Seat No.	

ENT - 29

Total No. of Pages : 20

P. G. Entrance Examination, 2025
M. Sc. CHEMISTRY
(Inorganic/Organic/Physical/Analytical/Industrial/Applied)
Subject Code: 58713

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Day and Date : Thursday, 10-07-2025 **Total Marks : 100**

Time : 10.30 a.m. to 12.00 p.m.

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Instructions :

1) All questions 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) Which of the following statements about the periodicity of elements is correct?

   a) The periodicity of elements is based on the atomic weight of each element.

   b) The periodicity of elements is based on the atomic number of each element.

   c) The periodicity of elements is based on the number of protons in the nucleus of each element

   d) The periodicity of elements is based on the number of neutrons in the nucleus of each element

2) In diborane molecule

   a) Four bridged hydrogens and two terminal hydrogens are present

   b) Two bridged hydrogens and four terminal hydrogens are present

   c) Three bridged hydrogens and three terminal hydrogens are present

   d) None of the above

3) Phenol on nitration gives mixture of o-nitrophenol and p-nitrophenol. This is an example of..... type of reaction

a) Opposing b) competing

c) chain d) consecutive

4) Number of chiral centres in sucrose are

a) 9 b) 2

c) 3 d) 6

5) All aromatic compounds are .....

a) planar b) having (4n+2) n-electrons

c) cyclic, conjugated d) All of these

6) Benzene is aromatic while ..... is non-aromatic

a) cyclopentadiene b) Pyridine

c) cyclopropene cation d) anthracene

7) Which part of the cell between two solutions allows the movement of current in the form of ionic charge?

a) electrode b) platinum wire

c) salt bridge d) none of these

8) 1 ppm is equal to ..... mg/ml.

a) 1 b) 6

c) 0.1 d) 0.001

9) 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

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

a) glucose and fructose b) glucose and galactose

d) fructose and galactose c) glucose and glucose

11) Which of the following is not a by product of Hoffmann bromamide degradation of acetamide with alcoholic KOH?

a) KBr b) KCN

c) K_2CO_3 d) H_2O

12) Hydrolysis of ester leads to the formation of which of the following products in an acidic medium?

a) Alcohol and carboxylic acid

b) Alcohol and sodium carboxylate

c) Alcohol and ether

d) None of the above

13) Oxygen on crystallization forms a perfect crystal. The entropy of oxygen at 0 K temperature is ..... Joule

a) 16 b) 32

c) zero d) Infinite

14) Which of the following is not correct for an ideal solution?

a) $\Delta S_{mix} = 0$

b) $\Delta H_{mix} = 0$

c) $\Delta V_{mix} = 0$

d) it obeys Raoult's law for entire concentration range and temperature

15) Which of the following is not characteristic of chemisorption?

a) It is irreversible b) It is specific

c) It is multilayer phenomenon d) Heat of adsorption is about 400 kJ

16) 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

17) OSTWALD ripening is .....

a) Re precipitation b) Dissolves small particles

c) Produces larger particles d) All of the above

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

a) Chlorine b) Hydrogen

c) Oxygen d) Nitrogen

19) What is the unit of current density?

a) A/m^2 b) A/dm^2

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

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

a) eluent b) effluent

c) eluate d) elution

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

a) positively, negatively b) negatively, positively

c) positively; neutral d) negatively, negatively

22) Ethyl mercapton is added to LPG to .....

a) increase its colorific value

b) make it flammable

c) timely leakage detection

d) make it coloured

23) For which of the following statements is lanthanide contraction responsible?

a) identical oxidation states of Zn and Zr

b) approximately equal covalent and ionic radii of Zr and Hf

c) identical oxidation states of Zr and Nb

d) approximately equal covalent and ionic radii of Zr and Yb

24) Magnetic moment for Mn^{2+} is

a) 5.92 B.M. b) 4.2 B.M.

c) 3.9 B.M. d) 7.9 B. M.

25) 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

26) 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

27) According to CFT, bonding between metal and ligand is .....

a) weak b) covalent

c) 100% ionic d) semipolar

28) For a high spin d^4 octahedral complex the crystal field splitting energy will be

a) $-1.6\Delta_o$ b) $-0.8\Delta_o$

c) $-0.6\Delta_o$ d) $-1.2\Delta_o$

29) Superconductors show ..... effect.

a) resonance b) Raman

c) trans d) Meissner

30) Which of the following is intrinsic semiconductor?

a) P b) Si

c) Ga d) As

31) Which one of the following can form dimer?

a) $Al(CH_3)_3$ b) $Cd(CH_3)_2$

c) $Zn(CH_3)_2$ d) None of these

32) Which one of the following is organometallic compound?

a) $Co(CN)_6$ b) $Ni(CO)_4$

c) $Fe(CN)_6$ d) All of these

33) Which of the following factor/s influence/s the activity of heterogeneous catalysts?

a) Total surface area b) Method of preparation

c) Number of active sites d) All of these

34) The important bulk chemical H_2SO_4 is prepared by which of the following catalytical process

a) Bergius Process b) Deacon's Process

c) Chamber process d) Ostwald's process

35) The frequency of infrared radiation lies between.

a) Visible and Micro-waves

b) Microwave and X-rays

c) Microwave and Gamma rays

d) Microwave and radio waves

36) The energy carried by electromagnetic radiation directly varies with its....

a) Wavelength b) Frequency

c) Wave number d) Intensity

37) The base value for $H_2C=CH-CH=CH-CH_3$ compound is .....

a) 246 nm b) 250 nm

c) 217 nm d) 230 nm

38) The possible transitions for water molecule in UV visible region are.

a) $\sigma > \sigma^*$ b) $n > \sigma^*$

c) $n > \pi^*$ d) None of these

39) Which of the following molecule is IR active?

a) CO b) N_2

c) H_2 d) O_2

40) 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

41) Which among the following proton will show highest chemical shift?

a) CH_3F b) CH_3CI

c) CH_3Br d) CH_3I

42) More the shielding effect.....

a) Lower the chemical shift c) Higher the chemical shift

b) No change in chemical shift d) More the peak splitting

43) The mass spectrum of $CH_3COOC_2H_5$ is not expected to show a major ion peak at which m/z ratio?

a) 88 b) 32

c) 15 d) 29

44) A compound with molecular formula C_4H_8O having δ value: 3.00 ppm (q, 2H), 2 ppm (s, 3H), 2.5 ppm (t, 3H). What is the possible molecular structure of this compound?

a) CH_3-CH_2-CH_2-OH

b) CH_3-CH_2-CH_2-CHO

c) CH_3- CH_2-CO-CH_3

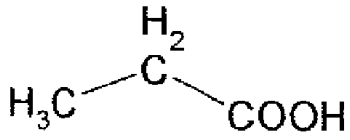
d) CH_3-CH(OH)-CH_3

45) Deduce the structure of compound on basis of following spectral data

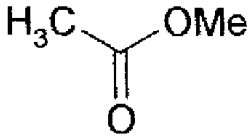
MF: $C_3H_6O_2$ MS: 74, 29 IR: 3500cm^{-1}

NMR: 1.2 (3H, t); 2.3 (2H, q); 10.1 (1H, s)

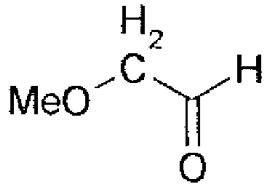
a)



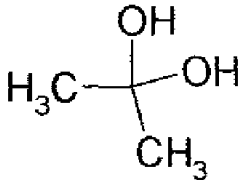
b)



c)



d)



46) Deduce the structure of the compound from the following spectral data.

MF: C_8H_8O UV-λ max 292 nm IR: 1710cm^{-1}

PMR- δ 7.27 (s, 5H); 2.80 (s, 2H); 9.88 (s, 1H)

a) C_6H_5-CO-CH_3

b) C_6H_5-CH_2-CHO

c) C_6H_5- CH_2-CH_2-OH

d) C_6H_5-CHOH-CH_3

47) The concept of matter wave was suggested by

a) de Broglie b) Schrodinger

c) Laplace d) Heisenberg

48) In a rigid rotator, distance between two particles is....

a) infinite b) zero

c) variable d) constant

49) It is only the absorbed light radiations that are effective in producing a chemical reaction. This is the statement of .....

a) Lamberts law b) Lambert-Beer law

c) Grotthus - Draper law d) Stark-Einstein law

50) Which of the following are the reactions in which molecules absorbing light do not themselves react but induce other molecules to react?

a) Photosensitized reactions

b) Free radical reactions

c) Chain reactions

d) Reversible reactions

51) Real solutions of type-II show large ..... deviations from Raoult's law,

a) negative b) positive

c) both a and b d) none of these.

52) The law of relative lowering in vapour pressure was given by.....

a) Lewis b) Ostwald

c) Raoult d) Van't Hoff

53) The vapour always contains relatively..... proportion of the more volatile component than does the liquid phase

a) less b) equal

c) slight d) more

54) In Nemst Equation for the calculation of EMF of cell, Qa represents

a) Quantum b) Einstein

c) Reaction quotient d) none of these

55) In Chemical Cell, EMF is due to .....

a) Different electrodes compositions

b) Different electrolyte concentration

c) Chemical Reaction

d) Both a & b

56) In a dry cell, which of the following is the electrolyte?

a) Potassium hydroxide b) Sulphuric acid

c) Ammonium chloride d) Manganese dioxide

57) In standardisation of potentiometer, a standard cell having voltage.... is generally used.

a) 1.5 V b) 1.018 V

c) 2.0 V d) 2.508 V

58) The glass electrode consists of a special glass of relatively.....

a) low melting point and high electrical conductivity

b) low melting point and low electrical conductivity

c) high melting point and low electrical conductivity

d) high melting point and high electrical conductivity

59) Lime defecation of cane juice is used to remove

a) soluble impurities b) suspended impurities

c) insoluble impurities d) all of these

60) Solvay process is used to prepare.....

a) Potassium carbonate b) Sodium carbonate

c) Sodium hydroxide d) Sodium chloride

61) Chemicals which are produced and handled in large lots and are often in a crude state are called.....

a) industrial b) toxic

c) heavy d) king

62) Gas-solid chromatography is best suited for separating

a) Thermally stable organic components

b) Low molecular weight gaseous species

c) Thermally stable inorganic components

d) Volatile organic components

63) Which is not a carrier gas in gas chromatography.

a) Helium b) Nitrogen

c) Argon d) Carbon dioxide

64) In the thermodynamic sense complexes are called .....

a) Inert and Labile

b) Inert and unstable

c) Labile and unstable

d) Stable and unstable

65) In an associative substitution reaction, the intermediate has .....

a) Lower coordination number than starting material

b) Higher coordination number than starting material

c) Same coordination number than starting material

d) None of these

66) The age determination of organic fossils using carbon dating method is based on the fact that...

a) C^{14} fraction is same in all objects

b) Ratio of Carbon-14 and Carbon-12 is constant

c) C^{14} is highly insoluble

d) All of these

67) When Uranium having atomic number 92 and atomic mass number 235 ($_{92}U^{232}$) absorbs one neutron and undergoes fission. It generates Krypton having atomic number 36 and atomic mass number 89 ($_{36}Kr^{89}$), 3 neutrons and.....

a) Barium with atomic number 56 and atomic mass number 144 ($_{56}Ba^{144}$)

b) Krypton with atomic number 36 and atomic mass number 103 ($_{36}Kr^{103}$)

c) Zirconium with atomic number 40 and atomic mass number 91 ($_{40}Zr^{91}$)

d) Krypton with atomic number 36 and atomic mass number 101 ($_{36}Kr^{101}$)

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

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

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

69) The formula of bastnaesite mineral is.....

a) $CePO_4$ b) $CePO_4$

c) (Y) PO_4 d) $CeFCO_3$

70) 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

71) 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

72) Storage of Iron in human body is carried out by

a) Myoglobin b) Ferritin

c) Haemoglobin d) Cytochrome P_{50}

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

a) Michael b) Knoevenagel

c) Wittig d) Dickmann condensation

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

a) Wagner-Meerwein b) Knoevenagel

c) Diels-Alder d) Wittig

75) A reagent which can provide the required synthons is .....

a) Target molecule b) FGI

c) Synthetic equivalent d) disconnection

76) The molecule whose synthesis is being planned is called as.....

a) target molecule b) new molecule

c) synthons d) synthetic equivalent

77) Addition of halogen to triple bond hydrocarbons produces .....

a) dihaloalkane b) tetrahaloalkane

c) alcohol d) aldehyde

78) Addition of water to unsymmetrical alkyne leads to formation of

a) ketone b) carboxylic acid

c) alcohol d) aldehyde

79) 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

80) Which of the following is NOT a natural product?

a) Terpenoids b) Alkaloids

c) Nanocomposite d) Proteins

81) An ideal drug is expected not to induce .....

a) resistance b) sleep

c) curative action d) all of these

82) Pulmonary tuberculosis is treated with .....

a) ethambutol b) benzocaine

c) isoniazide d) both a and c

83) In Sulphur system, when SR, SM and SVare in equilibrium, here the degree of freedom will be.....

a) one b) two

c) three d) zero

84) Benzene and water system will form..... phases.

a) zero b) two

c) three d) one

85) 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.

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

a) G b) P

c) S d) -S

87) 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

88) To obtain the diffraction pattern by using X-ray diffractometer a plot of is plotted.

a) Intensity vs. 2θ degree b) 2θ degree vs. Intensity

c) Intensity vs. θ degree d) θ degree vs. Intensity

89) Miller indices of the crystal plane intercepts the three crystallographic axes at 5/2, 2 and ∞ are .....

a) (5 4 0) b) (5 2 0)

c) (5 4 0) d) (4 5 ∞)

90) What is the order of reflection if wavelength of X-ray is 3.82 x $^{-10}$ m, angle of diffraction is 8.4^{0} and distance between successive faces 3.92 nm.

a) 3 b) 2

c) 4 d) 1

91) For a certain reaction, Rate of reaction = $k_1 \left(\frac{k_2}{k_{-2}}\right)^{3/2} [A][B]^{1/2}$ then the order of reaction with respect to reactant 'A' is .....

a) 1 b) 3/2

c) ½ d) 2

92) The greater the distribution ratio in favour of the organic solvent, the. amount extracted in any one operation. will be the

a) lesser b) greater

c) equal d) none of these

93) Polymers are grouped on the basis of their.....

a) origin b) structure

c) property d) all of theses

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

a) larger cation b) larger free radical

c) smaller cation d) smaller anions

95) Flame photometry is concerned with the measurement of intensity of light.... when a metal is introduced into the flame

a) absorbed b) emitted

c) both a and b d) none of these

96) In simple flame photometers, the monochromator is.....

a) grating b) slit

c) prism d) all of these

97) Which of the following is NOT a characteristic of nanomaterials?

a) High surface area to volume ratio

b) Reduced reactivity due to larger particle size

c) Increased strength and hardness compared to bulk materials

d) Unique optical, electrical, and magnetic properties

98) The secondary electrons radiated back in scanning microscope are collected by?

a) specimen b) detector

c) vacuum chamber d) cathode

99) Among the following, which is not a micro-nutrient

a) B b) Cu

c) Fe d) N

100) Choose the correct top-down process for nanomaterial synthesis from the given set of options.

a) PVD b) CVD

c) MBE d) Ball milling

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