

23BCP101

70

**UG PROGRAM (4 YEARS HONORS) WITH SINGLE MAJOR**  
**AT THE END OF FIRST SEMESTER**  
**ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND**  
**CHEMICAL SCIENCES**

(Common for B.Sc. (Mathematics, Statistics, Chemistry, Electronics, Physics, Data Science,  
 Computer Science, Artificial Intelligence and Robotics, Psychology, Internet of Things,  
 Chemistry / Analytical Chemistry, Geology, Geography))  
 (w.e.f. Admitted Batch 2023-24)

Time: 3 Hours

Maximum: 70 marks

**SECTION - A (Multiple Choice Questions)**

30x1=30

1. Multiplicative identity of complex numbers is

- (a)  $1 + 0i$  (b)  $0 + 0i$  (c)  $-1 + 0i$  (d)  $1 + i$

2. If  $Z = 3 + 4i$  then the value of  $|Z|$  is

- (a) 5 (b)  $\sqrt{7}$  (c) 25 (d) None

3.  $\tan A = \frac{1}{2}$  and  $\tan B = \frac{1}{3}$  then the value of  $A + B$  is

- (a)  $\frac{\pi}{6}$  (b)  $\pi$  (c) 0 (d)  $\frac{\pi}{4}$

4. Find the unit vector in the direction of  $a + b$ , if  $a = i + 2j + 3k$  and  $b = 3i + j$

- (a)  $\frac{1}{\sqrt{34}}(4i + 3j + 3k)$  (b)  $\frac{1}{34}(3i + 3j + 3k)$  (c)  $\frac{1}{27}(4i + 3k)$  (d)  $\frac{1}{47}(4i + 3j + 3k)$

5. If A and B are (3,4,5) and (6,8,9) find  $\overline{AB}$

- (a)  $3i - 4j - 4k$  (b)  $3i + 4j + 4k$  (c)  $2i + 4j + 4k$  (d)  $5i + 4j + 5k$

6. If mean = 14 and median = 15 then find mode

- (a) 16 (b) 17 (c) 13 (d) 18

7. The theory of relativity was introduced by

- (a) Planck (b) Einstein (c) Maxwell (d) Rutherford

8. Which physics principle is fundamental to remote sensing technologies used in environmental monitoring

- (a) Doppler effect (b) Snell's Law  
 (c) Electromagnetic radiation (d) Heisenberg's uncertainty Principle

9. Which branch of physics is specially concerned with the measurement of physical quantities and standard quality control?

- (a) Optics (b) Metrology (c) Thermodynamics (d) Acoustics



10. What aspect of physics is crucial for understanding the aerodynamics of vehicles? ( )

- (a) Thermodynamics (b) Fluid dynamics  
(c) Electromagnetism (d) Quantum mechanics

11. What type of physics sensors are commonly used in robotics to detect proximity and obstacles? ( )

- (a) Accelerometers (b) Thermocouples  
(c) Ultrasonic sensors (d) Photoelectric Sensors

12. Which Law predicts a doubling of transistors on a semiconductor chip approximately every two years? ( )

- (a) Ohm's Law (b) Faraday's Law (c) Boyle's Law (d) Moore's Law

13. Which element has the electronic configuration  $1s^2 2s^2 2p^6 3s^1$ ? ( )

- (a) Carbon (b) Oxygen (c) Sodium (d) Silicon

14. Which of the following is an example of a chemical change? ( )

- (a) Cutting paper (b) Mixing salt and sand  
(c) Rusting of iron (d) Melting ice

15. Which biomolecule is the primary source of energy for living organisms? ( )

- (a) Proteins (b) Nucleic acids (c) Carbohydrates (d) Lipids

16. What is the common name for table sugar? ( )

- (a) Glucose (b) Lactose (c) Sucrose (d) Fructose

17. Which of the following is a complete protein source, containing all essential amino acids? ( )

- (a) Rice (b) Quinoa (c) Pasta (d) Bread

18. Which vitamin is known as the sunshine vitamin? ( )

- (a) vitamin A (b) vitamin C (c) vitamin D (d) vitamin K

19. WWW Stands for? ( )

- (a) World wide web (b) World web wide (c) Organization (d) Website

20. What is the internet's first name? ( )

- (a) ARPANET (b) INTERNET (c) NET (d) Internet

21. Which of the following is a component of LAN? ( )

- (a) NIC (b) Cable (c) Bridge (d) All of the above



22. Each computer on a network is called

- (a) Bus (b) Node (c) Terminator (d) LAN

23. Full form of internet?

- (a) Inter continental (b) Internal network  
(c) Interconnected network (d) International network

24. The first computer virus is?

- (a) Creeper (b) Trojan (c) PARAM (d) Morris

25. Which of the following is a search engine?

- (a) Google (b) Yahoo (c) Lycos (d) All of the above

26. Online business on the internet is referred to as?

- (a) E-commerce (b) Chatting (c) Transaction (d) Surfing

27. Which of the following is a primary source of probiotics in the food and beverage industry?

- (a) Yogurt (b) Chocolate (c) Bread (d) Potato chips

28. The SI unit of energy is?

- (a) Joule (b) Calorie (c) Watt (d) Electron volt

29. When a bus starts suddenly, the passengers are pushed back. This is an example of?

- (a) Newton's first Law (b) Newton's second Law  
(c) Newton's third Law (d) Kepler's first Law

30.  $\sin 135^\circ$ ?

- (a)  $\frac{1}{\sqrt{2}}$  (b)  $\frac{1}{\sqrt{2}}$  (c)  $\frac{\sqrt{3}}{2}$  (d)  $\frac{\sqrt{-3}}{2}$

### SECTION - B (Fill in the blanks)

10x1=10

31.  $i^5 + i^{10} + i^{15} =$

32. The mode of the data 0, 0, 1, 1, 2, 2, 2, 3, 3, 4, 5 is

33. Rate of change of momentum of a particle is

34. Maxwell equations explain the behavior of waves

35. Graphite and diamond are allotropic forms of

36. Molecular weight of ammonia is

37. is known as a main memory

NH<sub>4</sub>



38. The brain of any computer systems is \_\_\_\_\_

39. A light year is a unit of \_\_\_\_\_

40. \_\_\_\_\_ is known as the watery plant

### SECTION - C (Very short answer questions)

41. Express  $(1 + i)^4$  in the form  $x + iy$ ?

42. If  $a = 2i - 5j + 5k$ ,  $b = -i - 4j + 2k$  then find  $a \times b$ ?

43. Find the median of 5, 8, 3, 6, 2, 8, 1, 3, 9.

44. State first Law of thermodynamics?

45. What is aerospace industry?

46. What are nucleons?

47. What are fat-soluble vitamins?

48. What is web browser?

49. What is the function of modem?

50. Write any four types of Networks?

### SECTION - D (Matching)

I.

51. Cos 210

52.  $\tan \frac{17\pi}{6}$

53. Radio waves are used in

54. X - rays are used in

55. Quick lime

II.

56. Apple

57. ENIAC

58. IBM 650

59. Grape sugar

60. Fruit sugar

( ) a.  $-\frac{1}{\sqrt{3}}$

( ) b.  $-\frac{\sqrt{3}}{2}$

( ) c. Airport security

( ) d. A.M. and P.M. Radio

( ) e.  $\text{Ca(OH)}_2$

( ) f. CaO

( ) a. 1943

( ) b. 1954

( ) c. 1976

( ) d. Lactose

( ) e. Glucose

( ) f. Fructose



SECTION - E (True Or False)

10x1=10

61. Two vectors  $a$  and  $b$  are parallel then  $a \cdot b = 0$

62. Mean is the most frequently repeated term

63. The branch of physics that deals with light related phenomena is called optics

64. The frequency of a sound wave is directly related to its pitch

65. Acid rain is a common by-product of chemical manufacturing process.

66. Ethanol is a key component in the production of alcoholic beverages

67. http stands for hypertext transmission protocol

68. A pen drive is a storage device

69. Bluetooth allows your device to connect with another device

70. Mercury is a noble metal