



திருவள்ளூர் பல்கலைக்கழகம், வேலூர்
THIRUVALLUVAR UNIVERSITY, VELLORE

Ph.D., - COMMON ENTRANCE TEST (CET9) – JUNE SESSION 2022

Subject : CHEMISTRY

Exam Date : 26.06.2022

Time : 11.00 A.M. TO 12.30. P.M

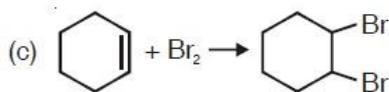
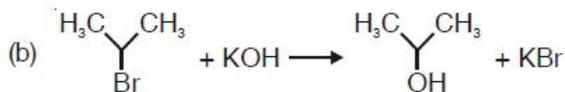
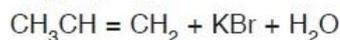
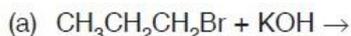
Maximum Marks : 50

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SECTION – A (50 x 1 = 50 Marks)
All Questions carry equal marks.

- Which of the following is incorrect for benzene?
(A) Planar C₆ ring
(B) Localised π bonding
(C) sp² hybridised C atoms
(D) It shows reactions characteristics of C=C double bonds
- The maximum number of stereoisomers possible for 4-phenyl but-3-en-2ol is
(A) 1
(B) 2
(C) 3
(D) 4
- According to Bayer strain theory _____ is most stable.
(A) Cyclopropane
(B) Cyclobutane
(C) Cyclopentane
(D) Cyclohexane
- Cope rearrangement is an example of
(A) [1,2] sigmatropic rearrangement
(B) [2,3] sigmatropic rearrangement
(C) [3,3] sigmatropic rearrangement
(D) [2,4] sigmatropic rearrangement
- The conversion of 3-methyl-hexa-1,5-diene to hepta-1,5-diene can be effected by
(A) Cope rearrangement
(B) Claisen rearrangement
(C) Diels Alder reaction
(D) Wagner-Meerwein rearrangement

6. With respect to the following reactions, which of the following statements is correct?



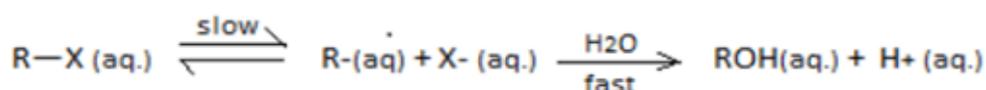
(A) (a) is elimination, (b) and (c) are substitution reactions

(B) (a) is substitution, (b) and (c) are addition reactions

(C) (a) and (b) are elimination reactions and (c) is addition reaction

(D) (a) is elimination, (b) is substitution and (c) is addition reaction

7. $\text{S}_{\text{N}}1$ reaction undergoes through a carbocation intermediate as follows:



[R = t-Bu, iso-Pr, Et, Me] (X = Cl, Br, I)

The correct statements are:

I. The decreasing order of rate of $\text{S}_{\text{N}}1$ reaction is t-BuX > iso-PrX > EtX > MeX

II. The decreasing order of ionization energy is MeX > EtX > iso-PrX > t-BuX

III. The decreasing order of energy of activation is t-BuX > iso-PrX > EtX > MeX

(A) I & II are correct

(B) I & III are correct

(C) II and III are correct

(D) I, II & III are correct

8. Which of the following alkyl halides is most likely to undergo rearrangement in an $\text{S}_{\text{N}}1$ reaction?

(A) 3-bromopentane

(B) 2-chloro-3,3-dimethylpentane

(C) 3-chloropentane

(D) 1-bromo-4-methylcyclohexane

9. The incorrect statement regarding Baeyer Villiger rearrangement is:

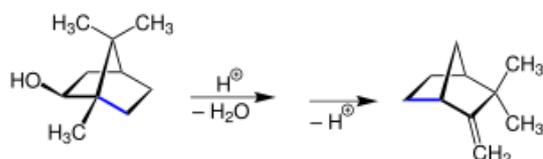
(A) Ketones are converted to esters

(B) The configuration of migrating group is retained

(C) It involves concerted rearrangement groups attached to carbonyl carbon onto electron rich oxygen

(D) There is oxidative cleavage of C-C bond

10. What is this rearrangement?



(A) Sommelet-Hauser rearrangement

(B) Wagner-Meerwein rearrangement

(C) Favorskii rearrangement

(D) Stevens rearrangement

11. The energy absorption in NMR spectroscopy is which type of the process:
(A) Pyroluminescence process
(B) Transmission process
(C) Quantized process
(D) Interferometry process
12. All the protons found in chemically identical environment within a molecule:
(A) Are chemically equivalent
(B) Exhibit the same chemical shift
(C) Both a and b
(D) None of these
13. Which of the given statement is true about spin selection rule?
(A) Triplet to singlet state of transition is allowed
(B) Singlet to singlet state of transition is forbidden
(C) Triplet to singlet state of transition is forbidden
(D) Singlet to triplet state of transition is allowed
14. Over tones are mainly observed in
(A) near IR
(B) mid IR
(C) far IR
(D) Not in IR region
15. What is the correct order of λ_{max} for $n-\sigma^*$ transition?
(A) $\text{R-OH} > \text{R-NH}_2 > \text{RSH}$
(B) $\text{R-OH} < \text{R-NH}_2 < \text{RSH}$
(C) $\text{R-OH} > \text{RSH} > \text{R-NH}_2$
(D) $\text{R-OH} < \text{RSH} < \text{R-NH}_2$
16. C-O bond length is minimum in
(A) CO_2
(B) CO_3^{2-}
(C) HCOO^-
(D) CO
17. When a neutral atom is converted into a cation, there is
(A) decrease in atomic number
(B) increase in atomic number
(C) decrease in size
(D) increase in size
18. Find the molecule with the maximum dipole moment
(A) CH_4
(B) NH_3
(C) CO_2
(D) NF_3
19. Which of the following reagents, when treated with phenyl magnesium bromide followed by acid workup, will yield 2-phenylethanol?
(A) Ethanol
(B) Diethyl ether
(C) Ethanal
(D) Oxirane

20. The reaction of carbon dioxide with Grignard reagents initially gives
(A) Magnesium salt of a carboxylic acid
(B) $\text{CH}_3\text{CH}_2\text{OH}$
(C) CH_3CHO
(D) None of these
21. The type of isomerism shown by the complex $[\text{CoCl}_2(\text{en})_2]$ is
(A) Geometrical isomerism
(B) Coordination isomerism
(C) Linkage isomerism
(D) Ionization isomerism
22. In the complex $[\text{E}(\text{en})_2(\text{C}_2\text{O}_4)]\text{NO}_2$ (where (en) is ethylenediamine) _____ are the coordination number and the oxidation state of the element 'E' respectively.
(A) 6 and 2
(B) 2 and 2
(C) 4 and 3
(D) 6 and 3
23. Jahn-Teller effect is not observed in high spin complexes of :
(A) d^4
(B) d^9
(C) d^7
(D) d^8
24. Fluorescence occurs when transition is
(A) Triplet-Triplet
(B) Singlet-singlet
(C) Triplet-singlet
(D) All of these
25. In photosynthesis reaction which of the following acts as Photosensitizer
(A) H_2O
(B) CO_2
(C) Chlorophyll
(D) Light
26. NaCl type crystal (with coordination no. 6 : 6) can be converted into CsCl type crystal (with coordination no. 8 : 8) by applying
(A) High Temperature
(B) High Pressure
(C) High Temperature And High Pressure
(D) Low Temperature And Low Pressure
27. The mass defect for an isotope was found to be 0.410 amu/atom. Calculate the binding energy in kJ/mol of atoms. ($1 \text{ J} = 1 \text{ kgm}^2/\text{s}^2$)
(A) $3.69 \times 10^{10} \text{ kJ/mol}$
(B) $1.23 \times 10^{20} \text{ kJ/mol}$
(C) $3.69 \times 10^{13} \text{ kJ/mol}$
(D) $1.23 \times 10^3 \text{ kJ/mol}$
28. In aqueous solution, Eu^{+2} ion acts as
(A) Oxidizing agent
(B) Reducing agent
(C) Both a and b
(D) None of these

29. Haemoglobin and myoglobin binds
(A) Only O_2
(B) CN^- , NO , CO
(C) RNC , N^{3-} , SCN^-
(D) All of these
30. Each of the following compounds has a singlet in its 1H NMR spectrum. Which compound would have its singlet at the highest frequency?
(A) 1-bromo-2,2-dimethylpropane
(B) ethyl methyl ether
(C) ethyl-tert-butyl ether
(D) 1,2-dibromoethane
31. Which compound shows $\pi \Rightarrow \pi^*$?
(A) Double and triplet bond
(B) Aromatic compound
(C) A and B
(D) None of this
32. For an ideal gas, C_V and C_P are related as :
(A) $C_V - C_P = R$
(B) $C_V + C_P = R$
(C) $C_P - C_V = RT$
(D) $C_P - C_V = R$
33. Carnot cycle consists of.....
(A) Two constant volume and two reversible adiabatic processes
(B) Two isothermal and two reversible adiabatic processes
(C) Two constant pressure and two reversible adiabatic processes
(D) One constant volume, one constant pressure and two reversible adiabatic processes
34. The enthalpy of dry saturated steam, with the increase in pressure
(A) Decreases
(B) Increases
(C) Remains constant
(D) All of the above
35. In the reaction $2A + B \rightarrow A_2B$, if the concentration of A is doubled and that of B is halved, then the rate of the reaction will
(A) increase 2 times
(B) increase 4 times
(C) decrease 2 times
(D) remain the same
36. The equivalent conductance of Ba^{2+} and Cl^- are respectively 127 and $76 \text{ ohm}^{-1} \text{ cm}^{-1} \text{ eq}^{-1}$ at infinite dilution. The equivalent conductance of $BaCl_2$ at infinite dilution will be
(A) 139.5
(B) 203
(C) 279
(D) 101.5

37. The lowest energy of a quantum mechanical harmonic oscillator is $1/2 h\nu$. It is referred to as
(A) Ground state energy
(B) Zero-point energy
(C) Vibrational energy
(D) All
38. NMR spectrometer provides _____ and _____ method of determining structure in soluble chemical compounds.
(A) Accurate, destructive
(B) Accurate, non-destructive
(C) Inaccurate, destructive
(D) Inaccurate, non-destructive
39. Which of the following is known as Lindlar's catalyst?
(A) Na in liquid NH_3
(B) Pt in ethanol
(C) Pd with BaSO_4
(D) Ni in ethanol
40. The term used to determine the protecting power of a lyophilic colloid is
(A) oxidation number
(B) coagulation value
(C) gold number
(D) critical micelle concentration
41. What is the inverse of -1 If $G = \{ 1, -1, i, -i \}$ is group under multiplication?
(A) -1
(B) i
(C) 1
(D) None of Above
42. The maximum number of electrons with $l = 3$ is
(A) 14
(B) 2
(C) 10
(D) 6
43. Which one of the following properties is not shown by NO?
(A) it is diamagnetic in the gaseous state
(B) it is a neutral oxide
(C) it combines with oxygen to form nitrogen dioxide
(D) its bond order is 2.5
44. Which one of the following pairs of molecules will have permanent dipole moments for both members?
(A) NO_2 and CO_2
(B) NO_2 and O_3
(C) SiF_4 and CO_2
(D) SiF_4 and NO_2
45. Which of the following is an example of pseudo alkaloid?
(A) Morphine
(B) Caffeine
(C) Ephedrine
(D) Reserpine

46. Which of the following statements is correct?
(A) Adenine is a pyrimidine
(B) DNA is made of amino acids
(C) Nucleosides do not contain phosphorous
(D) RNA contains thymine
47. Identify the product in following order when 3,4,5-Tribromoaniline undergoes diazotisation followed by attack of H_3PO_2 ?
(A) 3, 4,5-Tribromobenzene
(B) 1, 2, 3-Tribromobenzene
(C) 2, 4, 6-Tribromobenzene
(D) 3, 4, 5-Tribromo nitro benzene
48. Benzene diazonium chloride forms orange red dye with which of the following compound?
(A) Nitrophenol
(B) Benzophenol
(C) Resorcinol
(D) Methanol
49. Pantothenic acid contains an amino acid which is
(A) Aspartic acid
(B) Glutamic acid
(C) β -Alanine
(D) β -Aminoisobutyric acid
50. Organic compounds can be classified based upon the functional groups. Which of the following is not a functional group?
(A) Isocyano
(B) Carbonyl
(C) Isocyanide
(D) Carboxyl