श्री चित्रा तिरुनाल आयुर्विज्ञान और प्रौद्योगिकीसंस्थान, तिरुवनंतपुरम्-11
SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY
THIRUVANANTHAPURAM—695 011

ENTRANCE EXAMINATION - ACADEMIC SESSION JANUARY 2022

Program: PhD Chemical Sciences

Time:90 Minutes | Max. Marks: 100

(Select the most appropriate answer)

(There are **no negative** marks for wrong answers)

1 The molar conductivity of CH_3COONa, HCl and NaCl at infinite dilution are A, B and C Sm^2mol^{-1} respectively at 25°C. The molar conductivity at infinite dilution for CH_3COOH is represented as

a. [A+B+C] Sm^2mol^{-1}
b. [A-B-C] Sm^2mol^{-1}
c. [A+B-C] Sm^2mol^{-1}
d. [A-B+C] Sm^2mol^{-1}

2 Microwave spectra of a molecule has three rotational constants. The molecule is _____

a. Prolate
b. Asymmetric
c. Oblate
d. Spherical top

3 The ionic strength of 0.1M MgCl2 is ----------

a. 0.3 M
b. 0.1M
c. 0.6 M
d. 0.2 M

4 Choose the pair of monomers which does not favour condensation polymerization

a. propanoicacid and ethanol
b. butane-dioic acid and glycol
c. diamines and dicarboxylic acids
d. hydroxy acids

5 Among the following pick the name of the stabilizer that is capable of preventing the polymer from UV degradation?

a. phenyl napthylamines
b. dilaurylthiopropionate
c. styrenated phenols
d. phenyl salicylates

6 Name the polymer that is used in the manufacture of paints and lacquers.

a. Bakelite
b. Glyptal
c. Polypropene
d. Polyvinyl chloride

7 At the onset of gelation of a reaction mixture the viscosity

a. Increases
b. Decreases
c. Remains constant
d. None of the mentioned

8 An organic compound X is oxidized by using acidified K2Cr2O7. The product obtained reacts with phenyl hydrazine but reacts negatively to silver mirror test. What could be the possible structure of X?

a. CH3CHO
b. CH3CH2OH
c. (CH3)2CHOH
d. CH3COCH3

9 The correct geometry around oxygen in CH3OCH3 is

a. linear
b. bent
c. tetrahedral
d. trigonal planar

10 A strong signal at 1700 cm–1 in an IR spectrum indicates the presence of a(n)

a. alcohol
b. ether
c. carbonyl
d. amine

11 What is the wavelength associated with an electron moving at 10^3 m s^{-1}

a. 7.28 nm
b. 728 nm
c. 72.8 nm
d. 0.728 nm

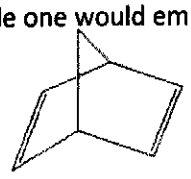
12 Which diatonic molecule is the strongest

a. H_2
b. F_2
c. N_2
d. O_2

13 One mole of naphthalene was burnt in oxygen gas at constant volume to give CO_2gas and liquid water at 25 °C. The heat evolved was found to be 5138.8 KJ. The heat of reaction at constant pressure is [Note: R=8.314 J/K/mol]

a. (+)6138.8 KJ
b. (-)5143.8 KJ
c. (-)6138.8 KJ
d. (+)5143.8 KJ

14 Which diene and dienophile one would employ to synthesize the compound norbornadiene;



a. Acetylene and cyclohexadiene
b. Acetylene and cyclopentadiene
c. Acetylene and cyclopropadiene
d. Acetylene and Heptafulvene

15 Wilkinson's catalyst ($(Ph_3P)_3RhCl$) is used for

a. halogenation of alkenes
b. Oxidation of alkenes
c. Phosphonation of alkenes
d. None of the above

16 Stereoregular polymers can be synthesized using

a. Living Polymerisation
b. Ziegler-Natta Polymerisation
c. Step growth Polymerisation
d. Alfin Polymerisation

17 Which of the statement is correct?

a. cyclopentadienone is a stable compound while Cyclopropenone is unstable and not been prepared
b. Cyclopropenone is a stable compound while cyclopentadienone is unstable and not been prepared
c. Both cyclopentadienone and cyclopropenone is stable
d. Both cyclopentadienone and cyclopropenone is unstable

18 On hydrogenation anthracene liberates 116.2 kcal/mol. What is the resonance energy of anthracene? [Note: During hydrogenation cyclohexene liberates 28.6 Kcal/mol]

a. 84 Kcal/mol
b. 80 Kcal/mol
c. 63 Kcal/mol
d. 48 Kcal/mol

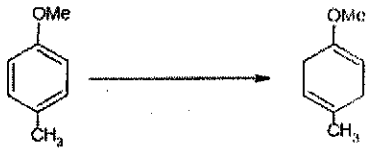
19 Nucleophilic reactivities of halides follow the order

a. $F^- > Cl^- > Br^- > I^-$
b. $I^- > Br^- > Cl^- > F^-$
c. $Cl^- > F^- > Br^- > I^-$
d. $I^- > Br^- > F^- > Cl^-$

20 Which one is a stronger base; amidines or amines?

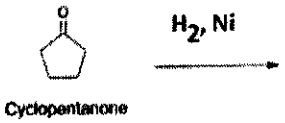
a. amidines
b. amines
c. both are weaker base
d. both amidines and amines have same basicity

21 The reaction is an example of

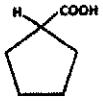


a. Baeyer -Villiger reaction
b. Birch Reduction
c. Knoevenagel reaction
d. Prins reaction

22 The reaction leads to which product



Cyclopentanone

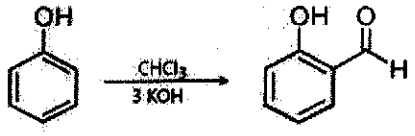
a. 

c. 

b. 

d. 

23 The reaction is an example of

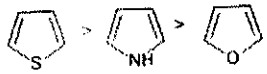


a. Kolbe reaction
b. RiemerTiemann reaction
c. Friedel-Crafts Acylation reaction
d. Cope reaction

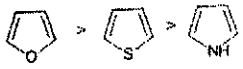
24 The order of reactivity for an electrophilic aromatic substitution reaction is

a.

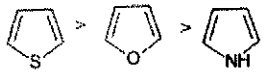
c.



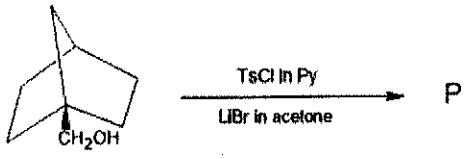
b.



d.



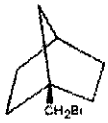
25 P in the reaction is



a.

c.

b.



d.

26 What is the empirical formula of an organic compound whose percentage composition is 48.7 % C, 13.6 % H, 37.8 % N [consider oxygen is not determined directly]

a. $C_4H_{14}N_4$
b. C_3H_8N
c. $C_2H_{10}N_3$
d. $C_3H_{10}N_2$

27 Acidity increases in the order

a. $H\text{-}CH_3 > H\text{-}NH_2 > H\text{-}OH > H\text{-}F > H\text{-}SH > H\text{-}Cl$
b. $H\text{-}CH_3 < H\text{-}NH_2 < H\text{-}OH < H\text{-}F < H\text{-}SH < H\text{-}Cl$
c. $H\text{-}CH_3 < H\text{-}NH_2 < H\text{-}OH < H\text{-}Cl < H\text{-}SH < H\text{-}F$
d. $H\text{-}CH_3 > H\text{-}NH_2 > H\text{-}OH > H\text{-}Cl > H\text{-}SH > H\text{-}F$

28 Which of the following compounds has the MOST deshielded protons?

a. CH3Cl
b. CH3I
c. CH3Br
d. CH4

29 Which one is of the following is the lightest transition element?

a. Ti
b. Fe
c. Sc
d. Hg

30 Which among the following is a photosensitive substance?

a. Nickel chloride
b. Silver chloride
c. Copper chloride
d. Manganous chloride

31 The process of reduction of ores with carbon is known an

a. Thermite process
b. Roasting
c. Zone refining
d. Smelting

32 An element X forms an oxide XO3 What is the valency of X?

a. 1
b. 6
c. 5
d. 6

33 During tensile testing of a polymer sample in UTM, the toughness of the polymer can be estimated from which part of the Stress-strain curve.

a. Slope
b. Maximum Load
c. Stress at break
d. Area under the stress-strain curve

34 Rod-climbing effect or Weissenberg effect is observed as the climbing of polymer solution up the stirrir shaft, during stirring. This behaviour is due to:

a. The elastic portion of the viscoelastic behaviour increases at high speed.
b. The elastic portion of the viscoelastic behaviour increases at low speed.
c. The viscous portion of the viscoelastic behaviour increase at low speed.
d. The viscous portion of the viscoelastic behaviour increase at high speed.

35 What is the viscosity value of water at ambient temperature?

a. 1 mPas
b. 0.1 mPas
c. 10 mPas
d. 100 mPas

36 For pactical applications, a liquid is called ideally Viscous liquids when, tan δ =

a. 1
b. 0
c. >100
d. <1

37 Which among the following is a conducting polymer?

a. Isotactic polypropylene
b. Polyacrylonitrile
c. Polyisobutylene
d. Polybutylthiophene

38 In Injection moulding process, faster moulding cycle can be achieved by selecting a polymer resin having:

a. High heat distortion temperature
b. Low heat distortion temperature
c. High glass transition temperature
d. High melting point

39 In order to obtain a polymer with maximum of 9-mers, what should be the extent of conversion?

a. 70%
b. 80%
c. 90%
d. 100%

40 Which among the following polymerization techniques is suitable for producing very high molecular weight products?

a. Bulk polymerization
b. Solution polymerization
c. Suspension polymerization
d. Emulsion polymerization

41 Which among the polymerization technique leads to a maximum value of $\bar{M}_w/\bar{M}_n$, typically > 20?

a. Polymerization leading to chain branching
b. Polycondensation
c. cationic/anionic polymerization using homegeneous catalyst
d. Free radical polymerization

42 As polarity of the medium increases, the rate of polymerization also increases. Which among the following solvents have the largest dielectric constant?

a. Cyclohexane
b. Dichloroethane
c. Nitroethane
d. Nitrobenzene

43 Which among the following type of Polymeric materials have application temperatures below T_g?

a. Soft and weak
b. Soft and tough
c. Hard and strong
d. Hard and tough

44 Which polymer processing technique is used for the fabrication of hollow Jerry cans/bottles.

a. Injection moulding
b. Blow moulding
c. Compression
d. Extrusion

45 Which among the polymers can form conformal pinhole free coatings through chemical vapour deposition polymerization process.

a. Polyethylene
b. Polypropylene
c. Polystyrene
d. Parylene

46 Which among these techniques are used for determining the glass transition temperature of Polymers?

a. Dilatometer
b. Dynamic Mechanical Analyser
c. Differential Scanning Calorimeter
d. All of the above

47 Which among the polymers is synthesized from a bacterium?

a. Polylactic acid`
b. polyhydroxybutyrate
c. Polymethylmethacrylate
d. Low density Polyethylene

48 When an uncross-linked elastomer is elongated and maintained at that length in a tensile-testing machine. Then the decay of stress under constant deformation is called:

a. Strain hardening
b. Stress relaxation
c. Retardation
d. Burst strength

49 An aromatic compound A on treatment with Chromyl chloride in dichloromethane yielded Benzaldehyde (B). B on treatment with Zinc amalgam in concentrated HCl produced A. What is A ?

a. Benzene
b. Anilin
c. Naphthalene
d. Toluene

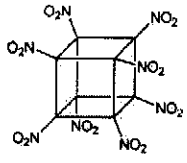
50 Friedrich Wohler produced an organic compound in lab for the first time by heating.....in 1828.

a. Ammonium hydroxide
b. Urea
c. Ammonium cyanate
d. Ammonium thiocyanate

51 A strong acid will have.....

a. Smaller Ka value
b. Smaller pKa value
c. Higher pKa value
d. Ka=0

52 The figure shows a multi nitro derivative of a compound reported by the group of Philip Eton in 2000. Highly strained rings enable this compound to be a shock insensitive explosive more powerful than TNT. This category of compounds are called.....

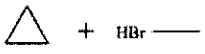


a. Cubanes
b. Prismanes
c. Icosanes
d. Fullerenes

53 Which of the following is the most stable intermediate ?

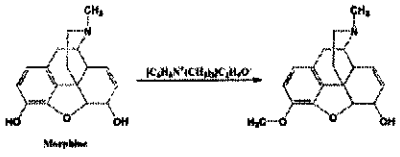
a. Methyl cation
b. Primary carbocation
c. Secondary Carbocation
d. Tertiary Carbocation

54 What will be the product of the following reaction..?



a. 1-bromocyclopropane
b. 1-bromopropane
c. 1-bromocycloprop-2-ene
d. cyclopropane

55 Methylation of one of the hydroxyl groups of Morphine result in the formation of a less potent analgesic with capability to inhibit cough reflex. It is called.....



a. Morpholine
b. Heroin
c. Codeine
d. Quinine

56 Completely amorphous polymers will show.....

a. Tg only
b. Tm only
c. Both Tg and Tm
d. None of them

57 Ebulliometry, Cryoscopy, and Osmometry are the common methods adopted for the determination of .....of a polymer.

a. Mw
b. Mn
c. Mv
d. Mz

58 One mole of gas with ideal behaviour is kept in a constant volume reactor as part of an industrial process. The pressure required for the process was 100 atm which will exert a temperature of 37 degrees.The operator unknowingly put a pressure of 300 atm. What will be the resulting temperature of the reactor ?

a. 600 K
b. 900 K
c. 910 K
d. 930 K

59 An adult man of 20 year old requires a daily input of 12 MJ of energy. If he consumes only glucose (Specific enthalpy 16 kJ/g), how much glucose he should take to meet his daily requirement ?

a. 750 kg
b. 750 g
c. 192 g
d. 192 kg

60 NADH has an absorption coefficient of 6220 Lmol-1cm-1at 340 nm. A solution of NADH gave an absorbance of 0.25 at 340 nm when analyzed using a pathlength of 1.0 cm. What will be the concentration of NADH in it?

a. 4x10-4 mol L-1
b. 7x10-4 mol L-1
c. 4x10-5 mol L-1
d. 7x10-5 mol L-1

61 Genome of COVID-19 causing virus genome is made of

a. ssDNA
b. dsDNA
c. ssRNA
d. dsRNA

62 PPE means?

a. Public private enterprise
b. Personal protective equipment
c. Public protection entity
d. Personal protection enterprise

63 In a certain code "DIVISION" is written as "DVISOIN", then how is "STATES" written?

a. SATETS
b. SATTES
c. SAETTS
d. STTAES

64 A room has 10 doors. In how many ways one can enter through a door and exit through a different door?

a. 9
b. 10
c. 100
d. 90

65 In this "see and tell" sequence, what is the next number?: 1, 11, 21, 1211, 111221, _____.

a. 312211
b. 1112221
c. 1112222
d. 112131

66 At extreme depths in the sea (beyond 170 m depth), divers experience hallucinations, dizziness, tremors etc because of --------- .

a. hyperventilation
b. decompression sickness
c. high-pressure neurological syndrome
d. diving reflex

67 Which is the primary stress hormone

a) cortisol
b) aldosterone
c) adrenaline
d) noradrenaline

68 Name a plastic-degrading systems

a. PETase
b. ACE
c. MHETase
d. both 1 &3

69 SARS-CoV-2 spike protein is a

a. surface glycoprotein
b. small envelope protein
c. nucleocapsid protein
d. matrix protein

70 Covishield is a ---------- type of vaccine

a. whole virion inactivated
b. recombinant, replication-deficient adenovirus vector encoding Spike protein
c. mRNA
d. DNA

71 Paralympic Games 2020 was conducted at

a. Abu Dhabi
b. Tokyo
c. Rio
d. Beijing

72 Nobel Prize for Physics in 2020 was awarded for the discovery of

a. cosmology
b. optical tweezers
c. theory for Black hole formation
d. discovery in alloys

73 The theory of relativity is presented by which scientist

a. Albert Einstein
b. Isaac Newton
c. Stephen Hawking
d. Marie Curie

74 Total number of elements in the Periodic table

a. 112
b. 118
c. 115
d. 127

75 Which one is the purest form of carbon

a. coal
b. diamond
c. graphite
d. iron

76 The membrane proteins can span across the lipid bilayer strictly due to the presence of

a. alpha helices
b. parallel beta sheet
c. antiparallel beta sheet
d. zinc finger domain

77 To detect specific macromolecule or structure by electron microscopy, the frequently used procedure is to couple the antibody with

a. Osmium tetraoxide
b. Alexa 568
c. Gold Particle
d. Cy5

78 The inner cell mass of mammalian embryo in the blastocyst stage are

a. totipotent
b. pluripotent
c. multipotent
d. unipotent

79 Which of the following number is a prime number

a. 121
b. 163
c. 183
d. 1020

80 The enzyme Rennin is secreted in which among the following parts of the Alimentary Canal?

a. Mouth
b. Duodenum
c. Pancreas
d. Stomach

81 Both prokaryotic as well as eukaryotic cells have

a. Lysosomes
b. Mitochondria
c. Ribosomes
d. Golgi Bodies

82 Which one of the following is does not involve in maturation of red blood cells

a. pyridoxine
b. tocopherol
c. vitamin B12
d. folic acid

83 Migration of individual cells from the surface into the embryo's interior is termed as

a. ingression
b. involution
c. invagination
d. delamination

84 Which of the following hormone is detected by pregnancy kits?

a. Estrogen
b. Progesterone
c. Human Chorionic Gonadotropin
d. Lutinizing Hormone

85 Five persons A, B, C, D, and E are sitting in a row. C in the middle of the group and D is at an extreme end. There are at least two persons between B and E. Which of the following statements is incorrect?

a. E can be on extreme left
b. A is always a neighbour of B or D
c. A cannot be on extreme left
d. E can be on extreme right

86 Each pixel in a liquid crystal display (LCD) television is composed of 3 sub-pixels that can transmit red, green and blue colours because

a. White light is made of three primary colours viz red, green, blue
b. Liquid crystals can only filter these primary colours
c. The human retina contains only three types of colour-sensitive cells
d. These colours are the most pleasing to the human eye.

87 The Nobel prize in physiology or medicine 2020 was shared by Harvey J. Alter, Michael Houghton and Charles M. Rice for

a. The development of a method for genome editing
b. The discovery of Hepatitis C virus
c. The discoveries of how cells sense and adapt to oxygen availability
d. The discoveries of molecular mechanisms controlling the circadian rhythm

88 The first WHO recognized outbreak of Nipah virus was reported in

a. Malaysia
b. Bangladesh
c. Singapore
d. India

89 Who among the following is a climate campaigner?

a. Verghese Kurien
b. Malala Yousafzai
c. Greta Thunberg
d. Michelle Obama

90 The only active volcano of India is located at

a. Gujarat
b. Haryana
c. Maharashtra
d. Andaman & Nicobar Islands

91 EJOT, DHLP, CFIL, ?

a. BHLM
b. BDFH
c. DGKL
d. DEIJ

92 A man walks 30 meters towards south. Then turning to his right, he walks 30 meters. Then turning left, he walks 20 meters. Again, he turns to his left and walks 30 meters. How far is he from his initial position?

a. 110 meters
b. 80 meters
c. 60 meters
d. 50 meters

93 The ratio of the ages of a man and his wife is 4:3. After 4 years, this ratio will be 9:7. If at the time of marriage, the ratio was 5:3, then how many years ago were they married?

a. 15 years
b. 12 years
c. 10 years
d. 8 years

94 The first track and field athlete to win a gold medal for India at the Olympics

a. Abhinav Bindra
b. PV Sindhu
c. Neeraj Chopra
d. Nirav Modi

95 By the end of next month my grandmother _____ in the same house for more than 80 years

a. will have been living
b. will live
c. will have lived
d. will be living

96 Leaf of a plant appears green in daylight. If this plant were observed in red light, what colour would its leaf appear ?

a. green
b. black-brown
c. red
d. blue

97 Twenty one liters of milk in a tank is to be divided into three equal parts using only5, 8 and 12 liters capacity cans. The minimum number of transfers needed to achieve this is.....

a. 3
b. 4
c. 5
d. 7

98 How many times starting at 1:00 pm would the minute and hour hands of a clock make an angle of 40 Degree with each other in the next 360 minutes?

a. 6
b. 7
c. 11
d. 12

99 Which is not an essential amino acid

a. proline
b. methionine
c. valine
d. lysine

100 Which Indian city has the Drink-from-Tap facility for the first time in India?

a. Bangalore
b. Srinagar
c. Trivandrum
d. Puri

Academic Session – January 2022

PhD Chemical Sciences

1	c
2	b
3	a
4	a
5	d
6	b
7	b
8	a
9	b
10	c
11	b
12	c
13	b
14	b
15	a
16	b
17	b

18	a
19	b
20	a
21	b
22	c
23	b
24	a
25	b
26	d
27	b
28	a
29	c
30	b
31	d
32	b
33	d
34	a

35	a
36	c
37	d
38	a
39	b
40	d
41	a
42	d
43	c
44	b
45	d
46	d
47	b
48	b
49	d
50	c
51	b

52	a
53	d
54	b
55	c
56	a
57	b
58	d
59	b
60	c
61	c
62	b
63	a
64	d
65	a
66	c
67	a
68	d

69	a
70	b
71	b
72	c
73	a
74	b
75	b
76	a
77	c
78	b
79	b
80	d
81	c
82	b
83	c
84	c
85	b

86	c
87	b
88	a
89	c
90	d
91	b
92	d
93	b
94	c
95	a
96	b
97	d
98	c
99	a
100	d