Important Instructions:

1) Use a soft (#2) graphite pencil only in filling out the answer sheet. ***Make dark marks*** in the correct circles on your answer sheet.

2) Print your name in the boxes on the upper left of Side 1 and blacken the respective circle under each letter of your name. Fill in your *last name first.*

3) Enter the first letter of the test color in the last box of the name grid and blacken the corresponding circle under the letter. *This is a* ***Yellow*** *test.*

4) You must enter a 10-digit identification code on your answer sheet as follows. If you have a 7-digit NAID number, the left-most digits will be 117 and should be followed by your NAID number. If you have a 6-digit NAID number, the left-most digits will be 1170 and should be followed by your NAID number. If you have an NAID number containing more than 7 digits, simply put enough zeros in front of your NAID number to make it 10 digits long. Now blacken the respective circle under each digit of this identification code.

   NOTE: Your exam score will be posted on the second floor of Ladd Hall according to the last five digits of this identification code.

5) ***Sign your name (do not print) in the upper left hand corner of the answer sheet.***

6) Answer each question by blackening the circle of the letter corresponding to the best or most correct answer to that question. *There is only one correct answer to each question.* If you blacken more than one circle for a question it will be scored as incorrect.

7) There should be 50 answers filled in when you are finished.

8) Turn in your answer sheet and be prepared to show a picture I. D. at the lecture hall door marked with the color of your test.

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1. Soap can be synthesized from:

   (a) peptides (b) proteins (c) triglycerides (d) cellulose (e) polysaccharides

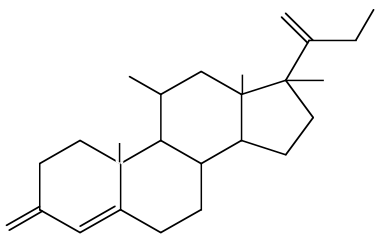
2. The double helix is a structural characteristic of molecules of:

   (a) essential amino acids (b) polyethylene (c) hemoglobin (d) DNA (e) acetic acid

3. In the modern periodic table, the chemical symbols of the elements are arranged by increasing numbers of

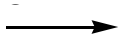
   (a) electrons (b) neutrons (c) protons (d) protons and neutrons (e) mass

4. The chemical structure of hydrocortisone, an anti-inflammatory steroid used in skin creams, is given below. How many functional groups does it contain?



   (a) 8 (b) 2 (c) 5 (d) 6 (e) 4

5. What is the coefficient for O_2 when the following equation is balanced using the smallest set of whole integers?



(a) 1 (b) 3 (c) 3.5 (d) 5 (e) 7

6. All of the following elements are nonmetals except

(a) He (b) O (c) Br (d) Ne (e) Si

7. Which of the following is the correct chemical formula of the salt produced by neutralization of hydrobromic acid (HBr) with $Mg(OH)_2$ (a weak base)?

(a) $MgBr_2$ (b) Mg_2Br_3 (c) Mg_3Br_2 (d) Mg_2Br (e) MgBr

8. Proteins are a complex biomolecule that are composed of:

(a) carbohydrates (b) fats (c) nucleic acids (d) amino acids (e) butene molecules

9. A shrewd, but tentative, initial explanation for a set of observations is best described as a:

(a) theory (b) experiment (c) hypothesis (d) scientific law (e) fact

10. Weak forces of attraction between the molecules in a liquid that affect boiling and melting temperatures are called a(n):

(a) covalent bond (b) ionic bond (c) intramolecular force (d) intermolecular force (e) none of these

In questions 11-15 match the simple hydrocarbon type or substituted hydrocarbon type with the formula. You may benefit from drawing a structure or using the general formula.

Hydrocarbon Type	↓	Chemical Formula
11. Alkane		a. $C_5H_{11}Cl$
12. Alkene		b. C_6H_{14}
13. Alkyne		c. C_9H_{18}
14. Aromatic		d. C_5H_8
15. Halogenated Alkane		e. C_6H_6

16. Arrange the following hydrocarbons in order of lowest to highest boiling points.

(a) decane, pentane, propane, ethane,nonane
(b) ethane, nonane, decane, propane, pentane
(c) ethane, propane, pentane, nonane, decane
(d) propane, decane, pentane, nonane, ethane
(e) decane, nonane, pentane, ethane, propane

17. Which one of the following forms of nuclear radiation can penetrate the deepest into body tissue?

(a) alpha (b) beta (c) gamma (d) electron (e) proton

18. Two terms, atomic number Z and mass number A, represent the number of _____ and number of _____, respectively:

(a) nucleons, protons (b) electrons, nucleons (c) protons, neutrons (d) protons, nucleons

19. What is the molarity of a solution containing 450 grams of glucose ($C_6H_{12}O_6$ molar mass = 180 grams/mole) in 750 mL of water?

(a) 1.2 M (b) 0.60 M (c) 3.3 M (d) 6.6 M

20. A solution is defined as a homogeneous mixture consisting of one or more _____ and a _____, respectively. The latter component is usually in excess.

(a) solutes, ionic salts (b) solvents, solute (c) solutes, solvents (d) molecules, solute

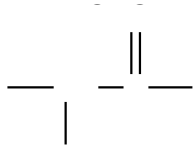
21. What is the molecular geometry around each carbon atom in the structure of ethylene?

(a) linear (b) trigonal planar (c) trigonal pyramidal (d) tetrahedral

22. The element most common to all living organisms on this planet that consists of two main stable isotopes and one radioactive isotope with a half-life of 5730 years is:

(a) O (b) Fe (c) C (d) H (e) S

23. The following general chemical formula is the structure for what class of chemical substances that are important in the human body?



(a) lipids (b) carbohydrates (c) bone (d) proteins (e) none of these

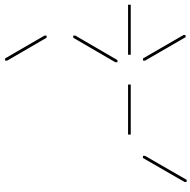
24. How many primary carbon atoms are in the structure for 3-methyl-1-butanol ?

(a) none (b) 5 (c) 10 (d) 12 (e)

25. An isomer that displays optical activity is called a(n):

(a) entantiomer (b) structural isomer (c) geometric isomer (d) duck in the water

Questions 26, 27, and 28 refer to the hydrocarbon structure below:



26. What class of hydrocarbon does this molecule belong in?

(a) alkenes (b) ketones (c) alkynes (d) alkanes (e) aromatics

27. The correct name for this structure is:

(a) n-hexene
(b) 2-ethyl-2-methylbutane
(c) 3,3-dimethylpentane
(d) 2,2-ethylpropane
(e) benzene

28. How many quaternary carbon atoms are in this structure?

(a) 2 (b) 4 (c) 1 (d) 3 (e) 5

For the anion of the sulfur isotope to the right, choose one of the numbers that correctly answers questions 29-33.

(a) 16 (b) 32 (c) 14 (d) 18 (e) 34

29. Number of protons _____

30. Number of neutrons _____

31. Number of electrons _____

32. Atomic number _____

33. Mass Number _____

34. What is the pH of a 0.10 M solution of NaOH? [Remember NaOH (aq) ➔ Na^+ (aq) + OH^- (aq)]

(a) 14 (b) 1 (c) 2 (d) 13 (e) 0.10

35. A solution that consists of a weak acid and the sodium salt of its conjugate base that can resist changes in pH is called a:

(a) acidic solution (b) buffered solution (c) basic solution (d) colored solution

36. An aqueous, neutral solution under equilibrium conditions has:

(a) $[H_3O^+] = [OH^-]$ (b) $[H_3O^+] > [OH^-]$ (c) $[H_3O^+] < [OH^-]$ (d) $[H_3O^+] \neq [OH^-]$

37. The balanced chemical equation for the synthesis of ammonia gas is given by:

$$N_2\,(g) + 3H_2(g) \rightarrow 2NH_3\,(g)$$

On a stoichiometrically equivalent scale, which of the following statements is correct?

(a) one mole of diatomic nitrogen reacts with two moles of ammonia
(b) one molecule of diatomic nitrogen gas reacts with three moles of diatomic hydrogen gas
(c) three moles of diatomic hydrogen gas react with one mole of diatomic nitrogen gas
(d) two moles of ammonia gas react to produce two moles of diatomic hydrogen gas
(e) one molecule of diatomic nitrogen gas reacts with 2 molecules of ammonia gas

38. The disaccharide sucrose (common table sugar) is composed of

(a) D-glucose and D-galactose
(b) D-glucose and D-fructose
(c) triglycerides and nucleic acids
(d) cellulose and DNA
(e) none are correct

39. Amino acids found in proteins contain:

(a) an amino group (b) a carboxyl group (c) a side chain (d) all of the above

In questions 40-46 match the general formula with the functional group name.

Functional Group	↓	General Formula
40. Aldehyde		a. R-O-R (or R')
41. Thiol		b. RCOOR (or R')
42. Ether		c. RCOOH
43. Ester		d. RCOH
44. Carboxylic Acid		e. R-S-H

45. The peptide bond (an amide linkage)

(a) is formed by elimination of water
(b) links two or more amino acids together
(c) is the basis of protein structure
(d) all of the above

46. Which of the following fuels has the highest energy content per gram?

(a) hydrogen (b) charcoal (c) methane (d) gasoline (e) pine wood

47. The double helical structure of standard DNA is the

(a) primary structure

(b) secondary structure
(c) tertiary structure
(d) quaternary structure

48. Identify the chemical species which is a cation:

(a) FeS (b) Fe^{2+} (c) S^{2-} (d) $C_6H_{12}O_6$ (e) none are cations

49. On the basis of electronegativity, which pair is least likely to form an ionic bond?

(a) C and N (b) Mg and F (c) Li and S (d) Zn and O (e) Ba and I

50 The water-fearing property of lipids is expressed by the word

(a) hydrophilic (b) hydrophobic (c) hydrolysis (d) condensation (e) combustion

Chemistry 117 Final Exam

Name _____
NAID #_____

Extra Credit Question (10 points)
Tear off and turn this in with your opscan.

Various types of chemicals are used to control pests of the land. Name the three classes of pesticides discussed in Chapter 13 and what they are used to control. One of these pesticides, agent orange, was used in the Vietnam conflict. What is the composition of agent orange ? What is the chemical associated with the manufacture of agent orange ? Why is this chemical of concern ? Explain as completely as possible.