Seat No.

M.Phil/Ph.D. Entrance Examination, October - 2021 CHEMISTRY/APPLIED CHEMISTRY/INDUSTRIAL CHEMISTRY

Day and Date : Wednesday, 20 - 10 - 2021 Time : 10.00 a.m. to 12.00 noon

Instructions : 1) All questions are compulsory.

- 2) Each question carries 2 marks.
- 3) Answers should be marked in the given OMR answer sheet by darkening the appropriate option.
- Use black ball point pen only for marking the circle. Do not make any **4**) stray mark on the OMR Answer Sheet.
- Follow the instructions given on OMR Sheet. 5)
- Rough work shall be done on the sheet provided at the end of question **6**) paper.
- 7) Only non-programmable calculators are allowed.

Many journals and editors encourage to use voice because it is less 1) verbose and unambiguous.

- (A) simple (B) complex
- (D) passive (C) active

2) Ideal literature search should include review material of last years.

- (A) five (B) two
- (C) three (D) eight

Learning to communicate with others is key to . 3)

- (A) never being misunderstood
- (B) eliminating all of your listeners' physiological noise
- (C) winning the approval of everyone around you
- (D) establishing rewarding relationship

Total Marks: 100



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Total No. of Pages : 12

- 4) Which of the three components are part of human communication process?
 - (A) Feedback, message, critiquing
- (B) Message, recording, feedback
- (C) Message, noise, feedback
- (D) Noise, feedback, jargon
- 5) Noise does the following
 - (A) enhances a message
 - (B) focuses wandering thoughts
 - (C) distorts or interferes with a message
 - (D) causes listener to listen to message more carefully
- 6) Message is a signal that serves as _____.
 - (A) stimuli for a mass audience (B) stimuli for a speaker
 - (C) noise reduction (D) stimuli for a receiver
- 7) If a researcher selects only 10 members as a sample from the total population of 5000 and considers it good because _____.
 - (A) he was a good researcher
 - (B) he was guided by his supervisor
 - (C) the population was homogeneous
 - (D) all of the above
- 8) What is deemed a good measure of the quality of a journal?
 - (A) The impact factor (B) The OPAC factor
 - (C) The influence factor (D) The intake factor
- 9) How can you utilize the knowledge gained after reading a journal article?
 - (A) Use the same ideas for your project
 - (B) Accept their ideas after all they are published authors
 - (C) Approach it with a questioning style
 - (D) Read it as a way of obtaining more information

10) Which of the following is the best way to test a hypothesis according to the hypothetico-deductive method?

- (A) By finding evidence which supports the hypothesis
- (B) By repeating a study looking for consistency in outcomes
- (C) By rejecting the hypothesis
- (D) By looking for instances where the hypothesis fails
- **11**) Which of the following is not true about e journals?
 - (A) They are distributed through digital methods
 - (B) They also have editors or editorial boards
 - (C) They are publications of serial nature
 - (D) They are always free of cost

12) Which of the following is not covered under Intellectual Property Rights?

- (A) Copyrights (B) Patents
- (C) Trade Marks (D) Thesaurus
- **13**) Allotropes of carbon are _____.
 - (A) graphite (B) graphene
 - (C) fullerene (D) all of these
- 14) Column chromatography separates molecules according to their
 - (A) Molecular size(B) Solubility(C) Polarity(D) Matrix

15) Beer's Law (or the Beer-Lambert Law) is _____.

- (A) A linear relationship between the intensity of a UV absorbance and the concentration of the analyte.
- (B) An inverse relationship between the IR stretching frequency and the energy of light
- (C) Used to calculate the chemical shift (δ) of an NMR resonance relative to that of the tetramethylsilane standard
- (D) Used to derive a molecular formula from the mass-to-charge ratio of an analyte.

16) Unit for Turbidometry is . (A) Nephelometric Turbidity Units (NTU) (B) Flourimetric Turbidity Units (FTU) (C) Turbidometric Turbidity Units (TTU) (D) All of the above 17) Which technique generally has the most complete atomization? (B) graphite furnace (A) flame (C) inductively coupled plasma (D) nuclear fusion 18) Hydride generation atomic absorption spectroscopy (HGAAS) is used for detection of -(A) As (B) Fe (C) Ca (D) Mn **19**) The glass transition temperature of polymer can be best analyzed by (A) TGA (B) DTA (C) DSC (D) DTG 20) For samples to be analyzed beyond 600 °C in TGA, the sample pan preferred would be _____. (A) steel (B) copper (D) alumina (C) aluminum 21) Overtone band arise due to (A) Anhormonocity (B) Deformations

(C) Stretching (D) None of these

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22) Which is the major product of the following reaction?



- **23**) Which one of the following represents sequential reactions involved in Robinson annulation?
 - (A) Tandem Michael-aldol reactions
 - (B) Tandem aldol-Michael reactions
 - (C) Tandem Knovengel-Michael reactions
 - (D) Tandem Michael-Knoevenagel reactions
- 24) Which reaction would result in a structure having a cyclohexene such as the following as a molecular signature?



- (A) The Friedal Crafts alkylation
- (B) The Wittig reaction
- (C) The Diels Alder reaction
- (D) The Claisen reaction
- **25**) The respective configurations of a and b are :



- (A) (2R,3S) and (2R,3R)
- (C) (2S,3S) and (2R,3R)
- (B) (2S,3R) and (2S,3R)(D) (2S,3R) and (2S,3S)

26) Predict the product of the following reaction.



- (A) (1R, 2S)-2,3,3-trimethylcyclohexanol + enantiomer
- (B) (R)-1,2,2-trimethylcyclohexanol + enantiomer
- (C) (1S, 2S)-2,3,3-trimethylcyclohexanol + enantiomer
- (D) (1R, 2S)-2,3,3-trimethylcyclohexanediol + enantiomer
- 27) Which lactam would be the main product of the following rearrangement of an oxime when the cis-trans isomerization of the oxime is retarded?



- **28)** Protection-deprotection and coupling between two amino acids components are important steps in peptide synthesis. Identify which one of the following is not used as a protecting group in the peptide synthesis.
 - (A) Benzoyloxycarbonyl
 - (B) N, N'-dicyclohexylcarbodiimide (DCC)
 - (C) 9-Flourenylmethoxycarbonyl (FMOC)
 - (D) tert-Butoxycarbonyl (BOC)

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29) With respect to the two reactions shown below, the correct statements about their stereochemical nature is : [where LDA=LiN(ⁱPr₂)]



- (A) The reactions are stereoselective, because P and Q are the same
- (B) The reactions are non-stereoselective, because P and Q are the same
- (C) The reactions are stereoselective, because P and Q are diastereomers
- (D) The reactions are enantioselective, because P and Q are enantiomers

30) Methyl ethers can be prepared by reaction of alcohols with

- (A) Alkyl halides (B) Diazomethane
- (C) Grignard reagent (D) None of these
- **31**) What is the correct name for this molecule?



- (A) (2R,3R)-2-bromo-3-chlorobutane
- (B) (2S,3R)-2-bromo-3-chlorobutane
- (C) (2S,3S)-2-bromo-3-chlorobutane
- (D) (2R,3S)-2-bromo-3-chlorobutane

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32) Identify the major product formed in the following reaction:



- **33)** Many ceramic materials consist of metal oxides or silicates with additives that give white or coloured pigments. Which combination of pigment and colour is incorrect?
 - (A) TiO_2 ; white (B) Cr_2O_3 ; green
 - (C) Cobalt oxides based pigments; blue (D) SnO₂; yellow

34) Why XRF spectrometer requires mono-energetic radiation source?

- (A) To provide good sensitivity
- (B) To provide high accuracy
- (C) To provide a proper range (D) To reduce unwanted background
- 35) Which of the following is also known as X-ray photoelectron spectroscopy?
 - (A) Auger electron spectroscopy
 - (B) Electron impact spectroscopy
 - (C) Electron spectroscopy for chemical analysis
 - (D) Secondary ion mass spectroscopy
- **36)** How many ESR lines would be possible for CD₃ radical?
 - (A) seven (B) five
 - (C) three (D) one

37) Mossbauer shift in the spectrum of AuCl was found to be _____ to that of AuBr and Aul.

- (A) lower (B) higher
- (C) equal (D) none of these

38) The most commonly used semiconductor is _____.

- (A) Carbon (B) Silicon
- (C) Germanium (D) Sulphur

39) Frequency below which no electrons are emitted from metal surface when irradiated with electromagnetic radiation is :

- (A) minimum frequency (B) angular frequency
- (C) maximum frequency (D) threshold frequency

40) Which type of the following radiation is least penetrating?

(A) Alpha(B) Gamma(C) Neutron(D) X-ray

41) In KMnO₄, MnO₄⁻ ion is deep violet in colour in solution though 'd' orbital of Mn is empty because

- (A) MnO_4^{-1} ion is covalent in nature (B) electronic spectra
- (C) charge transfer spectra (D) d-d transition

42) The shape of SF_4 according to VSEPR theory is _____.

- (A) square pyramidal (B) tetrahedral
- (C) trigonal bipyramidal (D) square planar

43) According to one of the Maxwell relations: $(\delta S/\delta V)_T = (?/\delta T)$

- (A) δT (B) δP
- (C) δE (D) δV

(B) $n_2 \delta \mu_1 + n_1 \delta \mu_2 = 0$ (A) $n_1\delta\mu_1+n_2\delta\mu_2=0$ (D) $n_2\delta\mu_1+n_1\delta\mu_2=0$ (C) $n_1\delta\mu_1+n_2\delta\mu_2=1$ 45) Out of Brauner's five types of adsorption isotherm type II show sigmoid type in which (A) El = 0(B) $El \leq EL$ (C) El = EL(D) EL < El**46**) The structure of amino acid at pH=6 is (B) $H_3N^+-CH_2COOH$ (A) $H_3N^+-CH_2COO^-$ (D) H_2N-CH_2COOH (C) $H_2N-CH_2COO^{-1}$ **47**) Free valence index is measure of _____. (B) Delocalization energy (A) π -bond energy (C) Bond order (D) Chemical reactivity **48**) In Hückel-Molecular Orbital theory α and β are respectively known as integrals. (A) resonance and exchange (B) coulomb and exchange (C) resonance and overlap (D) coulomb and overlap **49**) X-ray photo electron spectroscopy is measurement of energy of ejected electron (A) electrical (B) rotational (C) kinetic (D) vibrational **50**) In stripping voltammetry the first step is _____. (A) electrode stripping (B) electrodeposition (C) absorption (D) desorption

44) The correct form of Gibbs-Duhem equation for a two component system is

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Rough Work

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