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P.G. Entrance Examination, June - 2022**M.Sc. CHEMISTRY****(Inorganic / Organic / Physical / Analytical Industrial / Applied)****Sub. Code : 58713****Day and Date : Friday, 10 - 06 - 2022****Total Marks : 100****Time : 10.30 a.m. to 12.00 noon**

- Instructions :**
- 1) All question are compulsory.
 - 2) Each question carries 1 mark.
 - 3) Answers should be marked in the given OMR answer sheet by darkening the appropriate option.
 - 4) Follow the instructions given on OMR sheet.
 - 5) Rough work shall be done on the sheet provided at the end of question paper.

- 1) Azeotropic mixtures are _____.
A) mixtures that will boil at different temperatures
B) mixtures of two solids
C) constant boiling mixtures
D) both B) and C)
- 2) The equation, $W_m = RT \ln k_p + \Delta_n RT$ Represents _____.
A) Van't Hoff isotherm
B) Van't Hoff isochore
C) Clapeyron equation
D) None of these
- 3) If one ligand of Co (III) octahedral complex is replaced by _____ then the substitution reaction is termed as acid hydrolysis reaction.
A) H_2O or H^+
B) OH^- or H^-
C) NH_3 or NH_2^-
D) HSO_4^- or SO_4^{2-}

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- 4) The following two characteristics are variable in Heisenberg Uncertainty principle _____.
A) charge and displacement B) position and momentum
C) position and distance D) atomic radius and frequency
- 5) The physical interpretation of wave function is given by _____.
A) Planck B) Germer
C) Einstein D) Max Born
- 6) In rotational spectra of isotopic species, the frequency separation of successive lines will be _____ for heavier isotopic molecule than for a lighter one.
A) smaller B) larger
C) equal D) none of the above
- 7) In rotational spectroscopy the, _____ transitions are allowed transitions.
A) $\Delta J = +1$ B) $\Delta J = -1$
C) $\Delta J = \pm 2$ D) both A) and B)
- 8) The _____ molecule is IR inactive.
A) CO B) HCl
C) NO D) H₂
- 9) The reaction giving maximum amount of product is known as ____ reaction.
A) major B) side
C) opposing D) consecutive

- 3-

- 16) The formula, $K = \frac{C_1}{\sqrt{C_2}}$ indicates that the solute is present as a _____ molecule in second solvent.
- A) single
B) double
C) triple
D) none of these
- 17) What is the role of oxine in aluminum assay?
- A) Surfactants
B) Colloidal
C) Precipitating agent
D) Emulsifier agent
- 18) In which step, ions or element are aggregated in Gravimetric analysis?
- A) Supersaturation
B) Nucleation
C) Particle growth
D) None of the above
- 19) _____ is/are gravimetric analysis methods.
- (i) Precipitation Method.
(ii) Volatilization Method.
(iii) Electrogravimetry Method.
(iv) Thermogravimetric Method
- A) All (i), (ii), (iii) and (iv)
B) Only (i)
C) Both (i) and (iii)
D) Both (i) and (iv)
- 20) For the separation of which of the following substances, Gas-solid chromatography is being used?
- A) Thermally stable organic components
B) Volatile organic components
C) Thermally stable inorganic components
D) Low molecular weight gaseous species

- 21) Compounds with low Rf value can be effectively separated by _____ paper chromatography.
- A) Radial/circular
B) Ascending
C) Descending
D) None of these
- 22) Gradient elution means _____.
- A) Combination of A, B, C mobile phases with varying polarity
B) Polar mobile phase and nonpolar stationary phase
C) Polar stationary phase and nonpolar mobile phase
D) Mobile phase A and B with ratio 1:2
- 23) The formula $C_6H_4O_2.C_6H_4(OH)_2$ represents _____.
- A) hydroquinone
B) quinhydrone
C) quinone
D) benzoquinone
- 24) Which of the following is an example of photochemical reaction?
- A) Decomposition of ammonia
B) Photosynthesis
C) Formation of NaOH
D) Decomposition of HCl
- 25) Fe is _____ form and Fe^{3+} is _____ form of iron metal.
- A) oxidised, reduced
B) both reduced
C) oxidised, oxidised
D) reduced, oxidised
- 26) The fraction of free atoms that are thermally excited is governed by _____ distribution.
- A) Boltzmann
B) Planks
C) Einstein
D) Lamberts-Beer

- 27) _____ methods are used in flame emission Spectrometry analysis.
- A) Standard addition method B) Internal standard method
C) Calibration curve D) All of these
- 28) Beer-Lambert's law gives the relation between _____.
- A) energy absorption and concentration
B) reflected radiation and concentration
C) scattered radiation and concentration
D) energy absorption and energy transmission
- 29) Absorption = _____.
- A) log of transmittance B) reciprocal of transmittance
C) negative log of transmittance D) $2 \times$ transmittance
- 30) The extinction coefficient is the O.D. for unit length or reciprocal of thickness 'x' required to reduce the light to _____th of its intensity.
- A) 1/5 B) 1/10
C) 1/100 D) 1/2
- 31) The water content of clarified cane juice is _____.
- A) 85% water B) 15% water
C) 65% water D) 9.11% water
- 32) Which density scale is used to measure sugar concentration?
- A) Trix B) Brix
C) Pan D) Calendria

33) What is the optimum pH for yeast growth?

- A) Alkaline B) Basic
C) Neutral D) Acidic

34) _____ polymer is prepared by polycondensation of phenol and formaldehyde.

- A) PVC
- B) Buna
- C) Polythene
- D) Bakelite

35) Critical solution temperature (CST) for nicotine-water system will be _____.

- A) lower 381K and upper 433K
B) upper 481K and lower 333K
C) upper 341K and lower 310K
D) upper 420K and lower 320K

36) What is the name of colourless, non-conducting, fully reduced state of PANI?

- A) leucoemeraldine B) pernigraniline
C) emeraldine D) amberlite

37) The prefix “nano” comes from a _____.

- A) French word meaning billion B) Greek word meaning dwarf
C) Spanish word meaning particle D) Latin word meaning invisible

38) _____ is a chemical method usually used for preparing die more uniform nanomaterials?

- A) Sol-gel
B) Co-precipitation
C) Solvothermal
D) Ceramic auto-combustion

39) Liquid junction potential can be minimized by using _____.

- A) porous partition B) Salt bridge
C) Semi permeable membrane D) None of these

40) Chemical cell without transference is a combination of _____.

- A) Electrode reversible to cation and metal insoluble salt electrode
B) Two electrodes reversible to cations
C) Two electrodes reversible to anions
D) None of these

41) Electrolytic cells are used to convert electric energy to _____.

- A) Electrical energy B) Chemical energy
C) Both A) and B) D) None of these

42) Best quality biodiesel is produced from _____.

- A) olive oil B) soya oil
C) animal fat D) canola oil

43) Lubricating oil is essentially _____.

- A) base oil B) acid oil
C) phenol oil D) neutral oil

44) Which promoter mentioned below is used in the contact process?

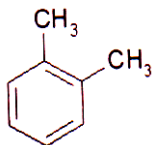
- A) Iron B) Alkali
C) Acid D) Air

- 45) Haber process is the name given to the industrial process for the manufacture of _____.
 A) Ammonia
 B) Nitric acid
 C) Sodium hydroxide
 D) Urea
- 46) The reactions which are caused by heat and in absence of light is called _____.
 A) Photochemical reactions
 B) Reversible reaction
 C) Dark reactions
 D) Reversible photochemical reaction
- 47) Sodium carbonate is prepared by using _____.
 A) Ostwald process
 B) Carnot process
 C) Solvay process
 D) Pearson process
- 48) In IR spectrum, band at 2200 cm^{-1} indicates presence of _____ functional group.
 A) $-\text{NO}_2$
 B) $-\text{CN}$
 C) $-\text{OH}$
 D) $-\text{CHO}$
- 49) Match the following :

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| I) UV | p) Nitrogen rule |
| II) ^1H NMR | q) $n+1$ rule |
| III) MS | r) Woodward fisher rule |
| IV) IR | s) Hook's law |

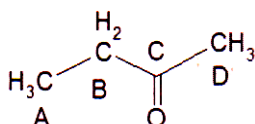
- A) I-r; II-q; III-p; IV-s
 B) I-p; II-q; III-r; IV-s
 C) I-q; II-r; III-s; IV-p
 D) I-r; II-s; III-p; IV-q

- 50) How many peaks one can observe for following molecule in ^1H NMR spectrum?

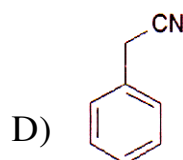
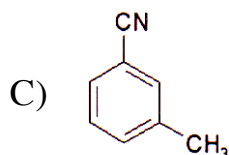
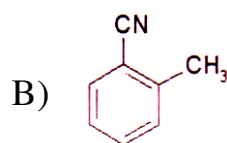
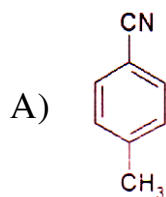


- A) 2
B) 3
C) 4
D) 5

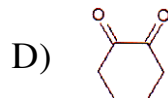
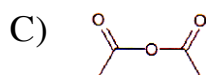
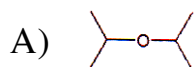
- 51) Identify the splitting of marked protons in following compound.



- A) A-triplet; B-quartet, C-No peak, D-singlet
B) A-singlet; B- triplet, C- quartet, D- No peak
C) A- No peak; B- singlet, C- triplet, D- quartet
D) A- singlet; B- quartet, C- No peak, D- triplet
- 52) NMR is the study of absorption of _____ by nuclei in a magnetic field.
A) Radioactive radiation
B) IR radiations
C) Radio frequency radiation
D) Microwave
- 53) Deduce the structure of organic compound from the following data.
M.F.= $\text{C}_8\text{H}_7\text{N}$
IR: 2220, 1620, 1570 cm^{-1}
 ^1H NMR(δ in ppm): 2.4 (2, 6 mm) 7.2 (d, J=8 Hz, 4mm), 7.5 (d, J = 8Hz. 4mm)



54) Identify the compound which will display only a singlet at δ 8.95 ppm in ^1H NMR.



55) Which of the following is false about wavelengths of electromagnetic radiation?

- A) Radiation with short wavelengths have high energies
- B) Energy does not depend on wavelength
- C) Radiation with long wavelengths have low energies
- D) Energy depends on wavelength

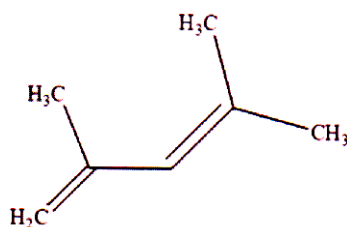
56) If wave length is 10 nm. So, what is the frequency?

- A) 0.5
- B) 0.10
- C) 0.6
- D) 0.3

57) The equation, $F' = C - P + 1$ is called as _____.

- A) phase rule
- B) reduced phase rule
- C) Gibbs rule
- D) both A) and C)

58) Calculate the λ_{max} for the following diene:



- A) 234 nm
- B) 273 nm
- C) 230 nm
- D) 241 nm

59) What is a red shift?

- A) The shifting of an absorption to higher energy.
- B) The shifting of an absorption towards the blue end of the spectrum.
- C) The shifting of an absorption to lower energy.
- D) The shifting of an absorption to shorter wavelength.

60) Which compound will show base ion peak at $m/z = 91$?

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| A) Acetophenone | B) Ethyl benzene |
| C) Benzaldehyde | D) Styrene |

61) In mass spectrometer, the sample that has to be analyzed is bombarded with which of the following?

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| A) Protons | B) Electrons |
| C) Neutrons | D) Alpha particles |

62) Tranquillizer is a functional drug belonging to a subclass of _____.

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| A) anti-inflammatory | B) CNS |
| C) anti-pyretic | D) none of these |

63) Which drug is used as an anti-malarial?

- | | |
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| A) Proguanil | B) Isoniazide |
| C) Phenobarbitone | D) benzocaine |

- 64)** The detection and estimation of methoxy group in organic compound is carried out by _____ method.
- A) Hoffmann method B) Herzig-Meyer's method
- C) Emde's degradation method D) Ziesel's method
- 65)** Presence of carbonyl group in an organic compound is indicated by formation of derivative with _____.
- A) Phenyl hydrazine B) methanol
- C) acetic anhydride D) None of these
- 66)** Diels-Alder reaction is also termed as _____ cycloaddition reaction.
- A) 1,4 B) 1,2
- C) 1,6 D) 1,3
- 67)** The reagent used for methylation is _____.
- A) OsO_4 B) DCC
- C) CH_2N_2 D) LAN
- 68)** Generally, the dotted lines in the phase diagram represent _____.
- A) stable equilibria B) true equilibria
- C) metastable equilibria D) both A) and C)
- 69)** The SeO_2 reagent is primarily used to oxidize _____ position.
- A) allylic B) benzylic
- C) both A) and B) D) neither A) nor B)

- 70) Homolytic fission of covalent bond forms _____.
A) cation
B) anion
C) oppositely charged ions
D) free radicals
- 71) The term Retrosynthetic analysis was introduced by _____.
A) E. J. Corey
B) Purcel and Bloch
C) Otto Diels and Curt Alder
D) Georg Wittig
- 72) Cyclohexanol on FGI (Functional Group Interconversion) gives _____.
A) cyclohexanone
B) cyclohexene
C) cyclohexane
D) 1,3 butadiene
- 73) In presence of water halogen reacts with alkene to form _____.
A) dihalide
B) halohydrin
C) diol
D) all of these
- 74) Compounds containing carbon-carbon double bond on ozonolysis form _____.
A) alcohols
B) carboxylic acids
C) aldehydes or ketones
D) diols
- 75) The extension of the lobes of the d orbitals which means the expansion of the d electron charge cloud, is known as _____.
A) Spectrochemical effect
B) Nephelauxetic effect
C) Jahn-teller effect
D) Crystal field effect

- 76) Which of the following method is more relevant to explain the nature of bonding involved in co-ordination complexes?
- A) Valence band theory B) Crystal field theory
C) Modified crystal field theory D) Molecular orbital theory
- 77) Which of the following is superconductor?
- A) $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ B) $\text{YBa}_3\text{Cu}_3\text{O}_{7-x}$
C) $\text{YBa}_2\text{Cu}_3\text{O}_{5-x}$ D) $\text{YBa}_3\text{Cu}_2\text{O}_7$
- 78) With increase in temperature, the conductivity of metal _____.
A) Increases B) Decreases
C) No change at all D) Is equal to insulator
- 79) The term fugacity has the dimensions of _____.
A) Temperature B) Volume
C) Pressure D) Length
- 80) What is the IUPAC name of $\text{B}(\text{CH}_2\text{CH}_3)_3$?
A) Boron triethylene B) Triethylboron
C) Triethylborane D) None of these
- 81) What is the oxidation state of Fe in $[\text{Fe}(\text{CO})_5]$ complex?
A) 2+ B) 3+
C) 0 D) Both 2+ and 3+
- 82) How many total σ -bonds (in between Ni and CO) are present in the structure of $\text{Ni}(\text{CO})_4$?
A) 0 B) 8
C) 4 D) 2

83) Which of the following is changed in a chemical reaction due to a catalyst?

- A) Internal energy B) Entropy
C) Enthalpy D) Activation energy

84) Homogenous catalysts are the one _____.

- A) which has same phase as that of the products.
B) which makes reactants homogenous.
C) which has same phase as that of reactants.
D) which is homogenous at room temperature.

85) Carbon dating method of age determination is based on the fact that _____.

- A) C14 fraction is same in all objects
- B) C14 is highly insoluble
- C) Ratio of Carbon-14 and Carbon-12 is constant
- D) All the above

86) When ^{235}U is bombarded with one neutron, fission occurs and the products are three neutrons, ^{94}Kr , and _____.

- A) ^{139}Ba
B) ^{141}Ba
C) ^{139}Ce
D) ^{139}Xe

87) When an atomic nuclei emits an alpha particle, it leads to a _____.

- A) Decrease of 2 units in the charge of the atom
B) Increase of 2 units in the mass of the atom
C) Decrease of 2 units in the mass of the atom
D) Increase of 4 units in the mass of the atom

95) _____ metal is involved in blood clotting.

- A) Ca B) Fe
C) Cd D) Pb

96) The function of haemoglobin is to transport _____ from lung to tissue and _____ from tissue to lungs.

- A) O₂, CO₂
B) CO₂, O₂
C) O₂, CO
D) CO, O₂

97) Liquid ammonia is _____ solvent.

- A) aprotic B) protonic
C) universal D) acidic

98) Soft-soft interaction produces _____ compounds

- A) Ionic B) covalent
C) complex D) co-ordinate

99) Which of the following does not obey EAN rule?

- A) $[\text{Cu}(\text{NH}_3)_4]^{2+}$
B) $[\text{Zn}(\text{OH})_4]^{2-}$
C) $[\text{HgI}_4]^{2-}$
D) $\text{Fe}(\text{CO})_5$

100) The co-ordination number and oxidation state of Al in $K_3[Al(C_2O_4)_3]$.

- A) 3 and +3 B) 6 and -3
C) 3 and -3 D) 6 and +3



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