

SECTION I [APPLIED SCIENCE (CHEMISTRY)]

1. -----transition exhibits the lowest absorptivity in the electronic spectroscopy.
A) π to π^* transitions
B) σ to σ^* transitions
C) d-d transition
D) None option is correct
2. What is the degeneracy of the rotational energy level with $J = 3$ for CO.
A) 7
B) 5
C) 3
D) 2
3. Which protein has iron transport major function-----
A) Serum transferrin
B) Haemoglobin
C) Myoglobin
D) Lactoferrin
4. ----- molecules of oxygen can bind to haemoglobin
A) 4
B) 1
C) 3
D) 2
5. Which of the following is the function of white blood cells?
A) Transport oxygen.
B) Maintain homeostasis.
C) Defend against infection.
D) Produce haemoglobin
6. Which protein/enzyme exhibits the main biological function of electron transfer----
A) Serum transferrin
B) Haemoglobin
C) Myoglobin
D) Cytochrome *c*
7. Which of the following is a non-heme iron containing protein
A) Hemerythrin
B) Haemoglobin
C) Myoglobin
D) Catalase
8. What material is used for coating of platinum foil in hydrogen electrode?
A) Lead
B) Copper
C) platinum black
D) Iron

9. What is the reduction potential of a half-cell at 298.15 K, containing Pt electrode immersed in 0.5 M Fe^{2+} and 0.01 M Fe^{3+} . The standard reduction potential of $\text{Fe}^{3+}/\text{Fe}^{2+}$ is 0.771 volt.
- A) 0.83 volt
 - B) 0.67 volt
 - C) -0.71 volt
 - D) 0.83 volt
10. The correct unit of entropy is generally given by?
- A) Watt
 - B) Meter
 - C) $\text{J K}^{-1} \text{mol}^{-1}$
 - D) Ohm^{-1}
11. Consider the coordination compound, $\text{Na}_2[\text{Pt}(\text{CN})_4]$. The Lewis acid is
- A) $[\text{Pt}(\text{CN})_4]^{2-}$
 - B) Na^+
 - C) Pt^{2+}
 - D) CN^-
12. What is the oxidation number of the central metal atom in the coordination compound, $[\text{Pt}(\text{NH}_3)_3\text{Cl}]\text{Cl}$?
- A) -1
 - B) 0
 - C) +1
 - D) +2
13. The ----- sphere is enclosed in brackets in formulas for complex species, and it includes the central metal ion plus the coordinated groups.
- A) Ligand
 - B) Donor
 - C) Oxidation
 - D) Coordination
14. Which one of the following complexes can exhibit geometrical isomerism?
- A) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ (square planar)
 - B) $[\text{Zn}(\text{NH}_3)_2\text{Cl}_2]$ (tetrahedral)
 - C) $[\text{Cu}(\text{NH}_3)_4]^{2+}$ (square planar)
 - D) $[\text{Cu}(\text{CN})_2]^-$ (linear)
15. Paramagnetism is a property of
- A) Completely filled electronic sub-shells
 - B) Unpaired electrons
 - C) Non-transition elements
 - D) m.pt. and b. pt. of elements.

16. The compound having tetrahedral geometry is
- $[\text{Ni}(\text{CN})_4]^{2-}$
 - $[\text{Pd}(\text{CN})_4]^{2-}$
 - $[\text{PdCl}_4]^{2-}$
 - $[\text{NiCl}_4]^{2-}$
17. In which one of the following species does the transition metal ion have d^3 electronic configuration?
- $[\text{Cr}(\text{NH}_3)_6]^{3+}$
 - $[\text{Co}(\text{OH}_2)_6]^{2+}$
 - $[\text{Ni}(\text{OH}_2)_6]^{2+}$
 - $[\text{Fe}(\text{CN})_6]^{3-}$
18. Which of the following is not an IR vibrational mode?
- Stretching
 - Scissoring
 - Rocking
 - Rolling
19. The slope of $\ln k$ vs $1/T$ plot for first order reaction is about -5000, what the activation energy for the system
- 1.0 k cal/mole
 - 10 k cal/mole
 - 100 k cal/mole
 - 50 k cal/mole
20. Where does a carbonyl ($\text{C}=\text{O}$) stretch appear in an IR spectrum?
- 1800-1740
 - 2100-1970
 - 3640-3250
 - 1600-1100
21. The term symbol for $L=2$ and $S=1$ is given as
- $^2\text{S}_2$
 - $^1\text{S}_0$
 - $^3\text{D}_{3,2,1}$
 - $^2\text{P}_1$
22. The effective nuclear charge for the 2s or 2p electron in carbon is
- 0
 - 3.25
 - 2.25
 - 3.15
23. For a diatomic molecule which behaves as a simple harmonic oscillator, the energy gap between the ground state and first excited energy levels is given to -----
- $h\nu$
 - $2 h\nu$
 - $(1/2)h\nu$
 - $(5/2)h\nu$

24. If vibrational frequency ($\tilde{\nu}$) for NO is $\sim 1904 \text{ cm}^{-1}$ then force constant (k) in NO is equal to
A) 1125 N/m
B) 1235 N/m
C) 1410 N/m
D) 1595 N/m
25. Consider a particle in the 3-D cubical box potential. For the first excited state (112),
A) There are 5 states having same energy
B) There are 3 states having same energy
C) There are 6 states having same energy
D) is non-degenerate
26. For spin product function, $\alpha(1)\alpha(2)$, the resultant spin quantum number (M_s) is given as-
A) 1/2
B) 0
C) 1/2
D) 1
27. BrF_5 belongs to the point group
A) C_{2v}
B) C_{3v}
C) C_{4v}
D) C_{5v}
28. What is the entropy change when two moles of an ideal gas expand isothermally and reversibly from a volume 1 dm^3 to a volume of 10 dm^3 at 300 K.
A) 38.29 JK^{-1}
B) 48.19 JK^{-1}
C) 60.15 JK^{-1}
D) 10.32 JK^{-1}
29. What is the source of shielding and deshielding in NMR?
A) Proton
B) Neutron
C) Photon
D) Electron
30. The conversion of Triplet state (T_1) of a molecule to singlet state (S_0) is known as
A) Fluorescence
B) Phosphorescence
C) Intersystem crossing
D) Internal conversion
31. Hunsdiecker reaction is used for the synthesis of
A) Alkyl nitrite
B) Alcohols
C) Alkyl chlorides and bromides
D) Ketenes

32. If 70% of a first order reaction was completed in 50 minutes, 50% of the same reaction would be completed in approximately

- A) 1728 seconds
- B) 728 seconds
- C) 28 seconds
- D) 8 seconds

33. The Freundlich and BET adsorption isotherm can be used to model:

- A) Multilayer adsorption
- B) Monolayer absorption
- C) Zero layer absorption
- D) None of correct

34. In -----, the half-life is independent to the initial concentration of reactant.

- A) Zero order reaction
- B) First order reaction
- C) Second order reaction
- D) Third order reaction

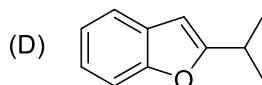
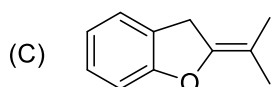
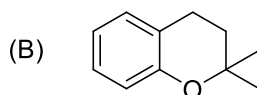
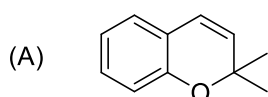
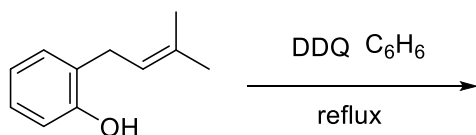
35. A molecule that cannot be superimposed on its mirror image is said to exhibit which of the following?

- A) Linkage isomerism
- B) Coordination isomerism
- C) Geometrical isomerism
- D) Optical isomerism

36. Which species is iso-electronic with BH^{-1} ?

- A) CH
- B) CN^{-1}
- C) CO
- D) NO

37. The major product of following reaction is:



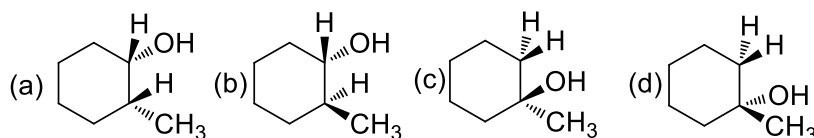
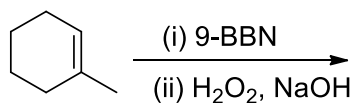
38. At what m/z you will get a peak in the mass spectrum when 2-pentanone undergoes McLafferty rearrangement?

- A) 71
 B) 58
 C) 43
 D) McLafferty rearrangement is not possible

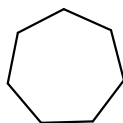
39. The chemical shift value for the CH₃ protons of CH₃Br, is 2.7 ppm when the spectrum is obtained at 100 MHz. What would be the chemical shift of these protons when the spectrum is recorded at 300 MHz?

- A) 5.1
 B) 7.1
 C) 2.7
 D) 1.4

40. The major product of following hydroboration-oxidation reaction is:



41. How many peaks do you expect in the proton decoupled ¹³C spectra of following molecule?

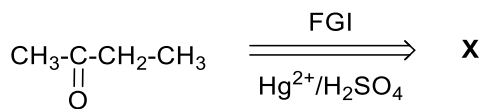


- A) 4
 B) 1
 C) 3
 D) 7

42. The rate of abstraction of proton by Br radical would be highest in

- A) Me₂CH-H
 B) PhCH₂-H
 C) Ph₃C-H
 D) MeCH₂-H

43. Which of the starting material (X) you will use for following functional group interconversion?



- (A) H₃C-C≡C-CH₃
 (B) CH₃CH₂CH₂CH₃
 (C) CH₂=CH-CH₂-CH₃
 (D) Both (a) and (b)

44. Which of the following conditions(s) favors the formation of thermodynamic enolates?

- A) Weaker base
 B) Protic solvent
 C) High temperature
 D) All A, B & C

45. Nucleophilic substitution of *p*-chlorotoluene in the presence of $\text{NaNH}_2/\text{NH}_3$ would provide which of the following as major product
A) *o*-methylaniline B) *p*-methylaniline
C) *m*-methylaniline D) Both *m*-methylaniline and *p*-methylaniline in 50:50
46. Consider the substitution reaction of $(\text{CH}_3)_3\text{-Cl}$ with CN^- ion in polar protic solvent, If the concentration of CN^- ion is doubled, the rate of formation of product (i.e. $(\text{CH}_3)_3\text{-CN}$) will:
(A) Double (B) Remain the same
(C) Become half (D) Increase four time
47. According to Slater rule, each electron in the same group contributes 0.35, the electron in the 1s group contributes-----
A) 0.5
B) 1
C) 0.5
D) 0.30
48. Shielding is the effective reduction in charge of a nucleus by surrounding electrons, the effective nuclear charge is given by-----
A) $Z_{\text{eff}} = Z + \sigma$
B) $Z_{\text{eff}} = Z - \sigma$
C) $Z_{\text{eff}} = Z + \sigma^2$
D) $Z_{\text{eff}} = Z - \sigma^2$
49. When a diatomic molecule behaves as simple harmonic oscillator, the zero-point energy is equal to-
A) kT
B) $1/2kT$
C) $h\nu/2$
D) $h\nu$
50. In a system when the chemical potential of each component is the same for all the phases, the equilibrium is said to be -----
A) Metastable equilibrium
B) Thermal equilibrium
C) Composition equilibrium
D) Mechanical equilibrium

SECTION II (RESEARCH METHODOLOGY)

51. Research is
- A) Producing available knowledge again and again
 - B) Finding solution to any problem
 - C) Working in a scientific way to search for truth of any problem.
 - D) None of the above
52. Computed measure of how much scores vary around the mean score.
- A) range
 - B) standard deviation
 - C) normal curve
 - D) skewed distribution
53. Which of the following statements is true?
- A) The mean is a continuous variable.
 - B) The variance and standard deviation of a normal population are equal.
 - C) For large samples, the distribution of scores is approximately normal.
 - D) None of the above
54. Taking someone else's words or ideas and taking credit for them as your own.
- A) cite
 - B) plagiarism
 - C) paraphrase
 - D) credit
55. What steps are involved in a central tendency test?
- A) Addition, subtraction, and division.
 - B) Determination of mean, median, and mode.
 - C) Addition, subtraction, multiplication, and division.
 - D) None of the above
56. Random sampling is also called _____.
- A) Availability sampling
 - B) Probation sampling
 - C) Probability sampling
 - D) Prospect sampling
57. What is the Median of the following data sample?
2, 7, 4, 8, 9, 10, 6, 12, 13
- A) 8
 - B) 11
 - C) 9
 - D) 10
58. Which of the following statements is CORRECT?
- A) Research is a hurried activity.
 - B) Research starts with a problem and ends with a problem.
 - C) Research is not a contributing factor of progress.
 - D) Research is an investigation where you look for answers that are already there.

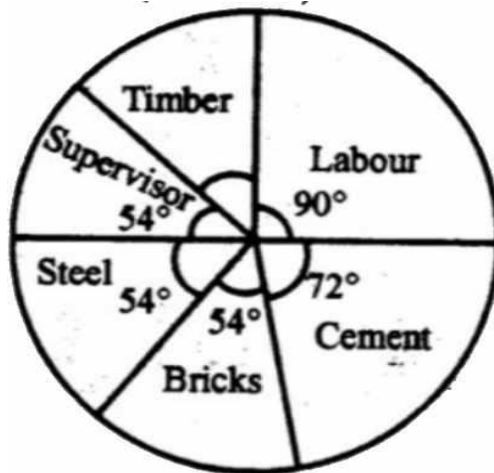
59. Which of the following has same mean median and mode?
- A) 6,5,2,4,3,4,1
 - B) 4,2,2,1,3,2,3
 - C) 2,3,7,3,8,3,2
 - D) 4,3,4,3,4,6,4
60. Resource libraries, economic census, trade shows & associations would be examples of what kind of data sources?
- A) Tertiary
 - B) Secondary
 - C) Primary
 - D) Unprofessional
61. The purpose of correlation research is to:
- A) study the relationship between two or more than two variables
 - B) predict the criterion variable on the basis of predictor variable
 - C) Both (1) and (ii)
 - D) Neither (i) Nor(ii)
62. It is sometimes called “central location” or just “center”. It is a way to describe what’s typical for a set of data. It is called.
- A) Middle destination
 - B) Center fold
 - C) Central Tendency
 - D) Mid frequency
63. Which is NOT a step of the scientific method?
- A) Hypothesis
 - B) Analyse data
 - C) Count items
 - D) Report Findings
64. In order to pursue the research, which of the following is priorly required?
- A) Developing a research design
 - B) Formulating a research question
 - C) Deciding about the data analysis procedure
 - D) Formulating a research hypothesis
65. Every person in the population has an equal chance of being selected -which sampling method
- A) Systematic sampling
 - B) Quota sampling
 - C) Volunteer sampling
 - D) Random sampling

66. When a distribution of scores is skewed, which of the following is the most representative measure of central tendency?
- A) Inference
 - B) Standard deviation
 - C) Mean
 - D) Median
67. An even spread of a variable that is symmetrical about the mean median and mode.
- A) bar graph
 - B) histogram
 - C) scatter graph
 - D) normal distribution
68. A diagram with rectangles showing values or numbers.
- A) Pictogram
 - B) Pie chart
 - C) Bar chart
 - D) Line graph
69. Type of research that solve practical issues is;
- A) Fundamental research
 - B) Exploratory research
 - C) Applied research.
 - D) Empirical research
70. What should not be included in the conclusion?
- A) literature review
 - B) summary
 - C) implication
 - D) major findings
71. A variable that is being manipulated is_____
- A) Independent variable
 - B) dependent variable
 - C) confounding variable
 - D) extraneous variable
72. What is qualitative research?
- A) Observation and description of activities, situations, attitudes, or behaviors of a specific group of people.
 - B) Analysis of numerical data.
 - C) Numerical comparisons and statistical inferences.
 - D) None of above
73. A standard deviation can never be
- A) positive
 - B) negative
 - C) zero
 - D) None

74. The sample standard deviation is denoted by:
- A) s
 - B) p
 - C) Σ
 - D) σ
75. First step of an investigation is _____ .
- A) collection of data.
 - B) presentation of data.
 - C) analysis of data.
 - D) explanation of data.
76. The sum of absolute deviations about median is _____.
- A) the least
 - B) the greatest
 - C) zero
 - D) equal
77. When the value of $r=0$, it is said to be _____.
- A) no correlation.
 - B) positive.
 - C) perfect positive.
 - D) perfect negative.
78. The straight-line trend is represented by the equation _____.
- A) $y=a+bx$
 - B) $y=mx$
 - C) $y=ax/ay$
 - D) $y=a*bx$
79. In discrete and continuous frequency distributions $N=$ ____ .
- A) the sum of frequency.
 - B) number of observations.
 - C) minimum value.
 - D) maximum value.
80. _____ is used to compare the variability of two or more than two series.
- A) Mean.
 - B) Standard deviation.
 - C) Coefficient of variation.
 - D) Mean deviation.
81. The simplest device for ascertaining whether two variables are related is to prepare a dot chart is called _____ .
- A) graphical method.
 - B) scatter diagram method.
 - C) method of least square.
 - D) concurrent deviation method.

82. A bag contains 10 black and 20 white balls; a ball is drawn at random. What is the probability that it is black?
- A) $\frac{1}{2}$
 - B) $\frac{1}{3}$
 - C) 0
 - D) 3
83. Diagrams are for _____
- A) the use of exports.
 - B) better quantitative picture.
 - C) better mental appeal
 - D) the use of imports.
84. Which of the following is not a type of research design?
- A) Experimental design
 - B) Descriptive design
 - C) Correlational design
 - D) Probability design
85. What is a research hypothesis?
- A) A tentative explanation for a phenomenon
 - B) A statement that is proven to be true
 - C) A prediction of what the researcher expects to find
 - D) A statement of fact
86. What is the purpose of a pilot study?
- A) To test the feasibility of the research design
 - B) To test the reliability and validity of the measures
 - C) To determine the appropriate sample size
 - D) To collect preliminary data
87. In five One-Day Internationals, a batsman has scored 31,97,112, 63, and 12 runs. the quality deviation of the info is-
- A) 21.78
 - B) 23.79
 - C) 25.79
 - D) 26.77
88. Determine the mode of the decision received seven days in a row: 11,13,13,17,19,23,25
- A) 11
 - B) 13
 - C) 17
 - D) 23

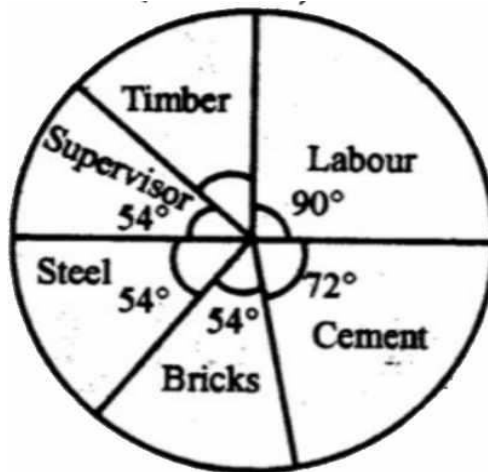
89. The following pie chart comprises the cost of constructing one house. The total cost was Rs. 6 lakhs



The amount spent on cement is

- A) Rs.2,00,000
- B) Rs.1,60,000
- C) Rs.1,20,000
- D) Rs.1,00,000

90. Referring to chart below,



the amount spent on cement, steel and supervision is what percent of the total cost of construction?

- A) 40%
- B) 45%
- C) 50%
- D) 55%

91. Table shows the mobile phones sold on different days by different sellers. Read the table carefully and answer the questions.

Mobiles Phones Sellers	Day						
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
P	40	45	48	28	50	24	20
Q	90	92	27	12	16	98	26
R	80	36	30	13	28	62	47
S	60	46	12	64	52	34	76
T	48	18	58	69	70	10	15

Find the difference of mobile phones sold by P and R together on Monday to the mobile phones sold by S and T on Wednesday.

- A) 60
- B) 50
- C) 80
- D) 20

92. Referring to above table, Find the ratio of mobile phones sold by Q on Tuesday and Saturday together to the mobile phones sold by R on Thursday and Sunday together.

- A) 7 : 19
- B) 19 : 5
- C) 19 : 6
- D) 2 : 5

93. The frequency distribution of a numerical data can be graphically represented by a _____

- A) Histogram
- B) Telegram
- C) Monogram
- D) Anagram

94. Which one of the following is not the graphical representation of statistical data:

- A) Bar graph
- B) Histogram
- C) Frequency polygon
- D) Cumulative frequency distribution

95. In a histogram, each class rectangle is constructed with base as

- A) frequency
- B) class-intervals
- C) range
- D) size of the class

96. What does the command `\documentclass{article}` do in LaTeX?
- A) It sets the document class as an article
 - B) It creates a new section in the document
 - C) It sets the font style of the document
 - D) It creates a new document
97. What does the command `\begin{center}` do in LaTeX?
- A) It creates a new center-aligned section.
 - B) It sets the font size to center aligned.
 - C) It creates a new paragraph.
 - D) It centers the text or content.
98. Which of the following procedures would not be included in a programme of qualitative research?
- A) Assessment of effect size.
 - B) Development of appropriate research questions.
 - C) Clarification of the logic linking the data to research propositions.
 - D) Explanation of criteria for data interpretation.
99. What is the most common method of data collection in quantitative research?
- A) Interviews
 - B) Focus groups
 - C) Observation
 - D) Surveys/questionnaires
100. Which statistical test is used to determine if there is a significant difference between the means of two or more groups in quantitative research?
- A) t-test
 - B) ANOVA (Analysis of Variance)
 - C) Chi-square test
 - D) Regression analysis