

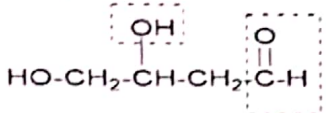
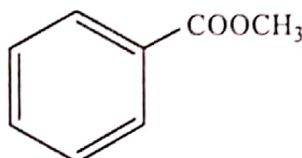
BOWEN UNIVERSITY, IWO, OSUN STATE.
FACULTY OF SCIENCE
DEPARTMENT OF CHEMISTRY AND INDUSTRIAL CHEMISTRY
B.S.C. DEGREE 2018/2019 EXAMINATION

COURSE CODE: CHM 102 COURSE TITLE: General Chemistry II CREDIT: 3

Date: 30/05/19

Time Allowed: 2¹/₂Hrs

INSTRUCTIONS: Answer all questions in the answer sheet (s) provided

- Which term best describes the shape of the acetylene (C₂H₂) molecule?
(a) trigonal planar (b) tetrahedral (c) linear (d) bent
- Consider ethyne, C₂H₂. Ethyne contains:
(a) no π-bonds. (b) one π-bond. (c) two π-bonds. (d) three π-bonds
- Which of the following compounds could have the molecular formula C₇H₁₆?
(a) hexane (b) pentane (c) 2-methylheptane (d) 2,3-dimethylpentane
- Consider C₂H₆, C₂H₄, and C₂H₂. Which of these has the **shortest** carbon-carbon bond?
(a) C₂H₆. (b) C₂H₄. (c) C₂H₂. (d) none of the above
- Identify the boxed functional groups

(a) primary alcohol and carboxylic acid
(b) secondary alcohol and aldehyde
(c) tertiary alcohol and carboxylic acid
(d) primary alcohol and aldehyde
- According to modern bonding theory the number of sigma (σ) and pi (π) bonds in the ethylene molecule H₂C = CH₂ is
(a) 1 σ and 4 π (b) 1 π and 5 σ (c) 1 σ and 5 π (d) 2 π and 4 σ
- Which of the following is called an ether group?
(a) R-COO- R (b) R-CO-R (c) R-CO-O-CO-R (d) R-O-R
- The compound below is classified as _____

(a) an ester (b) a symmetrical anhydride
(c) a mixed anhydride
(d) an ether
- What is the correct name for the compound CH₃CH₂CH(CH₃)CH(OH)CH₃?
(a) 2-ethylbutan-3-ol (b) 3-ethylbutan-2-ol (c) 2-methylpentan-3-ol (d) 3-methylpentan-2-ol
- Which is unsaturated, aliphatic and has alkyl chains?
(a) Cyclohexane (b) 2-methylpropene (c) 2,3-dimethyloctane (d) 1,3-dimethylbenzene
- Which pair are within the same homologous series?
(a) butane and methylpropane (b) ethane and ethanol (c) heptane and octane
(d) prop-1-enol and prop-2-en-1-ol
- What is the bond angle across the C=C bond in 1-chloropropene?
(a) 104.5° (b) 107° (c) 109.5° (d) 120°
- In the three-dimensional structure of methane, CH₄, the hydrogen atoms attached to a carbon atom are aligned.....
(a) in a straight line. (b) at the corners of a square. (c) at the corners of a tetrahedron.
(d) at the corners of a rectangle.

Give the IUPAC names of the following compounds in Questions 14-22

14.



- (a) propane (b) butane (c) pentane (d) hexane
 E: CH_3-CH_2

(a) chloromethane (b) methanochlorine (c) methane chloride (d) all options are correct

15.



- (a) 1-methylbutane (b) 2-methylbutane (c) 3-methylbutane (d) 4-methylbutane

16.



- (a) 1,1-dimethylbutanoic acid (b) 4,4-dimethylbutanoic acid
 (c) 2-methylpentanoic acid (d) 4-methylpentanoic acid

17.



- (a) ethyl methyl ether (b) methyl ethyl ether (c) propyl ether (d) none

18. $\text{Cl}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{OH}$

- (a) 1-hydroxypropyl-3-chloride (b) 3-chloropropanol (c) 3-chloropropan-3-ol
 (d) 1,3-chloropropanol

19.



- (a) 3-ethylhexanal (b) 3-propylhexanal (c) 3-ethylhexanone (d) 3-ethylhexanone

20.







- (a) 1,2-dichloro-3-methylpentane
 (b) 1,2-dichloro-3-methylcyclopentane
 (c) 3-methyl-1,2-dichlorocyclopentane
 (d) 3-methyl-1,2-dichlorocyclopentane

21. The hybridizing of one S atomic orbital and three P atomic orbitals produces

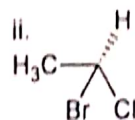
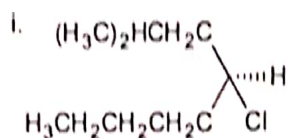
- (a) three hybrid orbitals (b) two sp^2 hybrid orbitals (c) three sp^3 hybrid orbitals
 (d) four sp^3 hybrid orbitals

22. What is the name of the alkyl group $\text{CH}_3-\text{CH}_2-\text{CH}_2-$?

- (a) propane (b) methyl (c) propyl (d) ethyl

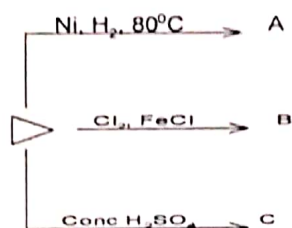
24. The blending of one s atomic orbital and three p atomic orbitals produces
 (a) three sp hybrid orbitals (b) two sp² hybrid orbitals (c) three sp³ hybrid orbitals
 (d) four sp³ hybrid orbitals
25. What is the name of the alkyl group CH₃-CH₂-CH₂-?
 (a) propane (b) methyl (c) propyl (d) ethyl
26. Which of the following groups does not contain oxygen atom?
 (a) alcohol (b) ether (c) amine
 (d) alkanal.
27. The product of this reaction $\text{CH}_3\text{CH}_2\text{MgCl} \xrightarrow{\text{H}_2\text{O}}$ is _____
 (a) an alkane (b) an alkene (c) an aldehyde (d) a ketone
28. In naming organic compounds, letters and numbers are separated by _____
 (a) comma (b) hyphen (c) colon (d) semi colon
29. Which of the following arrows is used to indicate two resonance structures?
 (a)  (b)  (c)  (d) 
30. A positive charge on an organic atom or group of atoms indicates _____ centre.
 (a) electron rich (b) electron deficient (c) neutral (d) reaction
31. In organic nomenclature, numbers are separated by (a) hyphen (b) comma (c) colon (d) semi colon
32. Organic compounds that are polar generally have higher _____ than their corresponding compounds that are not polar. (a) bonds (b) electrons (c) melting points (d) boiling points
33. A curly arrow shows the actual movement of a pair of electrons from a (an) _____ orbital to a (an) _____ orbital. (a) empty, filled (b) filled, empty (c) filled, filled (d) empty, empty
34. An organic reaction in which there is a constitutional change in carbon skeleton is called... reaction. (a) addition (b) substitution (c) rearrangement (d) elimination
35. Curved arrows are used to show the direction of... (a) electrons (b) Protons (c) products (d) reactants
36. One of the following is not a reaction of alkanes:
 (a) Substitution (b) Reduction (c) Combustion (d) Pyrolysis
37. One of the following is not an oxidizing agent (a) MnO₂ (b) KOCl (c) KMnO₄ (d) NH₃
38. Which of the following is a reducing agent? (a) LiAlH₄ (b) KOCl (c) KMnO₄ (d) NH₃
39. A reaction mechanism where bonds are broken in such a way that the bond electron pair is assigned completely to one fragment is called... (a) ionic
 (b) radical (c) electropositive (d) electronegative
40. The compound CH₃(CH₂)₄CHO is best named as... (a) 2-methylpentanal (b) hexanal
 (c) hexanol (d) hexan-4-one

Use the structures 'I' and 'II' below to answer questions 41 and 42.



41. The absolute configuration of the structure in 'a' above is ____ (a) R (b) S (c) E (d) Z
 42. The absolute configuration of the structure in 'b' above is ____ (a) R (b) S (c) E (d) Z
 43. Organic functional groups that can be classified into 1^o, 2^o and 3^o include the following but
 ____ (a) alcohol (b) alkyl halide (c) ether (d) a & b
 44. The reaction $\text{C}_6\text{H}_6 + \text{HNO}_3 \longrightarrow \text{C}_6\text{H}_5\text{NO}_2 + \text{H}_2\text{O}$ can specifically be described as ____
 (a) substitution (b) addition (c) elimination (d) rearrangement
 45. Which of the following reactions is an elimination reaction? (a) $\text{C}_4\text{H}_4 + \text{HBr} \longrightarrow \text{C}_4\text{H}_5\text{Br}$
 (b) $\text{C}_4\text{H}_5\text{Br} \longrightarrow \text{C}_2\text{H}_4 + \text{HBr}$ (c) $\text{C}_6\text{H}_5\text{OH} + \text{HCl} \longrightarrow \text{C}_6\text{H}_5\text{Cl} + \text{H}_2\text{O}$ (d) $3 \text{C}_2\text{H}_2 \longrightarrow \text{C}_6\text{H}_6$
 46. Which of these molecule is an example of a ketone?
 (a) Ethanal (b) Ethanoic anhydride (c) Propan-2-one (d) Propanamide
 47. Conversion of an aldehyde to an alcohol is generally known as.....
 (a) Reduction (b) Oxidation (c) Esterification (d) Polymerisation

Complete the reactions below and use them to answer questions 48 and 50.



48. The product A is an ____ (a) alkane (b) alcohol (c) alkyl halide (d) alkene
 49. The product B is an ____ (a) alkane (b) alcohol (c) alkyl halide (d) alkene
 50. The product C is an ____ (a) alkane (b) alcohol (c) alkyl halide (d) alkene
 51. An element is a substance: (a) that can only be studied systematically (b) that contains only an electron and a neutron (c) that is the smallest unit of matter that retains all of the chemical properties (d) that cannot be separated into simpler substances by chemical means
 52. Water also: (a) occurs in nature as snow, glaciers and fog (b) in the solid state as ice and Icebergs (c) occurs in the gaseous state as steam (d) All of the above
 53. All the following elements can displace hydrogen from water except (a) Na (b) Li (c) Mg (d) None of the above
 54. The modern periodic law states that (a) All periods are equal (b) The properties of elements are a periodic function of their atomic numbers (c) Metals are cable of releasing electrons (d) Atomic masses are responsible for isotopic behaviours

55. As one travels up through the lower layers of the atmosphere, the composition of air does not change much but (a) the number of molecules change (b) the composition changes slightly as the temperature also decreases (c) the pressure reduces a little (d) None of the above
56. The hybridization in BeF_2 and the shape is (a) sp^3 & Triangular Shape (b) sp & Linear Shape (c) sp^2 & V-Shape (d) None of the above
57. Graphite is an allotrope of ...and its hybridization is..... (a) Sulphur and sp (b) Nitrogen and sp^3 (c) No option (d) Carbon and sp^2
58. Arrange the following in the increasing order of atomic radius: C-F, C-O, C-N (a) C-O, C-N, F-F (b) C cannot bond to F (c) C-F, C-O, C-N (d) None
59. The bond order of the C-C bond in C_2H_4 and its hybridization are: (a) 1 & sp (b) 2 & sp^2 (c) 3 & sp^3 (d) 4 & sp
60. Cobalt can form coloured compounds due to (a) d-d electronic transitions (b) variable oxidation states (c) the peculiarity of its chemistry as a transition metal (d) all of the above

Use the following to answer questions 11 to 13: Co, V, Cr, Mn and Fe

61. The element with $[\text{Ar}], 4s^0, 3d^5$ electronic configuration with the oxidation state of +2 is (a) Co (b) V (c) Cr (d) Mn
62. The electronic configuration of $[\text{Ar}], 4s^0, 3d^6$ is suitable for (a) Mn^{2+} (b) Co^{3+} (c) Fe^{2+} (d) options (b) and (c)
63. On the periodic table, all these elements (a) belong to period 4 (b) are d-block elements (c) can form coordinate bonds (d) all options
64. A ligand (a) is a Lewis base (b) an electron donor specie (c) all options (d) can form complexes

Use the following to answer questions 15 to 17: The magnetic quantum number (m) values for the orbital with $n=2$ and $l=2$ are

65. (a) 1 and 2 (b) -2, -1, 0, +1 and +2 (c) -1, 0 and +1 (d) None
66. This orbital is likely to be the (a) S Orbital (b) P Orbital (c) D Orbital (d) F Orbital
67. The symbol of the principal quantum number and its value for the above orbital is (a) s; 1 (b) s; $1/2$ (c) n; 1 (d) n; 2
68. The values $n=1$ and $l=0$ represent which orbital? (a) None (b) 1s (c) 2p (d) 2s
69. Examples of crystal systems include all but one: (a) Tetragonal (b) Hexagonal (c) Orthorhombic (d) Triclinic
70. A cell is a subdivision of a crystal that, when stacked together without rotation or reflection, reproduces the crystal (a) Not always true (b) it can also be represented in three dimensions (c) False (d) True