Seat No.	

M.Phil/Ph.D. Entrance Examination, September - 2019
CHEMISTRY/APPLIED CHEMISTRY/INDUSTRIAL CHEMISTRY

Day and Date : Thursday, 19 - 09 - 2019   **Total Marks : 100**
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.
4) Use black ball point pen only for marking the circle. Do not make any stray mark on the OMR Answer Sheet.
5) Follow the instructions given on OMR Sheet.
6) Rough work shall be done on the sheet provided at the end of question paper.
7) Only non- programmable calculators are allowed.

SECTION - I

1. Review of literature refers to extensive, exhaustive and systematic survey of publications relevant to selected topic, which are _____.

   A) Articles & Review articles   B) Books & Newspaper

   C) Thesis   D) All the above

2. Interpersonal communication occurs only when _____

   A) an individual interacts with another person as a unique individual.

   B) three or more people are communicating with each other at the same time.

   C) intimate conversation takes place.

   D) an individual converses with people they have no interest in knowing.

P.T.O.

3. The ability to communicate effectively _____.

   A)   can be learned.

   B)   depends on the education level of those around you.

   C)   depends on not using technology to send messages.

   D)   is a natural talent that cannot be learned.

4. An example of physiological noise is _____.

   A)   a speaker using complex terms.

   B)   a lawn mower.

   C)   a humming air conditioner unit.

   D)   a listener reviewing weekend plans in his/her head.

5. To decode a message is to _____

   A)   interpret a message

   B)   reject a message

   C)   evaluate a message

   D)   translate ideas into code

6. Who said that the members of the same species are not alike?

   A)   Herbert Spencer

   B)   Darwin

   C)   Nicole

   D)   Edison

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. The essential qualities of a researcher are _____

   A) Spirit of free enquiry

   B) Reliance on observation and evidence

   C) Systematization or theorizing of knowledge

   D) All the above

9. What is the collection of terms or records in MARC called?

   A) System   B) Network

   C) Website   D) Database

10. Technological Gatekeeper is _____

    A) A formal method of giving current awareness service

    B) A method of technology assessment and evaluation

    C) A process of transfer of technology

    D) An informal mechanism of keeping user informed of relevant development

11. Protocol means _____

    A) Interchange of data between two devices

    B) Interchange of data between two computers

    C) Linkage between two computers

    D) Linkage between two devices

12. 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.

13. You are about to do a literature search, what would be the first stage?

A) Ask your lecturer for some articles.

B) Do a literature search online.

C) Read introductory textbooks.

D) Order some inter-library loans.

14. During XPS analysis the surface contamination is removed by _____

A) Anion sputtering

B) By polishing the surface

C) By vacuum

D) None of these

15. Which one of the following nuclei cannot be studied using Mossbauer Spectroscopy?

A) Fe   B) Sn

C) Sb   D) C

16. Thermal Analysis is defined as _____

    A) Measurement of concentration of materials as a function of temperature

    B) Measurement of solubility of materials as a function of temperature

    C) Measurement of physical properties as a function of temperature

    D) Measurement of line positions of crystals as a function of temperature

17. The most common technique for sampling particulates is _____

    A) sedimentation   B) filtration

    C) impingement   D) thermal precipitation

18. The matrix elements H_{ii} that appear on the diagonal of the determinant are called _____

    A) Coulomb integral   B) Bond integral

    C) Resonance integral   D) Overlap integral

19. Free valence index is measure of _____

    A) π-bond energy

    B) Delocalization energy

    C) Bond order

    D) Chemical reactivity

20. In Mössbauer spectroscopy, when the absorber nucleus is in chemical surroundings different from those of the source nucleus, it does not absorb at the same frequency. This effect is referred to as _____

    A) Isomer shift   B) Doppler shift

    C) Doppler effect   D) Spin effect

21. For normalized wave functions, the integral $\int \psi_i \hat{H} \psi_i d\tau$ is called as _____

A) Laplacian
B) Average energy theorem
C) Slater determinant
D) First order perturbation

22. An electrochemical method based upon measurement of current as a function of the potential applied to a tiny microelectrode is known as _____

A) High frequency titration
B) Potentiometry
C) Voltammetry
D) Electrogravimetry

23. Identify precursor required for Shapiro reaction.

A) Tosyl hydrazide
B) Tosyl hydrazone
C) Ketoxime
D) Tosyl amine

24. Trimethyl silyl iodide is used for protection of _____ functional group.

A) -OH
B) -CHO
C) -NH$_2$
D) -COOH

25. $H_2C{=}CH_2$ + CH_2N_2 $\longrightarrow$
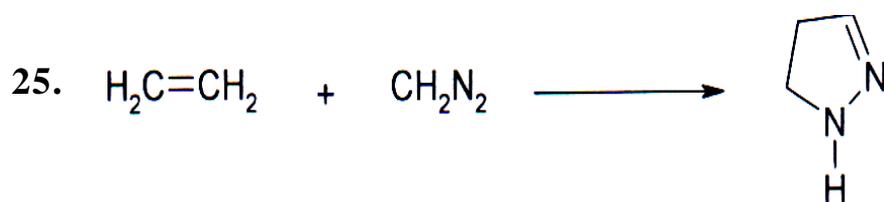
In this transformation diazomethane behaves as _____

A) 1,3-dipolar species
B) 1,2-dipolar species
C) 1,4-dipolar species
D) 1,5-dipolar species

26. Among the following the Newmann projection of meso - 2,3 butanediol is
_____.

A)

B)

C)

D)

27.

A)

B)

C)
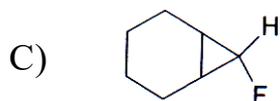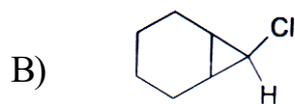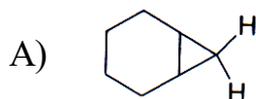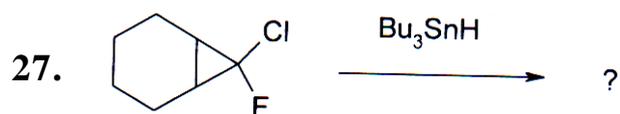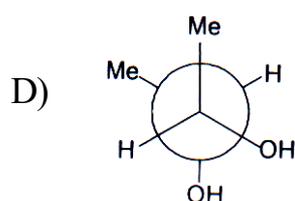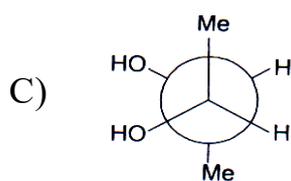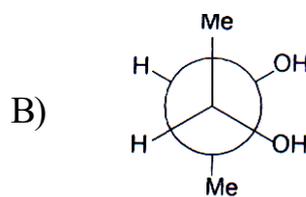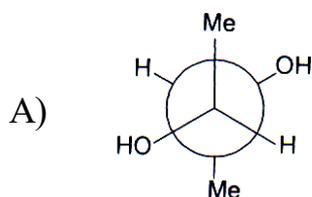
D) No reaction

28. In Sonogashira coupling aryl or vinyl halides are coupled with _____in the presence of Pd(0).

A) Terminal alkynes
B) Alkenes

C) Boronic acids
D) Disubstituted alkynes

29. Indentify the product in following transformation.

O_2N—⬡—COOH $\xrightarrow[\text{HOH}]{\text{BH}_3 / \text{THF}}$?

A) H_2N—⬡—CH_2OH

B) O_2N—⬡—CH_2OH

C) H_2N—⬡—COOH

D) H_2N—⬡—CHO
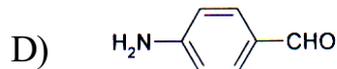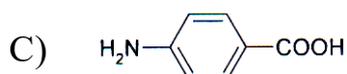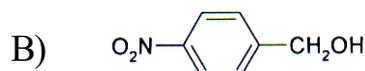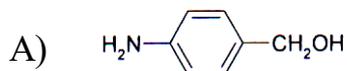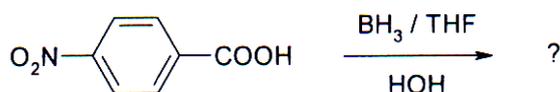
30. Trans diol is formed by _____

A) $KMnO_4$

B) OsO_4

C) Woodward reagent

D) Prevost reagent

31. In SN^1 reaction products are formed with _____ of configuration.

A) Retention

B) Racemic mixture

C) Inversion

D) None of these

32. Birch reduction of toluene would be expected to give _____ as the major product.

A) methylcyclohexane

B) 1-methyl-1,4-cyclohexadiene

C) 3-methlcycyclohexene

D) 3-methy1-1,4-cyclohexadiene
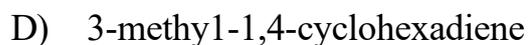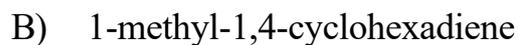
33. Identify the reaction which is useful to synthesize the following molecule.

R—⬡(—CO_2Et, —CO_2Et)

A) Friedal Crafts

B) Wittig reaction

C) Claisen reaction

D) Diels Alder

34. Which of the following compound is used for making crucible?

A) CeO_2 B) CeS

C) ThO_2 D) Nd_2O_3

35. The metal present in Chlorophyll is _____.

A) Mn   B) Mg

C) V   D) Cu

36. Diamond is an allotropic form of _____.

A) Carbon   B) Hydrogen

C) Nitrogen   D) Silicon

37. $[Ca\text{-}EDTA]^{2-}$ chelate complex has _____ membered rings.

A) Three   B) Two

C) Four   D) Five

38. Adecay series ends with a _____.

A) stable nuclide   B) parent nuclide

C) fission reaction   D) beta decay

39. If we add a trivalent impurity in the lattice of pure semiconductor Silicon it creates lots of _____.

A) holes   B) free electrons

C) valence electrons   D) bound electrons

40. Average momentum of a particle in a box, having box length of a, is _____.

A) a/2
B) Zero

C) $h/2\pi$
D) None of the above

41. To every observable in classical mechanics there corresponds a linear _____ operator in quantum mechanics.

A) Hamiltonian
B) Momentum

C) Legendre
D) Hermitian

42. What will be the molar entropy change upon vaporization of H_2O at 1 atm? Given: Enthalpy of vaporization = 40.7 kj mol^{-1}

A) 60.0 J.K^{-1} mol.$^{-1}$
B) 109.0 J.K^{-1}. mol^{-1}

C) 407 J.K^{-1}. mol^{-1}
D) 0.407 kJ.K^{-1}. mol^{-1}

43. Sackur - Tetrode equation represents entropic contribution due to _____ motion to the total entropy.

A) Translational
B) Rotational

C) Vibrational
D) Electronic

44. Ionic strength of 1.0 mol dm^{-3} NaC1 solution is _____ mol dm^{-3}.

A) 0.0
B) 2.0

C) 0.5
D) 1.0

45. Given that the standard potentials of the Cu^{2+}/ Cu and Cu^+/Cu couples are + 0.340 V and 0.522 V respectively, the standard potential of Cu^2/Cu^+ couple is _____ V.

A) 0.182
B) 0.862

C) 0.158
D) -0.158

46. Intrinsic viscosity depends on the molar mass as $\eta = KM^a$. The empirical constants K and 'a' are dependent on _____.

A) Solvents only

B) Polymer only

C) Polymer Solvent pair

D) Polymer-Polymer interactions

47. In case of heterogeneous catalysis which of the following is correct?

A) At least one reactant must be physisorbed on the catalyst.

B) At least one reactant must be chemisorbed on the catalyst.

C) The number of active sites decrease with increase in surface area.

D) Surface area can be determined by spectroscopic studies.

48. In the reaction N_2O_4 (g) $\leftrightarrow$ $2NO_2$ (g) an increase in pressure would result in _____

A) Increase in the amount of product

B) Increase in the amount of reactant

C) Have no effect on equilibrium

D) Initial increase and then decrease in the amount of product formed

49. To determine the surface area of a catalyst _____ equation is used.

A) Ilkovic

B) BET

C) Michealis - Menten

D) All of them

50. Water present in a sample solution for recording NMR can be minimized by _____

A) Diluting the solution

B) Concentrating the solution

C) Adding molecular sieves and equilibrating

D) Adding D_2O and equilibrating

❈ ❈ ❈

Rough Work