COMMON P.G. ENTRANCE TEST – 2021 (CPET-2021)

Test Booklet No.: 117461

HIGHER EDUCATION DEPARTMENT, GOVT. OF ODISHA

TEST BOOKLET

Subject Code : **15**

Entrance Subject : **CHEMISTRY**

Time Allowed: 90 Minutes

Full Marks : 70

INSTRUCTIONS TO CANDIDATES

1. **Please do not open this Question Booklet until asked to do so.**
2. Check the completeness of the Question Booklet immediately after opening.
3. Enter your **Hall Ticket No.** on the Test Booklet in the box provided alongside. **Do not** write anything else on the Test Booklet.
4. Fill up & darken Hall Ticket No. & Test Booklet No. in the Answer Sheet as well as fill up Test Booklet Serial No. & Answer Sheet Serial No. in the Attendance Sheet carefully. Wrongly filled up Answer Sheets are liable for rejection.
5. Each question has four answer options marked (A), (B), (C) & (D).
6. Answers are to be marked on the Answer Sheet, which is provided separately.
7. Choose the most appropriate answer option and darken the oval completely, corresponding to (A), (B), (C) or (D) against the relevant question number.
8. Use only **Blue/Black Ball Point Pen** to darken the oval for answering.
9. Please do not darken more than one oval against any question, as scanner will read such markings as wrong answer.
10. **Each question carries equal marks. There will be no negative marking for wrong answer.**
11. **Electronic items such as calculator, mobile, etc., are not permitted inside the examination hall.**
12. *Don't leave the examination hall until the test is over and permitted by the invigilator.*
13. **The candidate is required to handover the original OMR sheet to the invigilator and take the question booklet along with the candidate's copy of OMR sheet after completion of the test.**
14. Sheet for rough work is appended in the Test Booklet at the end.

CHEMISTRY

Serial No's of Questions	Question	Number of marks 1x70
1.	Catalytic reduction of thiophene with H_2/Raney Ni forms: A. n-butane B. tetrahydrothiophene C. thiophan D. 2-thienyl nickel	
2.	Hydrogenation of benzoyl chloride in presence of Pd on $BaSO_4$ gives: A. benzyl alcohol B. benzaldehyde C. benzoic acid D. phenol	
3.	Cycloalkanes are isomeric with A. Olefins B. Alkynes C. Alkadienes D. All the above	
4.	A compound with molecular formula, C_7H_{16} shows optical isomerism, the compound will be A. 2,2-dimethylpentane B. 2-methylhexane C. 2, 3-dimethylpentane D. None of these	
5.	What characteristic is at best common to both *cis*-2-butene, and *trans*-2-butene ? A. boiling point B. dipole moment C. heat of hydrogenation D. product of hydrogenation	
6.	The reason of the loss of optical activity of lactic acid when OH group is changed by H, is that: A. asymmetry of the molecule is destroyed	

B. symmetry of the molecule is destroyed
C. structural change occurs
D. spatial arrangement is changed

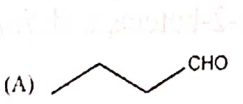
7. An alkane with molecular weight 72 upon chlorination gives only one monochlorination product. The alkane is
A. 2-Methylbutane
B. *n*-Pentane
C. 2, 2-Dimethylpropane
D. all the three above

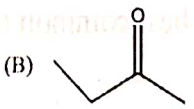
8. A gas decolourises cold aqueous alkaline $KMnO_4$ solution but does not give a precipitate with ammonical CuCl solution. The gas is
A. Methane
B. Ethane
C. Ethylene
D. Acetylene

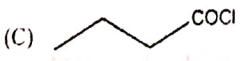
9. An alkene with molecular formula C_6H_{12} upon ozonolysis gives only one product which does not reduce Fehling's solution. The alkene is
A. 3-Hexene
B. 2-Hexene
C. 2-Methyl-2-pentene
D. 2, 3-Dimethyl-2-butene

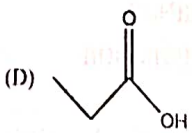
10. The principal organic product formed in the reaction,
$CH_2 = CH(CH_2)_8COOH + HBr \xrightarrow{peroxide}$ is :
A. $CH_3CHBr(CH_2)_8COOH$
B. $CH_2 = CH(CH_2)_8COBr$
C. $CH_2BrCH_2(CH_2)_8COOH$
D. $CH_2 = CH(CH_2)_7 CHBrCOOH$

11. Primary alcohol on oxidation with Cl_2 gives A









12. Among the following which is the Sangers reagent?
(A) Fluoro dinitro benzene

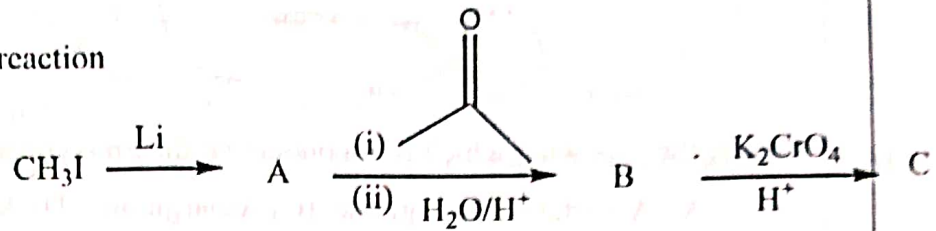
(B) Chloro dinitro benzene

(C) Dinitro benzene

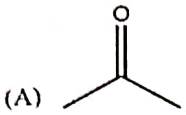
(D) Dibromo nitro benzene

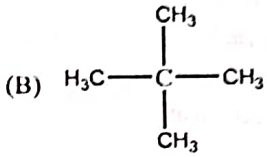
13.

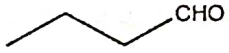
For the reaction



What is C A

(A) 

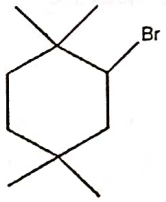
(B) 

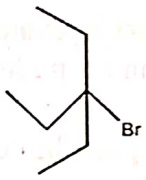
(C) 

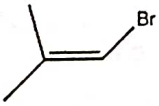
(D) 

14.

Which of the following will favour elimination reaction with cyanide nucleophile? B

(A) 

(B) 

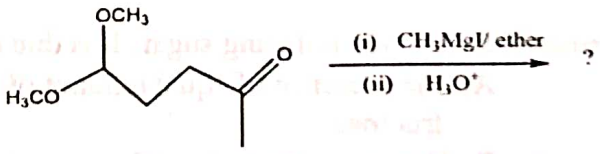
(C) 

(D) CH_3Br

15.

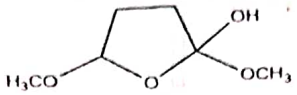
In the following reaction, the end product is A

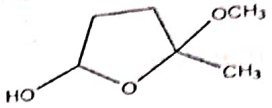
For the reaction



(A) 

(B) 

(C) 

(D) 

16. Among the following which is a monoamino dicarboxylic acid

A. Aspartate (B) Arginine (C) Asparginine (D) Alanine

17. Which reaction is used for the preparation of α-chloroacetic acid ?

A. HVZ reaction
B. Nef reaction
C. Stephens reaction
D. Perkin reaction

18. Which among the following is aromatic A

(A) 

(B) 

(C) 

(D) 

19. In which reaction isocyanate is not an intermediate

A. Hofmann bromide
B. Curtius
C. Gabriel phthalimide
D. Schmidt

20. Isoelectronic point of an amino acid is

A. pH at which it has maximum positive charge
B. pH at which it has maximum nagative charge
C. pH at which it has least positive charge
D. pH at which it has no net charge

21 Sucrose itself is a non reducing sugar. It is due to:

A. the presence of equal amount of D(+) glucose and D(-) fructose
B. the easy conversion of sucrose in to invert sugar on hydrolysis
C. the linkage of both anomeric carbon atoms in an acetal form
D. the presence of α - hydroxy keto group in its structure

22. Diabetes is detected by testing the urine of a patient usually with:

A. Tollen's reagent
B. Nessler's reagent
C. Fenton's reagent
D. Benedict's reagent

23. What is the shape of ClF_3 molecule

A. Plane triangle B. T-shaped C. TBP D. Tetrahedral

24. What is the bond order of He_2^+

A. 1 B. ½ C. 0 D.3/2

25. Which of the following compound of potassium is known as pearl ash?

A. K_2CO_3 B. KNO_3 C. KCl D. $KMnO_4$

26. Among La, Sm, Gd, Yb which element will give coloured ion ?

A. Gd^{2+} B. Sm^{3+} C.Gd^{3+} D. Yb^{3+}

27. When boric acid is heated, finally it gives glassy mass which is due to formation of

A. HBO_2 B. BO_2^- C.B_2O_3 D. $H_2B_4O_7$

28. Which of the following combinations cannot produce a buffer solution?

A. HNO_2 and $NaNO_2$
B. HCN and NaCN
C. $HClO_4$ and $NaClO_4$
D. NH_3 and $(NH_4)_2SO_4$

29. The solubility product of a sparingly soluble salt AB at room temperature is $1.21 \times 10^{-6} M^2$. Its molar solubility is

A. 1.21×10^{-6} M
B. 1.1×10^{-4} M
C. 1.1×10^{-3} M
D. 1.1×10^{-2} M

30. Which of the following is used as an indicator in the titration of a weak acid and a strong base?

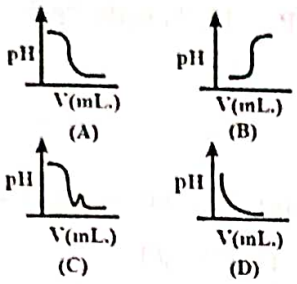
A. Bromothymol blue (6 to 7.5)

B. Methyl orange (3 to 4)

C. Methyl red (5 to 6)

D. Phenolphthalein (8 to 9.6)

31. In an acid-base titration, 0.1 M HCl solution was added to the NaOH solution of unknown strength. Which of the following correctly shows the change of pH of the titration mixture in this experiment?



A. A
B. B
C. C
D. D

32. Based on the first law of thermodynamics, which one of the following is correct?

A. For an isothermal process, q = +w
B. For an isochoric process, $\Delta U = -q$
C. For an adiabatic process, $\Delta U = -w$
D. For a cyclic process, q = -w

33. Two moles of an ideal gas expand spontaneously into vacuum. The work done is

A. 2 J
B. Infinity
C. Zero
D. None of these

34. The heat change at constant volume, q_v, is equal to

A. ΔU
B. ΔH
C. ΔG
D. RT

35 The species which by definition has ZERO standard molar enthalpy of formation at 298 K is

A. $Br_{2(g)}$
B. $Cl_{2(g)}$

C. $H_2O_{(g)}$
D. $CH_{4(g)}$

36. Which of the following factor affects the heat of reaction based on Kirchhoff equation?

A. Molecularity
B. Temperature
C. Pressure
D. Volume

37. C-O stretching frequency for tertiary alcohol is
A. $1100cm^{-1}$ B. $1230cm^{-1}$ C. $1050cm^{-1}$
D. $1150cm^{-1}$

38. The molecule which is IR inactive but Raman active is
A. HCl B. N_2 C. SO_2
D. Protein

39. The rotational spectrum of a rigid diatomic molecule consists of equally spaced lines with spacing equal to (where B= rotational constant)
A. B B. 2B C. 4B D. B/2

40. Acetone shows three important peaks in mass spectrum at m/e = 58, 43, 15. Which peak is most intense
A. 58 B. 43 C. 15 D.None

41. The nitrogen rule states that in case of a compound has an odd numbered molecular ion, the compound has an..... number of nitrogens
A. Odd B. even C.zero D. (m+1) number

42. In which compound molecular ion peak is not visible.
A. Alkane B. Amine C. Alcohol D. Aromatic compound

43. How many numbers of double bonds present in the compound $C_8H_8O_3$.
A. 3 B. 1 C. 4 D. 5

44. Mass spectra of a compound shows following peaks at m/e 86, 71, 57, 43. The compound Is
A. Butane B. 2- methyl butane C. n-hexane
D.2-methyl pentane

45. Arrange the following compounds in the increasing order of carbonyl frequency:
A. $p-methoxy\ acetophenone < Acetophenone < p-nitro\ acetophenone$
B. $p-nitro\ acetophenone < p-methoxy\ acetophenone <$

Acetophenone

C. *Acetophenone < p − nitro acetophenone < p − methoxy acetophenone*

D. *Acetophenone < p − methoxy acetophenone < p − nitro acetophenone*

46. What is the difference in energies of protons oriented with and against a magnetic field of strength 1.5 T ?

A. 5.05×10^{-27} J

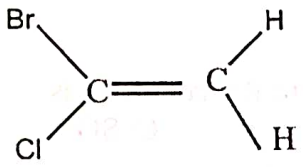
B. 4.231×10^{-26} J

C. 63.8×10^{-25} J

D. 63.85×10^{-27} J

47. A compound with molecular formula C_2H_2BrCl exhibit two doublets (J= 16 Hz) in its PMR spectra. Predict the structure C

(A)



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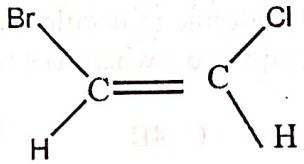

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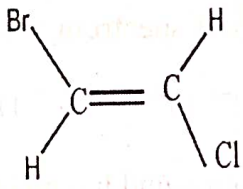

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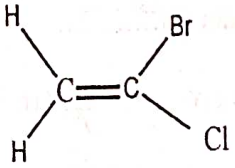

48. Freundlich adsorption isotherm is

A. $\frac{x}{m} = KP^{1/n}$

B. $\frac{x}{m} = mKP^{1/n}$

C. $\frac{x}{m} = KP^{-n}$

D. all of these

49. Which of the following compound corresponds to vant Hoff factor to be equal to 2 in dilute solution?

A. KCl B. $BaCl_2$ C. K_2SO_4 D. $C_6H_{12}O_6$

50. The number of atoms per unit cell in a simple cubic, f.c.c and b.c.c are respectively

A. 1,4,2 B. 4,1,2 C. 2,4,1 D. 4,8,2

51. Which of the following relationships is/are not true

A. Most probable velocity= $\sqrt{\frac{2RT}{M}}$

B. $PV = \frac{3}{2}kT$

C. $Z = \frac{PV}{nRT}$

D. Average kinetic energy= $\frac{1}{2}kT$

52. Two moles of ideal gas expands spontaneously into vacuum. The work done is

A. 2J B. infinite C. zero D.none of these

53. For mean free path (λ) is

(A) $\lambda \propto \frac{P}{T}$ (B) $\lambda \propto \frac{T}{P}$ (C) $\lambda = \frac{v}{T}$ (D) $\lambda \propto \frac{P}{\theta}$

54. The transport number of H^+ is

A. 0.230 B. 0.430 C. 0.630 D. 0.830

55. Third law of thermodynamics provides a method to evaluate which property?

A. Absolute Energy

B. Absolute Enthalpy

C. Absolute Entropy

D. Absolute Free Energy

56. One mole of which of the following has the highest entropy?

A. Liquid Nitrogen

B. Hydrogen Gas

C. Mercury

D. Diamond

57. Which of the following is true for the reaction? H_2O (l) $\leftrightarrow$ H_2O (g) at 100° C and 1 atm pressure ?

A. $\Delta S = 0$

B. $\Delta H = T\Delta S$

C. $\Delta H = \Delta U$

D. $\Delta H = 0$

58 The temperature of the system decreases in an :

A. Adiabatic Compression

B. Isothermal Expansion

C. Isothermal Compression

D. Adiabatic Expansion

59. A metal 'M' is in the first group of the Periodic Table. What will be the formula of its oxide?

A. MO
B. M_2O
C. M_2O_3
D. MO_2

60. Which of the following set of elements is written in order of their increasing metallic character?

A. Na, Li, K
B. C , O, N
C. Mg, Al, Si
D. Be, Mg, Ca

61. Lattice energy is :

A. Directly proportional to inter-ionic distance
B. Directly propotional to Born exponent
C. Inversely proportional to inter-ionic distance
D. Inversely proportional to Avogadro's number

62. The correct order of dipole moment is :

A. $CH_4 < NF_3 < NH_3 < H_2O$
B. $NF_3 < CH_4 < NH_3 < H_2O$
C. $NH_3 < NF_3 < CH_4 < H_2O$
D. $H_2O < NH_3 < NF_3 < CH_4$

63. In which of the following cases the covalent character and the melting point order are the same ?

A. $BeCl_2$, $CaCl_2$, $BaCl_2$
B. NaCl, $MgCl_2$, $AlCl_3$
C. $MgBr_2$, $SrBr_2$, $BaBr_2$
D. NaF, MgF_2, AlF_3

64. Which of the following has T-shape ?

A. I_3^-
B. NH_2^-
C. BeF_2
D. H_2O

65. PF_3 is very reactive because :

A. Bond angle FPF is 90^0
B. Axial bonds are longer than equatorial bonds
C. It is SP^3d hybridised
D. None of these

66. The molality of pure water is

A. 100M B. 55.6 M C. 50 M D. 18M

67. Which of the following 0.1 M aqueous solution will have the lowest freezing point?

A. K_2SO_4 B. NaCl C.urea D. Glucose

68. Among the following species, the one having the highest bond strength is

A. O_2 B.O_2^+ C. O_2^- D. O_2^{2-}

69. Halide ions are reducing agent. Which one of the following is their correct sequence in the increasing order of their reducing power?

A. $Cl^- > F^- > Br^- > I^-$
B. $I^- > Br^- > Cl^- > F^-$
C. $F^- > Cl^- > Br^- > I^-$
D. $Br^- > Cl^- > F^- > I^-$

70. Which one of the following is a pseudohalide ?

A. CN^- B. ICl C. IF_5 D. I_3^-

ROUGH WORK