Seat No.	

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SHIVAJI UNIVERSITY, KOLHAPUR

M. Sc. Entrance Examination-2023

Subject : CHEMISTRY

Sub. Code : 58713

Day and Date : Tuesday, 08-08-2023 **Total Marks : 100**

Time : 10.30 a.m. to 12.00 noon.

1. $\left(\frac{\partial A}{\partial T}\right)_V$ = ?

   a) G b) P

   c) S d) -S

2) The ratio of fugacity of substance in a given state to that in its standard state is known as ..... of a substance.

   a) activity b) molarity

   c) concentration d) chemical potential

3) Condensation of gases in the narrow capillary pores of the adsorbent at pressures even below the saturation pressure of the gas is known as .....Condensation of the gas

   a) Molecular b) partial

   c) complete d) capillary

4) The free energy during adsorption process

   a) Decreases b) increases

   c) remains constant d) none of these

5) Species having strong tendency to accept electrons & form ionic bond with base, are called

   a) Hard base b) Hard acid

   c) Soft base d) Soft acid

6) HSAB concept can be used to determine:

a) Stability of complexes

b) Predicting feasibility of reactions

c) Solubility of compounds in a given solvent

d) All the above

7) In biological system, the metal ions involved in electron transport are:

a) Zn^{2+} and Mg^{2+} b) Na^{2+} and K^{2+}

c) Ca^{2+} and Mg^{2+} d) Cu^{2+} and Fe^{2+}

8) Sodium and potassium pumps are examples of .....

a) Plasmolysis b) Active transport

c) Passive transport d) Osmosis

9) Brine is saturated solution of.....

a) NaCl b) NaOH

c) KCL d) CsCl

10) Solvay process is used to make

a) Potassium carbonate b) Sodium carbonate

c) Sodium hydroxide d) Sodium chloride

11) Which gas is evolved at the cathode in aqueous medium?

a) Chlorine b) Hydrogen

c) Oxygen d) Nitrogen

12) What is the unit of current density?

a) A/sq.ft b) A/dm^3

c) Both a) and b) d) None of these

13) Non-volatile compounds can be best analyzed by

a) gas chromatography

b) liquid column chromatography

c) thin layer chromatography

d) size exclusion chromatography

14)..... principle is used in water purification technology.

a) high performance liquid chromatography

b) size exclusion chromatography

c) ion exchange chromatography

d) affinity chromatography

15) The detector commonly used in liquid chromatography are .....

a) flame ionization detector

b) thermal conductivity detector

c) refractive index detector

d) both a and b

16) Compounds with low Rf value can be effectively separated by ..... paper chromatography.

a) Ascending b) Descending

c) Radial/circular d) None of these

17) In gas chromatography, the separation of compounds is best achieved by.....

a) temperature programming b) gradient elution

c) isocratic elution d) gravimetric separation

18) 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

19) The ion exchange resins are characterized by .....

a) percentage of ion active groups

b) number of ion active groups

c) gram equivalent of ions

d) the ability to exchange positive ions

20) The solution used for elution is called.....

a) eluent b) effluent

c) eluate d) elution

21) Cation exchanger possesses ..... charged groups and anion exchanger possess ..... charged groups.

a) positive; negative b) negative; positive

c) positive; neutral d) negative; negative

22) Which of the following detectors have high sensitivity to all organic compounds?

a) Sulphur chemiluminescense detector

b) Thermionic emission detector

c) Flame ionization detector

d) Argon ionisation detector

23) Gravimetric analysis in which weight change as a function of temperature/ time is measured .....

a) Electrogravimetry b) Thermogravimetry

c) Volatilisation gravimetry d) Precipitation gravimetry

24) How many types of gravimetric analysis?

a) One b) Two

c) Three d) Four

25) When the foreign ions gets trapped in the growing crystal, it is called as....

a) Inclusion b) Mechanical Entrapment

c) Surface adsorption d) Occlusion

26) Gravimetric analysis is governed by .....

a) The law of mass action and reversible reactions

b) The principle of solubility product

c) The common ion effect

d) All the above

27) What is the role of oxine in aluminum assay?

a) Surfactants b) Colloidal

c) Precipitating agent d) Emulsifier agent

28) In gravimetric analysis, crucibles are used when the precipitates are dried in the muffle furnace.

a) Crucible made of porcelain b) Crucible made of silica

c) None of the above d) Both porcelain or silica

29) What is a supersaturation?

a) Solution containing low amount of solute

b) Solution containing equilibrium amount of solute

c) Solution containing more amount of solute than normal circumstances

d) None of this.

30) In which step, ions or element are aggregated in Gravimetric analysis"?

a) Supersaturation b) Nucleation

c) Particle growth d) None of the above

31) The process that contaminates the precipitates and also carries the precipitate solution containing soluble impurities is called .....

a) Coprecipitation b) Post precipitation

c) Digestion d) Reprecipitation

32) OSTWALD ripening is

a) Re precipitation b) Dissolved small precipitate

c) Produced larger precipitate d) All of the above

33) Which relationship is true regarding molecular energy levels?

(a) E(vibrational)>E(electronic) > E(rotational)

(b) E(rotational) E(vibrational) > E(electronic)

(c) E(electronic) > E(rotational) E(vibrational)

(d) E(electronic) > E(vibrational) > E(rotational)

34) The Rotational energy level for particular state (state) is given as

(a) $E_J = \frac{\hbar^2}{2I} J(J+1)$

(b) $E_J = \frac{\hbar^2}{2I} J(J+2)$

(c) $E_J = \frac{\hbar^2}{I} J(J+1)$

(d) $E_J = J(J+1)$

35) The wavelength in the visible region ranges from..... to .....

(a) 400, 760 (b) 200, 760,

(c) 200, 400 (d) 190, 400

36) A device for measuring a response of photocell is called.....

(a) Voltmeter (b) Conductometer

(c) Galvanometer (d) All of theses

37) The observed electronic configuration of holmium is

a) [Xe] 41°5d 6s b) [Xe] 4f25d6s

©) [Xej4f!!5g6g7 d) [Xe] 4f45d6s

38) .....are the anomalous oxidation states of lanthanides.

a) +1, +3 b) +2, +4

c) +3, +3 d) +2, +3

39) In the L. D. process, the pure and dry oxygen is introduced into molten mass through copper lance under pressure of..... pounds per square inch.

a) 50-90 b) 100-175

c) 95-150 d) 150-95

40) Steel contains about..... percent of chromium with carbon and nickel is called stainless steel.

a) 5-10 b) 16-20

c) 10-15 d) 16-25

41) Ethyl mercapton is added to LPG to

a) increase its colorific value b) make it flammable

c) timely leakage detection d) make it coloured

42) Petroleum resources are highest in .....

a) Iraq b) Venezuela

c) India d) United Arab Emirates

43) 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

44) During electrolysis current produces due to.....

a) Flow of ions b) Flow of electrons

c) Both a and b d) None of these

45) Photochemical reactions takes place by the absorption of.....

a) UV and visible radiation b) IR radiation

c) heat energy d) none of the above

46) Photosynthesis is an example of....

a) Fluorescence b) Phosphorescence

c) Chemiluminescence d) Photosensitization

47) Condensation reaction of activated methylene compound and aldehyde or ketone is called as ..... reaction.

a) Michael b) Knoevenagel

c) Wittig d) Dickmann condensation

48) Rearrangement involving change in carbon skeleton through carbocation intermediate is called as .....

a) Wagner-Meerwein b) Knoevenagel

c) Diels-Alder d) Wittig

49) Cinnamaldehyde can be prepared by ....using benzaldehyde and acetaldehyde.

a) Aldol condensation
b) Claisen condensation
c) Perkin reaction
d) Diels-Alder reaction

50) Synthetic equivalent for alkyl anion is .....

a) Grignards reagent
b) alkyl halide
c) Tollen's reagent
d) alkane

51) Propene on reaction with HBr in presence of peroxide forms.....

a) 1-bromo propene
b) 2-bromo propene
c) 1,2-dibromo propene
d) 1,3-dibromo propene

52) Alkenes form 12 diols on reaction with.....

a) dil. $H2SO_4$
b) BH and H_2O_2
c) cold aq. $KMnO_4$ solution
d) dilute alkali

53) Nicotine reacts with methyl iodide to form dimethiodide and two monomethiods but it does not form acetyl or benzyl derivatives which indicate.....

a) Two nitrogen atoms in nicotine are tertiary
b) One nitrogen atom is secondary and the other is tertiary
c) Two nitrogen atoms in nicotine are primary
d) One nitrogen atom is primary and the other is tertiary

54) What is an alkaloid?

a) A type of hydrocarbons
b) A type of isoprene unit containing molecules
c) Nitrogen-containing natural products
d) Oxygen-containing natural products

55) The water content of clarified cane juice is.....

a) 85%
b) 15%
c) 65%
d) 9.5%

56) The density scale used to measure sugar concentration is .....

a) trix b) brix

c) pan d) calendria

57) An antipyretic is a drug used to .....

a) control sleep b) induce sleep

c) lower body temperature d) elevate body temperature

58) Pulmonary tuberculosis is treated with.....

a) ethambutol b) benzocaine

c) isoniazide d) both a and c

59) The CPs are used in.....

a) storage batteries b) gas sensers

c) PCBs d) all of these

60) Free radical binds to monomer to form .....

a) larger cation b) larger free radical

c) smaller cation d) smaller anions

61) The total probability of finding the particle in space must be.....

a) zero b) unity

c) infinity d) double

62) In a rigid rotator distance between two particles is.....

a) infinite b) zero

c) variable d) constant

63) In flame emission photometers, the measurement of.....is used for qualitative analysis.

a) velocity b) colour

c) intensity c) frequency

64) Flame photometry cannot be used for the direct detection and determination of .....metals

a) noble
b) alkali
c) non-metals
d) all of these

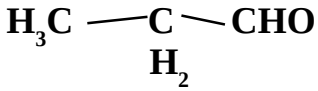
65) The expression KD-1/2 C/C where C1 and C2 denote the concentration of a solute in constant, is called.... two solvents A & B, and KD is the

a) equilibrium law
b) rate law
c) Nernst distribution law
d) none of these

66) The formula, $K=\frac{C_1}{\sqrt{C_2}}$ Kindicates that the solute is present as a ..... molecule in second solvent

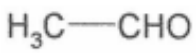
a) single
b) double
c) triple
d) none of these

67) How many peaks will be observed in ^{1}H NMR spectrum of the following molecule?



a) 1
b) 2
c) 3
d) 4

68) How many peaks will be observed in ^{1}H NMR spectrum of the following molecule?

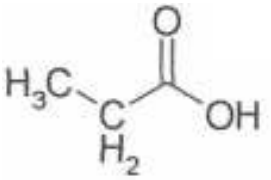


a) 1
b)2
c) 3
d) 4

69) The region of electromagnetic spectrum for nuclear magnetic resonance is.....

a) Microwave
b) Radiofrequency
c) Infrared
d) Ultraviolet

70) Approximate chemical shift value of carboxylic acid proton in the following compound will fall within the range of δ .....



a) 1-2 b) 2.5-3.5

c) 4.5-5.5 d) 10-11

71) Which of the following produces magnetic anisotropy?

a) Hydrogen bonding b) Aromatic ring system

c) Electronegativity d) pH

72) What is the significance of Double Bond Equivalence (DBE)=2?

a) presence of one triple bond

b) presence of two double bond

c) presence of one double bond and one ring

d) All of above

73) At what stretching frequency-OH depict band in IR spectrum?

a) 1700 cm^{-1} b) 2200 cm^{-1}

c) 1250 cm^{-1} d) 3230-3550 cm^{-1}

74) As the ring size..... angle strain increases, this causes the ..... in carbonyl stretching frequency

a) Increases, Increase b) Decreases, Decrease

c) Decreases, Increase d) Increases, Decrease

75) What is the purpose of a standard solution in titrimetric analysis?

a) To react with the analyte and form a product

b) To determine the concentration of the analyte

c) To calibrate the titration apparatus

d) To increase the sensitivity of the titration reaction

76) What is the purpose of standardization in titrimetric analysis?

a) To prepare a solution of known concentration

b) To determine the concentration of an analyte in a sample

c) To measure the volume of the titrant solution being added to the sample

d) To determine the concentration of the titrant solution

77) Which of the following chelating agents is commonly used in the preservation of food?

a) Ethylene diamine tetraacetic acid (EDTA)

b) Dimercaprol

c) Deferoxamine

d) Penicillamine

78) Which of the following elements has the highest number of valence electrons?

a) Sodium b) Magnesium

c) Aluminium d) Silicon

79) Which one of the following is organometallic compound?

a) Co(CN) b) Ni(CO)

c) Fe(CN) d) All of these

80) The important bulk chemical H2SO4 is prepared by which of the following catalytical

a) Bergius Process b) Deacon's Process

c) Chamber process d) Ostwald's process

81) Which of the following theory is best suitable to explain the homogeneous catalysis?

a) Nucleate b) Intermediate compound formation theory

c) Paratoid d) Absorption theory

82) If an isotope of Silicon has fifteen neutrons in its nucleus, then what will be its atomic number and atomic mass number?

a) 13, 15 b) 14, 15

c) 14, 29 d) 14, 28

83) When Uranium having atomic number 92 and atomic mass number 235 (U2) absorbs one neutron and undergoes fission. It generates Krypton having atomic number 36 and atomic mass number 89 (Kr), 3neutrons and.

a) Barium with atomic number 56 and atomic mass number 144 (Ba44)

b) Krypton with atomic number 36 and atomic mass number 103 (1Kr103)

c) Zirconium with atomic number 40 and atomic mass number 91 (40Z")

d) Krypton with atomic number 36 and atomic mass number 101 (36Kr10)

84) X-rays are generated by

a) Coolidge tube b) Geiger tube

c) Gonimeter d) Scintillation tube

85) Crystal can have..... centre of symmetry.

a) only one b) more than one

c) less than one d) all of these

86) In reaction between H_2 and Cl_2- -are formed in photochemical primary process

a) Hydrogen Molecule b) Chlorine Molecule

c) Chlorine free Radical d) Hydrogen free Radical

87) 50 ml of water is boiled at 373 K temperature to convert it in vapours, then the entropy of this process will be.....

a) Positive b) Negative

c) Zero d) Infinite

88) Lactose on hydrolysis yields a mixture of .....

a) glucose and fructose b) glucose and galactose

c) glucose and glucose d) fructose and galactose

89) Benzene undergoes ..... reactions readily.

a) electrophilic substitution

b) electrophilic addition

c) nucleophilic substitution

d) nucleophilic addition

90) In case of one component systems in case of Area the system is .....

a) trivariant b) univariant

c) non-variant d) bivariant

91) The equation, F=C-P+2, represents .....

a) phase equation b) Gibbs phase rule

c) Both (a) & (b) d) None of these

92) The temperature at which one crystalline form changes into another, is known as the .....

a) Eutectic point b) Cryohydric point

c) Trasition point d) Congruent m.p.

93) The titrations in which end points are determined by emf measurement and precipitation occurs are called..... titrations

a) redox b) precipitation

c) acid-base d) oxidation-reduction

94) Fe is..... form and Fe^{3+} is..... form of iron metal.

a) oxidised, reduced b) both reduced

c) oxidised, oxidised d) reduced, oxidised

95) The number of moles of solute present in 1000 grams of solvent is called as.....

a) Molarity b) Molality

c) Normality d) mole fraction

96) Two solutions of different coposition co-existing with one another are called as ..... solutions.

a) conjugate b) miscible

c) true d) all of these

97) The highest frequency electromagnetic radiations are.....

a) Gamma rays b) Infrared rays

c) X-rays d) Radio wave

98) The velocity electromagnetic radiation varies with.....

a) Frequency b) Wave number

c) Wavelength d) All of these

99) Ligands are considered as .....

a) Charged species b) Point groups

c) Point charges d) Charged group

100) Superconductors show..... effect

a) resonance b) raman

c) trans d) meissnier