss about Uncertainty Principle Theories and Understanding of Universe.

### Unit - III : Essentials of Chemistry

- 1) What is chemistry? Explain the Nature and Scope of chemistry.
- 2) Discuss about Importance of chemistry in Daily Life.
- 3) Discuss about Branches of chemistry and its significance.
- 4) Discuss about Periodic Table.
- 5) Discuss about chemical changes.
- 6) Discuss about classification of Matter.
- 7) Discuss about Carbohydrates.
- 8) Discuss about Proteins.
- 9) Discuss about Fats.
- 10) Discuss about Vitamins.

## Unit - IV : Applications of Mathematics, Physics & Chemistry

- 1) Discuss about Applications of Calculus in Physics and Chemistry.
- 2) Discuss about Applications of differential equations in Physics and Chemistry.
- 3) Discuss about Applications of Complex Analysis in Physics and Chemistry.
- 4) Discuss about Applications of Physics in Industry and Technology.
- 5) Discuss about Electronics and Semiconductor Industry.
- 6) Discuss about Robotics and Automation.
- 7) Discuss about Chemical Manufacturing.
- 8) Discuss about Quality Control and Instrumentation.
- 9) Discuss about Pharmaceuticals and Drug Discovery.
- 10) Discuss about Food and Beverage Industry.



## Unit - V : Essentials of Computer Science

- 1) Define Computer. Explain in detail characteristics of Computer.
- 2) Discuss about Block diagram of Computer with neat diagram.
- 3) Discuss about Generations of Computers.
- 4) What is Internet. Explain in detail.
- 5) Discuss about Network and Security Concepts..
- 6) Discuss about Types of Networks.
- 7) Discuss about Information assurance fundamentals.
- 8) Discuss about Symmetric and Asymmetric Cryptography.
- 9) Discuss about
  - i) IP Address.
  - ii) Cryptography
  - iii) Fire walls.
- 10) Discuss about Fraud Techniques.