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23BCP101

**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: 31 hours

Maximum: 70 Marks

SECTION-A (Multiple Choice Questions)

30x1=30

1. Find the value of $(i)^{15}$ ()
(a) i (b) $-i$ (c) 1 (d) -1
2. What is the imaginary part of $\frac{a+bi}{b}$ ()
(a) -1 (b) 1 (c) a/b (d) $\frac{b}{a^2+b^2}$
3. $\sin 30^\circ \cos 60^\circ + \cos 30^\circ \sin 60^\circ$ ()
(a) 0 (b) -1 (c) 1 (d) None
4. If $\sin A = \frac{4}{5}$ What is the value of $\tan A$ ()
(a) $\frac{3}{4}$ (b) $\frac{4}{3}$ (c) $\frac{3}{5}$ (d) $\frac{5}{4}$
5. If $\vec{a} = 3\vec{i} + 2\vec{j} - 2\vec{k}$ and $\vec{b} = 2\vec{i} + 4\vec{j} + 3\vec{k}$ then find $\vec{a} \cdot \vec{b}$ ()
(a) 8 (b) 6 (c) 7 (d) 0
6. If $\vec{a} = \vec{i} + \vec{j} + \vec{k}$ and $\vec{b} = 3\vec{i} + 2\vec{j} - \vec{k}$ then find $\vec{a} + 3\vec{b}$ ()
(a) $2\vec{i} + 3\vec{j} + \vec{k}$ (b) $10\vec{i} + 7\vec{j} - 2\vec{k}$ (c) 0 (d) $\vec{i} + \vec{j} + \vec{k}$
7. Find the mean of the data 103, 105, 102, 104 ()
(a) 102 (b) 103 (c) 104 (d) 103.5
8. Write the relation between mean, median and mode ()
(a) $\text{Mode} = 2 \text{ median} - 3 \text{ mean}$ (b) $\text{Mode} = 3 \text{ median} - 2 \text{ mean}$
(c) $\text{Mode} = 2 \text{ median} + 3 \text{ mean}$ (d) $\text{Mode} = 3 \text{ median} + 2 \text{ mean}$
9. Which branch of physics deals with the behavior of matter at the atomic and subatomic levels? ()
(a) Classical mechanics (b) Thermodynamics (c) Quantum mechanics (d) Relativity

10. The rate of change of momentum is called? ()

- (a) Acceleration (b) Force (c) Work (d) Inertia

11. The special theory of relativity was introduced in 1905 by.... ()

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

12. Which law talks about "Entropy"? ()

- (a) Zeroth law (b) Second law
(c) First law (d) None of these

13. In which waves particles of the medium vibrates perpendicular to the direction of wave propagation? ()

- (a) Transverse waves (b) Longitudinal waves
(c) Matter waves (d) Both a & b

14. Which substance particle determines the chemical properties of an element? ()

- (a) Proton (b) Neutron (c) Electron (d) Alpha particle

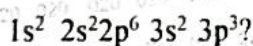
15. What force binds protons and neutrons together in the atomic nucleus? ()

- (a) Electromagnetic force (b) Gravitational force
(c) Strong nuclear force (d) Weak nuclear force

16. Which sustainable technology focuses on reducing greenhouse emissions and energy consumptions? ()

- (a) Renewable energy sources (b) Recycling
(c) Composting (d) sustainable waste management

17. How many unpaired electrons are in the ground-state electron configuration



- (a) 0 (b) 1 (c) 2 (d) 3

18. The magnetic quantum number specifies? ()

- (a) The size of the orbital (b) The shape of the orbital
(c) The orientation of the orbital (d) The spine of the electron

19. Which of the following is a evidence of a chemical changes? ()

- (a) Change in temperature (b) Change in shape
(c) Change in volume (d) Change in density

20. What is the law of conservation of mass? ()

- (a) Mass is created during a chemical reaction
- (b) Mass is destroyed during a chemical reaction
- (c) Mass is conserved during a chemical reaction
- (d) Mass is irrelevant during a chemical reaction

21. What is the building block of proteins? ()

- (a) Nucleotide
- (b) Amino acid
- (c) Monosaccharide
- (d) Fatty acid

22. Which sugar is commonly found in milk? ()

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

23. The structure of a protein is often described in how many levels? ()

- (a) 1
- (b) 2
- (c) 3
- (d) 4

24. What is the primary function of fats in the body? ()

- (a) Energy storage
- (b) Enzyme catalysis
- (c) Genetic information storage
- (d) Structural support

25. WWW stands for? ()

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

26. The server on the internet is also known as a? ()

- (a) Hub
- (b) Host
- (c) Gateway
- (d) Repeater

27. Internet is a network of which computer network? ()

- (a) All over the state
- (b) Country
- (c) World
- (d) None of these

28. Many networks include a central computer that may be called? ()

- (a) Bridges
- (b) Servers
- (c) Client
- (d) Gateways

29. Which of the following networks extends a private network across public network? ()

- (a) LAN
- (b) EPN
- (c) SAN
- (d) VPN

30. Computer virus is? ()

- (a) A hard ware
- (b) Windows tool
- (c) A computer program
- (d) A system software

SECTION - B (Fill in the Blanks)**10x1=10**

31. The conjugate complex of $\frac{1}{3+4i}$ is _____
32. The value of $(1 - \sin^2 A) \sec^2 A$ is _____
33. If $\vec{a} = 3i + 2j - 6k$ and $\vec{b} = 4i - 3j + k$ then the angle between $\vec{a}$ and $\vec{b}$ is _____
34. Angstrom is a unit of _____
35. Newtonian principle involved in motion of rocket is _____
36. Transverse wave consists of _____
37. _____ Vitamin is important in blood clotting
38. _____ is the primary function of a food stabilizer?
39. Full form of INTERNET is _____
40. VPN stands for _____

SECTION - C (Very short answer questions)**10x1=10**

41. Find the median of the data 6, 12, 9, 10, 16, 28, 25, 13, 15, 17
42. Find $|2i + 3j + 3k|$
43. What is the theory related to origin of universe?
44. What field involves the design, construction and programming of robots?
45. What is the function of ATP in the cell?
46. What is the chemical name for table sugar?
47. What is a chemical change?
48. Which method is commonly used for preserving food by removing water content?
49. What is E-mail?
50. Give one application of joy stick

SECTION - D (Matching)**2x5=10****I.**

- | | | |
|---|-----|--------------------------------------|
| 51. $\text{cis}\theta_1 \text{cis}\theta_2$ | () | a. $\cos\theta + i \sin\theta$ |
| 52. $\text{cis}\theta$ | () | b. $\cos\theta - i \sin\theta$ |
| 53. $\text{cis}(-\theta)$ | () | c. $\text{cis}(\theta_1 + \theta_2)$ |
| 54. Very large scale Integration | () | d. III generation |
| 55. Stored programme | () | e. IV generation |
| | () | f. II generation |

II.

56. Mercury () a. C_6H_6
57. Thorium () b. CH_4
58. Benzene () c. Radio active metal
59. Methane () d. Liquid metal
60. Acetylene () e. C_2H_6
() f. C_2H_2

SECTION - E (True Or False)

10x1=10

61. $\tan 3A = \frac{2\tan A}{1+\tan^2 A}$ is ()
62. In a data the maximum value is 100 and minimum value is 10 then the range =90 ()
63. Infrared waves are used in night vision devices ()
64. Barium belong to III group of periodic table ()
65. Isotopes are atoms of the same element ()
66. Atomic number of zinc is 31 ()
67. Bluetooth allows your device to connect with another device ()
68. A firewall is a type of hardware ()
69. Radio waves are lowest frequency waves in electromagnetic spectrum ()
70. $E = mc^2$ is Newtonian principle ()