23BCP102

UG PROGRAM (4 YEARS HONORS) WITH SINGLE MAJOR

AT THE END OF FIRST SEMESTER

ADVANCES IN 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: 3Hours **Maximum: 70 marks**

Section-A (Multiple Choice Questions) **30x1=30**

1. Intercept form of straight line $x + y + 1 = 0$ *is* ( )

(a) $\frac{x}{1} + \frac{y}{1} = -1$ (b) $\frac{x}{-1} + \frac{y}{-1} = 1$ (c) $\frac{x}{-1} + \frac{y}{1} = -1$ (d) $\frac{x}{-1} + \frac{y}{-1} = -1$

2. The point of concurrence of the concurrent straight lines

$2x - 3y - 23 = 0$, $2x + y - 3 = 0$ and $3x + 2y - 2 = 0$ is ( )

(a) (0, 2) (b) (4, -3) (c)(4, -5) (d) (5, -4)

3. Slope of a straight line $ax + by + c = 0$ is equal to ( )

(a) $\frac{b}{a}$ (b) $\frac{-a}{b}$ (c) 0 (d) None

4. $\lim_{x \to 0} \log(1 + x) =$ _____ ( )

(a) 1 (b) 0 (c) -1 (d) None

5. $\frac{d}{dx}(\log x) =$ _____ ( )

(a) $1/x$ (b) 0 (c) 1 (d) e

6. $\frac{d}{dx}(x e^x) =$ _____ ( )

(a) $e^x + 1$ (b) $x + 1$ (c) e^x (d) $e^x(x + 1)$

7. $\int xCosx\, dx =$ ( )

(a) $xSinx - Cosx + c$ (b) $xSinx + Cosx + c$ (c) $xSinxCosx + c$ (d) None

8. If $\begin{bmatrix} x & 4 \\ 2 & 8 \end{bmatrix}$ is a singular matrix then x= ( )

(a) 1 (b) 0 (c) 8 (d) None

9. Which of the following is NOT considered a renewable energy source? ( )

(a) Coal(b) Solar (c) Wind (d) Hydropower

10. Which of the following is common form of chemical energy storage used in batteries?

(a) Compressed air (b) Flywheels (c) Hydrogen (d) Molten salt ( )

11. What type of display technology uses quantum dots to produce vivid colors and high-definition displays ( )

(a) OLED (b) CRT (c) QLED (d) LCD

12. What recent advancement in biophysics has improved our understanding of protein folding and misfolding in diseases like Alzheimer's, Parkinson's? ( )

(a) Cryo-electron microscopy (b) Atomic force microscopy

(c) Nuclear magnetic resonance (NMR)spectroscopy

(d) X-ray diffraction

13. Which technology is commonly used for large -scale energy storage in smart grids? ( )

(a) Lithium-ion batteries(b) Flywheel energy storage

(c) Lead-acid batteries (d) Hydrogen fuel cells

14. What is the term used to describe the process of using nanoparticles to enhance imaging techniques for medical diagnostics? ( )

(a) Nanoscopy(b) Nano therapy (c)Nano diagnostics(d) Nano treatment

15. What is the key application of biophysics In neuro science? ( )

(a) Quantum computing (b) Brain imaging techniques

(c) Agricultural genetics (d) Weather prediction

16. What is the primary imaging modality used in nuclear medicine? ( )

(a) X-rays (b) Magnetic Resonance imaging (MRI)(c) Computed tomography(CT)

(d) Single photon Emission computed tomography (SEPCT)

17. What role does virtual screening play in CADD? ( )

(a) Identifying potential drug candidates

(b)Synthesizing actual drugs

(c)Conducting clinical trials

(d) Marketing pharmaceutical products

18. Which of the following is an example of a chemical probe used in chemical biology research? ( )

(a) Antibiotic (b) Painkiller (c)Antacid(d) Fluorescent dye

19. What is the main goal of chemical genetics in chemical biology? ( )

(a) Developing new drugs

(b) Understanding the genetic code

(c)Manipulating biological systems with small molecules

(d) Cloning genes

20. What is the primary consequence of habitat destruction caused by chemical pollutants? ( )

(a) Increased species diversity(b) Improved ecosystem resilience

(c)Loss of biodiversity and ecosystem (d) Accelerated ecological succession

21.How does exposure to lead in drinking water primarily affect children? ( )

(a)Improved cognitive development

(b) Enhanced digestion

(c)Neurological damage and development delays

(d) Increased energy levels

22.Which catalysis method is commonly used for the degradation of organic dyes in waste water treatment? ( )

(a) Photocatalysis (b)Electrolytic catalysis

(c)Thermal catalysis(d) Enzymatic catalysis

23. In catalytic dye removal, what is the primary role of a catalyst? ( )

(a) Change the color of the dye (b) Speed up the degradation of dye molecules

(c)Increase the intensity of the dye (d) Prevent the interaction with other chemicals

24. Which of the following is a common disinfection method used in water treatment? ( )

(a) Coagulation (b) Filtration (c)Chlorination (d) pH adjustment

25.What is the decimal equivalent of the binary number10101? ( )

(a) 20 (b) 15 (c)21(d) 17

26. 4 bit binary value of the hexadecimal symbol "D" is? ( )

(a)1101 (b)1111(c) 1001(d) 1000

27. In which form are digital signal transmitted? ( )

(a) Voltage (b)Waveforms (c) 0s and 1s (d) Frequencies

28.Telephone lines? ( )

(a) ADSL (b) V.92 (c)Fiber- optic (d)Ethernet

29.Widely used for web graphics? ( )

(a) JPEG (b) PNG (c)GIF (d)TIFF

30. Which of the following is an example of a gateway device? ( )

(a) Router (b) Switch (c) Modem (d) Firewall

Section – B(Fill in the Blanks) **10x1=10**

31. $x\,Cos\,\alpha + y\,Sin\,\alpha = P$ is called _____ form of a straight line

32. $D(a^x)$ =_____

33. $\int Tanx\,dx$ = _____

34. $D(Tanx)$ =_____

35. Quantum dots are _____

36. Advantage of hydro power is _____

37. Quantum dots are mainly used in the field_____

38. _____ is a key component of DNA structure

39. ASCII stands for _____

40. Binary equivalent of the octal number 67 is _____

Section – C(Very short answer questions) **10x1=10**

41. Find the equation of the straight line parallel to the straight line $3x + 4y + 5 = 0$ and passes through (4, -5)

42. Find $\lim_{x\to 3} \frac{x^4 - 3^4}{x-3}$

43. Find $D(xTan^{-1}x)$

44. How has artificial intelligence been integrated with medical physics?

45.Which process involves the removal of dissolved impurities by forcing water through a semi – permeable membrane?

46. What is the primary environmental concern associated with open dumping of solid waste?

47. What is the full form of CADD?

48. What is the function of RNA in the cell?

49. What is modem?

50. What is the full form of Wi-Fi?

Section – D(Matching) **2x5=10**

I.

51.	$Sin\,0$	( )	a. $\sqrt{3}/2$
52.	$Cos\,0$	( )	b. 1/2.
53.	$Sin\,60$.	( )	c. 1
54.	$Cos\,60$	( )	d. $\sqrt{2}$
55.	$Sin\,45$	( )	e. 0
		( )	f. $\frac{1}{\sqrt{2}}$

II.

56.	Coagulation	( )	a. Chlorination
57.	Disinfection	( )	b. Settling of suspended particles
58.	Sedimentation	( )	c. Reverse osmosis
59.	Desalination	( )	d. Removing odor & taste
60.	Carbon adsorption	( )	e. Removal of suspended particles
		( )	f. Forcing water

Section – E (True Or False) **10x1=10**

61. Wind turbines can generate electricity at any time ( )
62. Pesticide use in agriculture causes acid rain ( )
63. Wood is an example of biomass energy ( )
64. The process of splitting atoms to release energy is known as chemical energy ( )
65. Wind energy converts sunlight into electricity ( )
66. Optical fiber is used for long distance communication ( )
67. Decimal equivalent of $(1110)_2$ is 15 ( )
68. Hexadecimal equivalent of 1238 is 4D7 ( )
69. Cable modem works with the help of Telephone line (T)
70. Computer science is depended on hexadecimal number system (F)