aglasem.com

FOR KUET EXAM PREPARATION

KUET 2022 Question Paper · M.Sc. Chemistry

EXAM	YEAR	TYPE	SUBJECT
KUET	2022	Question Paper	M.Sc. Chemistry

Sr. No. .....520.....

ENTRANCE TEST-2022

SCHOOL OF PHYSICAL & MATHEMATICAL SCIENCES

CHEMISTRY

Total Questions : 60
Time Allowed : 70 Minutes

Question Booklet Series **D**

Roll No. : | | | | | | |

Instructions for Candidates :

1. Write your Entrance Test Roll Number in the space provided at the top of this page of Question Booklet and fill up the necessary information in the spaces provided on the OMR Answer Sheet.
2. OMR Answer Sheet has an Original Copy and a Candidate's Copy glued beneath it at the top. While making entries in the Original Copy, candidate should ensure that the two copies are aligned properly so that the entries made in the Original Copy against each item are exactly copied in the Candidate's Copy.
3. All entries in the OMR Answer Sheet, including answers to questions, are to be recorded in the Original Copy only.
4. Choose the correct / most appropriate response for each question among the options A, B, C and D and darken the circle of the appropriate response completely. The incomplete darkened circle is not correctly read by the OMR Scanner and no complaint to this effect shall be entertained.
5. Use only blue/black ball point pen to darken the circle of correct/most appropriate response. In no case gel/ink pen or pencil should be used.
6. Do not darken more than one circle of options for any question. A question with more than one darkened response shall be considered wrong.
7. There will be **'Negative Marking'** for wrong answers. Each wrong answer will lead to the deduction of 0.25 marks from the total score of the candidate.
8. Only those candidates who would obtain positive score in Entrance Test Examination shall be eligible for admission.
9. Do not make any stray mark on the OMR sheet.
10. Calculators and mobiles shall not be permitted inside the examination hall.
11. Rough work, if any, should be done on the blank sheets provided with the question booklet.
12. OMR Answer Sheet must be handled carefully and it should not be folded or mutilated in which case it will not be evaluated.
13. Ensure that your OMR Answer Sheet has been signed by the Invigilator and the candidate himself/ herself.
14. At the end of the examination, hand over the OMR Answer Sheet to the invigilator who will first tear off the original OMR sheet in presence of the Candidate and hand over the Candidate's Copy to the candidate.

aglasem.com For more Question Papers, Sample Papers, Notes & Syllabus visit aglasem.com

1. Which of the following statement is/are false about the correction terms in van der Waals equations ?

   (A) The coefficient "a" accounts for the mutual attraction between the molecules.

   (B) The term a/v^2 increases the pressure of real gas relative to ideal gas.

   (C) The coefficient "b" represents the volume that is compressible.

   (D) Both (B) and (C)

2. The fraction of total gas molecules which has acquired most probable velocity will _____ with the decrease in temperature.

   (A) increase

   (B) decrease

   (C) remains constant

   (D) can't say without knowing pressure

3. For a cubic crystal, the Miller indices of the plane for which interplanar spacing is $a/\sqrt{3}$ would be :

   (A) 111

   (B) 100

   (C) 200

   (D) 110

4. Which of the following liquid crystalline phases has only orientational order and no positional order ?

   (A) Smectic liquid crystal

   (B) Cholesteric liquid crystal

   (C) Nematic liquid crystal

   (D) None of these

5. After two half lives, the concentration of reactan is reduced to _____ in case of zero orde reaction.

   (A) 0%

   (B) 25%

   (C) 50%

   (D) 75%

6. The rate of formation of NO in the reactio $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + H_2O(g)$ i 5.90×10^{-3} $molL^{-1}s^{-1}$. The rate of disappearanc of oxygen would be :

   (A) 4.72×10^{-3} $molL^{-1}s^{-1}$

   (B) 7.38×10^{-3} $molL^{-1}s^{-1}$

   (C) 3.39×10^{-3} $molL^{-1}s^{-1}$

   (D) 5.90×10^{-3} $molL^{-1}s^{-1}$

7. For the $T \rightarrow \infty$, what will be the value of A the rate constant, $k = 3.2 \times 10^3$ mol^{-1} L s^{-1} an $E_a = 1.0 \times 10^2$ kJ mol^{-1} ?

   (A) $A = 1.0 \times 10^2$ kJ mol^{-1}

   (B) $A = 3.2 \times 10^3$ mol^{-1} L s^{-1}

   (C) $A = 1.2 \times 10^3$ mol^{-1} L s^{-1}

   (D) $A = 3.2 \times 10^3$ kJ mol^{-1} s^{-1}

8. If the intensity of incident beam of monochromat radiation having intensity I_o is reduced to ha when passed through a solution of concentratic c and thickness l, then what would be intensi of transmitted radiation if thickness of the solutic is kept the same and concentration tripled ?

   (A) I_o

   (B) 1/2 I_o

   (C) 1/4 I_o

   (D) 1/8 I_o

aglasem.com For more Question Papers, Sample Papers, Notes & Syllabus visit aglasem.com

9. Which of the following statement is/are CORRECT ?

1. Third law of thermodynamics allows us to calculate absolute entropy of a substance.
2. Temperature dependence of enthalpy of a reaction is given by Arhenius equation.
3. Residual entropy of carbon monoxide is not zero

(A) 1 and 2

(B) 1 and 3

(C) 2 and 3

(D) 1, 2 and 3

10. The Clasius-Clapeyron equation is not applicable to which of the following processes ?

(A) Sublimation of ice in freezer

(B) Condensation of steam into water

(C) Evaporation of mercury liquid from a broken thermometer

(D) Conversion of O_2 (g) into O_3 (g)

11. The following processes are used for cooling :

1. Adiabetic expansion
2. Adiabetic demagnetization
3. Joule-Thomson effect
4. Evaporation

The correct sequence of these processes to produce lower and lower temperature is :

(A) 1, 4, 2, 3

(B) 1, 4, 3, 2

(C) 4, 1, 2, 3

(D) 4, 1, 3, 2

12. If one mole of ethane is burnt in excess of O_2 at constant pressure and 500K, 1560 kJ of heat is liberated. What is the change in internal energy for the reaction

$C_2H_6(g) + 3.5\ O_2(g) \rightarrow 2\ CO_2(g) + 3\ H_2O(g)$

(A) –1562.08 kJ

(B) +1562.08 kJ

(C) –518.5 kJ

(D) –1557.9 kJ

13. If the dissociation constant of weak acid, HA, is K_a of 1.00×10^{-6}, then the percentage acid dissociated at equilibrium will be closed to _____ if 0.100 mol of this acid is dissolved in 100 mL of water.

(A) 99.0%

(B) 1.00%

(C) 99.9%

(D) 0.10%

14. During the conductometric titration of an acid (placed in beaker) by an alkali (taken in burrette), the plot between the conductance and volume of alkali added was found to initially decrease slightly and then slowly increase followed by a sharp increase. Which of the following combinations would give such a plot ?

(A) Strong acid and strong base

(B) Weak acid and strong base

(C) Strong acid and weak base

(D) Weak acid and weak base

aglasem.com For more Question Papers, Sample Papers, Notes & Syllabus visit aglasem.com

15. Molar conductance at infinite dilution for a compound AB is 145.0 Scm^2mol^{-1} and for CB is 110.1 Scm^2mol^{-1}. Limiting molar conductance for A^+ is 73.5 Scm^2mol^{-1}. What is limiting molar conductance for C^+ ion ?

(A) 326.6 Scm^2mol^{-1}

(B) 38.6 Scm^2mol^{-1}

(C) 181.6 Scm^2mol^{-1}

(D) 90.8 Scm^2mol^{-1}

16. For a cell reaction involving two electrons change, the standard e.m.f. of the cell is found to be 0.295 V at 25°C. The equilibrium constant of the reaction would be (Given F = 96500 C mol^{-1}; R = 8.314 $JK^{-1}mol^{-1}$)

(A) 10×10^2

(B) 1.0×10^{10}

(C) 2.0×10^{11}

(D) 4.0×10^{12}

17. Which of the following quantum numbers specifies the z-component of angular momentum of an electron in an atom ?

(A) Principal quantum number (n)

(B) Azimuthal quantum number (l)

(C) Magnetic quantum number (m)

(D) Both (B) and (C)

18. For a particle in a one-dimensional box w potential V_o inside the box and infinite out the ratio of the energy difference bet n = 1 and n = 2 states to that of between n and n = 3 states is :

(A) 4:9

(B) 3:5

(C) 1:1

(D) 1:4

19. The number of vibrational degrees of fre for SO_2 molecule would be :

(A) 2

(B) 3

(C) 4

(D) 5

20. The rotational spectrum of a rigid diatomic consists of equally spaced lines with s equal to :

(A) B

(B) B/2

(C) 2B

(D) 6B

21. The number of lone pairs are identica pair :

(A) XeF_4, ClF_3

(B) XeO_4, ClF_3

(C) XeO_2F_2, ICl_4^-

(D) XeO_4, ClF_3

aglasem.com For more Question Papers, Sample Papers, Notes & Syllabus visit aglasem.com

22. An orbital with same number of angular and radial nodes is :

(A) 4p

(B) 5d

(C) 4f

(D) 3d

23. Switching the internuclear axis from Z to X, the molecular orbital formed from combination of px orbital's of two atoms in a homo diatomic molecule will have a change from :

(A) Having one node to no node along the x axis

(B) Having no node to one node along the x axis

(C) Will keep its node

(D) A low energy M.O. to high energy M.O.

24. Identify the molecule whose bond length decreases on adding an extra electron.

(A) O_2

(B) N_2

(C) B_2

(D) Li_2

25. The correct order of lewis acidity in case of xenon compounds can be :

(A) $XeF_6 > XeOF_4 > XeF_4$

(B) $XeOF_4 > XeF_4 > XeF_6$

(C) $XeF_4 > XeOF_4 > XeF_6$

(D) $XeF_4 > XeF_6 > XeOF_4$

26. The BBB multicentre bond is seen in higher boranes. Identify number of such BBB bonds in B_5H_9 borane molecule. (styx of B_5H_9 = 4120)

(A) 1

(B) 2

(C) 3

(D) 4

27. What is correct for the carborane $C_2B_{10}H_{12}$?

(A) It has a nido type structure

(B) It has 12 electron pairs for skeletal structure

(C) It has an arachno type structure

(D) It has (n+1) skeletal pairs with three isomeric closo structures

28. The ^{19}F NMR spectra of ClF_3 molecule depicts :

(A) T shape evidenced from Doublet and Triplet

(B) T shape evidenced from Singlet

(C) T shape evidenced from Doublet and Singlet

(D) Sp^3d hybridization from Singlet

29. The inner transition elements differ to transition elements in :

(A) Coordination chemistry especially higher coordination numbers

(B) Electronic transitions and factors affecting these excitations

(C) Magnetic properties especially couplings

(D) All of these

aglasem.com For more Question Papers, Sample Papers, Notes & Syllabus visit aglasem.com

30. Which of the following lanthanide (III) ions has highest observed magnetic moment ?

(A) Nd{$4f^3$}

(B) Gd{$4f^7$}

(C) Dy{$4f^9$}

(D) La({$4f^0$}

31. Metallothioneins are natural polypeptides to reverse the toxicity of softer heavy metals like mercury and cadmium; these have mostly the aminoacid residue with softer donor site :

(A) Glycine

(B) Leucine

(C) Lysine

(D) Cysteine

32. Which of the following is the correct order of arrangement of the first five lanthanides according to atomic number ?

(A) La, Ce, Pr, Nd, Pm

(B) La, Pr, Ce, Pm, Nd

(C) La, Pr, Ce, Nd, Pm

(D) La, Ce, Pr, Pm, Nd

33. Which of the following can be facile reducing agent ?

(A) $(\eta^5\text{-}C_5H_5)_2Fe$

(B) $(\eta^5\text{-}C_5H_5)_2Co$

(C) $(\eta^5\text{-}C_5H_4)_2Ru$

(D) $(\eta^5\text{-}C_5H_5)_2Mn$

34. The correct order of Δt for the tetrahedral cobalt(complexes is :

(A) $[CoCl_4]^{2-} > [CoBr_4]^{2-} > [Co(NCS)_4]^{2-}$

(B) $[Co(NCS)_4]^{2-} > [CoCl_4]^{2-} > [CoBr_4]^{2-}$

(C) $[CoBr_4]^{2-} > [CoCl_4]^{2-} > [Co(NCS)_4]^{2-}$

(D) $[Co(NCS)_4]^{2-} > [CoBr_4]^{2-} > [CoCl_4]^{2-}$

35. The final product of the reaction between Me and $[Mn(CO)_6]^+$ is :

(A) $[Mn(CO)_6]^+ Me^-$

(B) $[Mn(CO)_5Me]$

(C) $[Mn(CO)_6]$

(D) $[(MeCO)Mn(CO)_5]$

36. Cysteine is an amino acid with an S-donor s The calculated formation constants of complexes with some metals (log K values) 6.2, 14.4, < 4 and 9.8. Which set of assignme can be the correct one ?

(A) Fe^{2+}, 6.2; Hg^{2+}, 14.4; Mg^{2+}, < 4; Zn^{2+},

(B) Fe^{2+}, 14.4; Hg^{2+}, < 4; Mg^{2+}, 6.2; Zn^{2+},

(C) Fe^{2+}, 6.2; Hg^{2+}, 9.8; Mg^{2+}, < 4; Zn^{2+}, 1

(D) Fe^{2+}, < 4; Hg^{2+}, 6.2; Mg^{2+}, 14.4; Zn^{2+},

37. For the precipitation based method using A ions, Mark the odd one out.

(A) Volhard

(B) Haber

(C) Fajan's

(D) Mohr method

aglasem.com For more Question Papers, Sample Papers, Notes & Syllabus visit aglasem.com

38. For clear quantitative estimation of Ag^+ and Ni^{2+} binary mixture, the correct sequence can be :

(A) EDTA titration followed by dimethylglyoxime to estimate Ni^{2+} gravimetrically.

(B) EDTA titration followed by chloride addition to estimate Ag^+ gravimetrically.

(C) Gravimetric estimation of Ni^{2+} with dmg followed by Ag^+ gravimetrically with chloride.

(D) Ag^+ gravimetrically with chloride followed by Ni^{2+} with EDTA.

39. In the qualitative analysis scheme of cations (metal ions) of group II, when H_2S gas is passed through HCl containing analyte solution, which of the following precipitates are not obtained ?

(A) CuS

(B) HgS

(C) Bi_2S_3

(D) CoS

40. NO ligand has two binding modes linear and bent, identify its binding mode in $[Co(CO)_3(NO)]$ and $[Ni(\eta^5C_5H_5(NO)]$ complexes respectively.

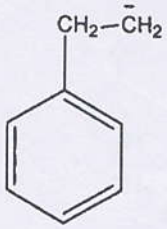
(A) Linear and Bent

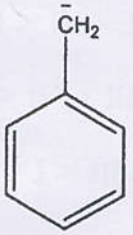
(B) Bent and Linear

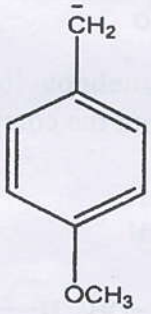
(C) Both Linear

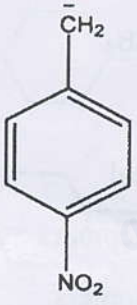
(D) Both Bent

41. The most stable carbanion among the following is :

(A) 

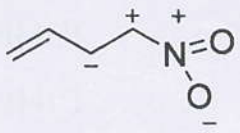
(B) 

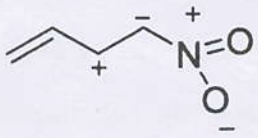
(C) 

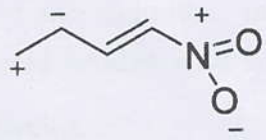
(D) 

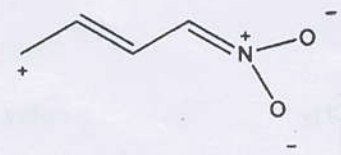
aglasem.com For more Question Papers, Sample Papers, Notes & Syllabus visit aglasem.com

42. Among the following the least stable resonance structure is :

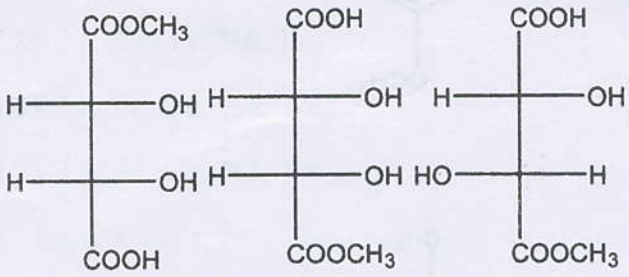
(A) 

(B) 

(C) 

(D) 

43. The correct statement about the compounds I, II & III :



(I) (II) (III)

(A) (I) & (II) are identical

(B) (I) & (II) are diastereomers

(C) (I) & (III) are enantiomers

(D) (I) & (II) are enantiomers

44. Which among the following is true for cyclohex chair conformer ?

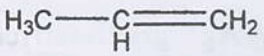
(A) It has 12 axial H's

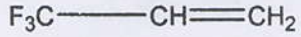
(B) It has 6 axial H's & 6 equatorial H's

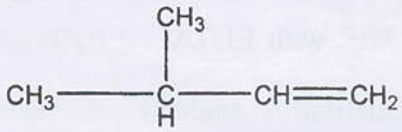
(C) It has 12 equatorials H's

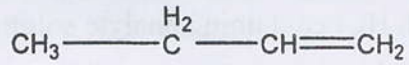
(D) None of these

45. Which among the following doesn't o Markownikoff's rule ?

(A) 

(B) 

(C) 

(D) 

46. Acidic character of terminal alkynes is bec of :

(A) Increased electron density

(B) Increased p-character of sp hybridized ca atom

(C) Increased s-character of sp hybridized ca atom

(D) None of these

47. Isopropylchloride undergoes hydrolysis by

(A) S_N^1 Mechanism

(B) S_N^2 Mechanism

(C) S_N^1 & S_N^2 Mechanism

(D) Neither S_N^1 nor S_N^2 Mechanism

48. In case of elimination reaction of alkyl halide which among the following is the best leaving group ?

(A) –I

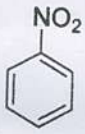
(B) –Br

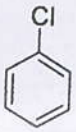
(C) –Cl

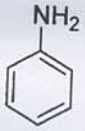
(D) –F

49. Which among the following exhibits higher rate of electrophilic substitution ?

(A) 

(B) 

(C) 

(D) 

50. With periodic acid (HIO_4) glycerol undergoes oxidation to form :

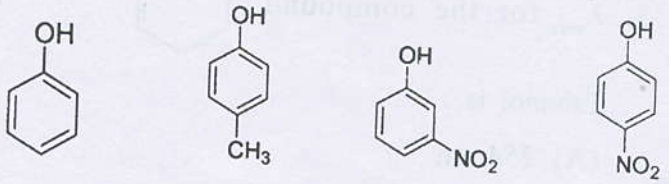
(A) Glyceric acid & Meso-oxalic acid

(B) Oxalic acid & dihydroxyacetone

(C) Formaldehyde and formic acid

(D) Gtyceraldehyde & glyceric acid

51. Among the following compounds, the order of acidity is :



(I) (II) (III) (IV)

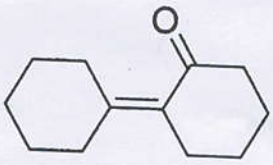
(A) III > IV > I > II

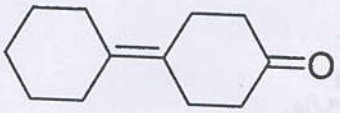
(B) I > IV > III > II

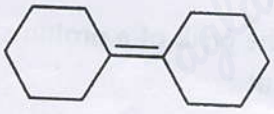
(C) II > I > III > IV

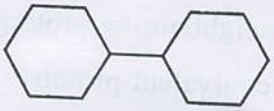
(D) IV > III > I > II

52. Alcohol condensation of  with NaOH yields :

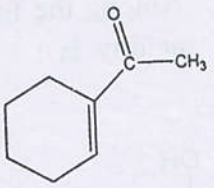
(A) 

(B) 

(C) 

(D) 

SV-14774–D

53. λ_{max} for the compound  in Ethanol is :

(A) 254 nm

(B) 237 nm

(C) 286 nm

(D) 313 nm

54. The stretching vibration frequency of C≡N is in the region of :

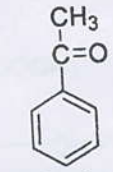
(A) 1400-1250 cm^{-1}

(B) 2260-2240 cm^{-1}

(C) 2950-2650 cm^{-1}

(D) 3590-4420 cm^{-1}

55. The no. of ^{1}HNMR peaks observed for the below given compound is/are :



Acetophenone

(A) Two

(B) Three

(C) Four

(D) None of the above

56. The area under the peak of a proton signal gives information about :

(A) The nature of protons

(B) The no. of neighbouring protons

(C) The no. of equivalent protons

(D) None of the above

57. Which of the following is not a sex hormone ?

(A) Testosterone

(B) Estrone

(C) Estradiol

(D) Cortisone

58. Which among the following is correct statement ?

(A) Starch is a polymer of α glucose

(B) Amylose is a component of cellulose

(C) Proteins of compounds of only one type of amino acid

(D) In cyclic structure of fructose there are four carbon atoms

59. α-D(+) glucose & β-D(+)-glucose are :

(A) Enantiomers

(B) Geometrical isomers

(C) Epimers

(D) Anomers

60. At isoelectric point amino acids are present as :

(A) $NH_2-CH(R)-COOH$

(B) $NH_2-CH(R)-COO^-$

(C) $\overset{+}{N}H_3-CH(R)-COOH$

(D) $\overset{+}{N}H_3-CH(R)-COO^-$