Chemistry 1101
Final Exam
December 11th, 2001

Name: _____

Student #: _____

Instructions:

This exam contains 14 pages, including this page (57 questions). Be sure that you have all pages.

As a courtesy to all, TURN OFF YOUR CELL PHONE AND PUT IT AWAY! It must <u>not</u> remain on your desk during the exam.

You have <u>three</u> hours in which to complete this exam. You may not leave until after the first hour. If you leave early, please be very quiet in consideration of the others still writing.

Work independently. You may not share your calculator or any other materials (erasers, etc.) with others. Students caught cheating will be dealt with according to Kwantlen's plagiarism and cheating policy.

Multiple choice questions are worth one mark each; marks for other questions are indicated.

A periodic table and information about organic compounds is included with this exam.

GOOD LUCK, and have a great holiday!

1. One goal of this course was to provide you with enough basic knowledge of chemistry to make informed decisions about things chemical. Given this objective of the course, how would you respond to the following scenarios? **(4 marks)**

   a) A new fruit and vegetable market that opened in your neighborhood is advertising that they sell only chemical free produce.

   b) An advertisement claims that an herbal product can cure disease X, and that since it is an all natural product, there are no side effects.

2. Balance the following chemical equations: **(2 marks)**

   a) ____ P_4 + ____ H_2 → ____ PH_3

   b) ____ C_7H_{16} + ____ O_2 → ____ CO_2 + ____ H_2O

3. Provide names or formulas for the following ionic compounds: **(4 marks)**

   a) SrS _____

   b) Al_2O_3 _____

   c) _____ sodium oxide

   d) _____ magnesium chloride

4. Determine the molecular mass of aspartame, whose molecular formula is: $C_{14}H_{18}N_2O_5$ **(2 marks)**

5. Aspartame is a dipeptide that provides the body with 4.0 Calories/gram. Yet aspartame (known commercially as Nutrasweet) is useful for sweetening low calorie foods and drinks. This is because aspartame:

   a) is 160 times as sweet as sucrose

   b) is not metabolized by the body

   c) consists of two essential amino acids

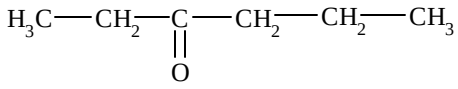
   d) consists of two non-essential amino acids

   e) produces a specific dynamic action large enough to compensate for the calories it delivers

6. Complete the following chart: **(3 marks)**

Symbol	Atomic # Z	Mass # A	# protons	# neutrons	# electrons
^{238}Np					
	56			81	54
		235	92		90

7. Give an IUPAC name for each of the following structures. **(4 marks)**

a) 

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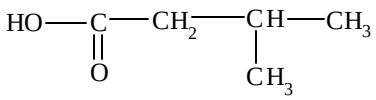
b) 

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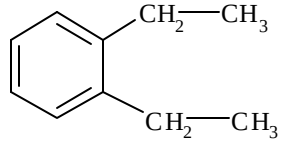
c) 

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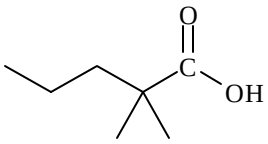
d) 

_____

8. Fill in the blanks with an appropriate term or example. **(8 marks)**

   a) An example of an element that is considered to be a halogen is _____

   b) The element whose atomic number is eight is _____

   c) An example of an alkaline earth metal is _____

   d) Silicon is an example of a _____

   e) An example of a gaseous, diatomic element is: _____

   f) An element that can be found in a catalytic converter is: _____

   g) The property that characterizes noble metals is their _____

   h) Melting ice is an example of a _____

9. Match each item in Group A with one in Group B. **(4 marks)**

Group A	**Group B**
_____a. chloride anion	1. assembly of atoms
_____b. compound	2. chemical particle that carries either of positive or negative electrical charge
_____c. electrolyte	3. conducts electricity when it is dissolves in water or when it is molten
_____d. ion	4. element
_____e. ionic bond	5. negatively charged ion
_____f. molecule	6. positively charged ion
_____ g. sodium cation	7. pure substance formed by combination of two or more elements in a specific ratio
_____h. sulfur	8. results from the attraction of oppositely charged ions

10. Fill in the blanks with an appropriate word or phrase from below. **(10 marks)**

In its modern form, the _____ is an organization of all the known elements, arranged in order of increasing _____. Elements that lie in the same _____ have similar _____, have the same number of _____, and belong to the same chemical _____. The table shows the element's chemical _____, atomic number, and _____, which is the average mass of all the _____ of the element, weighted for the _____ of each. The table is particularly useful for predicting the outcome of chemical reactions between _____, since an atom of any element tends to react so as to convert its electronic structure to that of a nearby _____. When atoms react by a complete _____ of electrons, the products are _____. When they react by _____ pairs of electrons, the result is a _____. While ionic compounds exist as crystals made up of extensive _____ of ions, covalent compounds are composed of discrete _____. If the atoms that form the covalent bonds have significantly different _____, the bond that forms is a _____.

periodic table	electronegativites	sharing	group	molecules
elements	lattices	ions	symbol	isotopes
family	covalent bond	atomic number	noble gas	transfer
period	valence electrons	salt	molecules	mass
mass	chemical properties	polar covalent bond	isotopes	abundance

11. When magnesium reacts with bromine, the molecular formula of the product is:
    a) MgBr
    b) $MgBr_2$
    c) Mg_2Br
    d) Mg_2Br_3
    e) Mg_3Br_2

12. Acid rain results from pollution of the atmosphere with:
    a) CO_2
    b) unburned hydrocarbons in automobile exhausts
    c) CFCs, which are chlorofluorocarbons
    d) ozone
    e) SO_2 and oxides of nitrogen

13. Propane, benzene, acetylene, and 2-butene are all examples of:
    a) alkenes
    b) alkanes
    c) aromatic compounds
    d) hydrocarbons
    e) alkynes

14. A pure substance that cannot be decomposed or converted into simpler substance by the action of heat, light, magnetism, kinetic energy, sound, electricity, or any of the other common forces of our everyday world is considered to be a(n):
    a) ionic compound
    b) diatomic molecule
    c) element
    d) electrolyte
    e) covalent compound

15. The ozone layer is important to life on the surface of the earth because the ozone layer:
    a) furnishes us with our atmospheric oxygen
    b) protects us from excessive ultraviolet radiation from the sun
    c) catalyzes the formation of vitamin D as we absorb ultraviolet radiation
    d) counteracts the harmful effects of nitrogen dioxide
    e) hinders the formation of thermal inversions

16. The smallest, electrically neutral particle of an element that can be identified as that element is:
    a) a proton
    b) a neutron
    c) a molecule
    d) an atom
    e) an electron

17. Even though nitrates phosphates are nutrients and are major components of agricultural fertilizers, they are considered to be pollutants in lakes and slow-moving streams because they:
    a) are readily converted into toxic substances
    b) interfere with the reproductive processes of marine animals
    c) cause young fish and other marine animals to mature too rapidly
    d) produce a rapid growth of plant life on the surface of the water, which form a barrier to the penetration of atmospheric oxygen into the lower regions of the water
    e) combine with the minerals of hard water and form polluting sediments within the body of water

18. All the different kinds of substances that make up all of the material of the universe are known collectively as:
    a) elements
    b) compounds
    c) matter
    d) electrolytes
    e) ions

19. DDT has been used widely throughout the world as a(n):
    a) insecticide
    b) herbicide
    c) agent for the purification of drinking water
    d) agricultural fertilizer
    e) poison for mice, rats, and similar animal pests

20. The reaction of calcium and sulfur produces:
    a) CaS
    b) Ca_2S
    c) CaS_2
    d) Ca_3S_2
    e) Ca_2S_3

21. One of the major disadvantages to the widespread use of DDT is its:
    a) very high toxicity to humans
    b) rapid decomposition into other, highly toxic substances
    c) high toxicity to insects
    d) resistance to degradation to other substances
    e) high cost

22. The greatest hazard in the disposal of household wastes by flushing them into a sink, down a drain, or into a toilet, or by dumping them on the ground, is:
    a) the poisoning of domestic pets
    b) widespread destruction of birds
    c) contamination of groundwater
    d) the destruction of lawns and gardens
    e) increased air pollution in urban areas

23. Absolute safety:

a) comes from a thorough understanding of the risks and benefits of chemicals
b) is unattainable
c) is defined by the Delaney Amendment
d) can be achieved by eating only unprocessed foods
e) is the goal of the agencies established by federal legislation

24. Match each of the following organic compounds with the property or source that is the origin of its common name: **(2 marks)**

Compound	**Property or source**
_____ a. methane	1. Related to the first in a series of acids found in fats.
_____ b. ethane	2. Related to an acid found in rancid butter.
_____ c. propane	3. Related to a very highly flammable compound.
_____ d. butane	4. Related to an alcohol obtained from wood.

25. a) Draw the structures of two isomers of C_4H_6 that contain a triple bond. **(2 marks)**

b) Draw the structure of one isomer of C_4H_6 that contains a ring. **(1 mark)**

26. A compound whose molecular formula fits the general formula C_2H_{2n+2} :

a) must be an alkane
b) cannot be an alkane
c) cannot contain any 1° carbons
d) cannot contain any 2° hydrogens
e) must contain at least one 2° carbon

a) Adding vinegar to a slightly basic solution of anthocyanins in water turns the color of the solution from green to:

a) colorless
b) red
c) yellow
d) blue-violet
e) orange

28. Chlorine atoms and bromine atoms that are present in the stratosphere can:

a) generate acid rain
b) intensify the greenhouse effect
c) catalyze the conversion of ozone to diatomic oxygen molecules
d) generate photochemical smog
e) convert atmospheric nitrogen and oxygen to N_2O

29. Of the following, the one that cannot be used to determine whether a solution is acid or basic is:
    a) anthocyanin dyes
    b) litmus
    c) a strip of gold foil
    d) phenolphthalein
    e) a pH meter

30. An acid does not:
    a) taste sour
    b) release a proton to a base when in water
    c) react with tin, zinc and iron to release H_2
    d) turn phenolphthalein from pink to colorless
    e) turn litmus from red to blue

31. According to the Lowry-Bronsted definition, an acid is a substance that:
    a) donates a proton to another chemical
    b) releases a proton in water
    c) turns litmus red
    d) reacts with zinc and other metals to produce H_2
    e) tastes sour when dissolved in water

32. Eating extremely large amounts of carrots is not likely to produce symptoms of vitamin A poisoning because:
    a) carrots do not contain vitamin A itself
    b) the body excretes vitamin A almost as fast as we ingest it
    c) the body metabolizes vitamin A rapidly
    d) large amounts of vitamin A do not produce toxic symptoms
    e) vitamin A is a water-soluble vitamin

33. The pH of lemon juice is about:
    a) 0
    b) 3
    c) 7
    d) 9
    e) 11

34. Dietary minerals are generally considered to be:
    a) all the elements of our diet that normally exist as metals
    b) all the dietary elements that lie in the first two columns of the periodic table
    c) all the elements of our diets except for C, H, N, O and, by some definitions, S
    d) all the elements of our diets, including C, H, N, O, and S
    e) any element of our diet that normally exists as a solid
    f) phosphorus

35. The second most abundant element of the bones is:

a) calcium
b) carbon
c) iron
d) nickel
e) phosphorus

36. The fat-soluble vitamins are:

a) A, B, C, K
b) A, C, D, K;
c) A, D, E, K
d) B, C, D, E
e) C, D, E, K

37. The pH of household ammonia is about:

a) 0
b) 3
c) 7
d) 9
e) 11

38. Scurvy is caused by a deficiency of:

a) vitamin A
b) vitamin C
c) vitamin D
d) calcium
e) iron

39. There are a number of allowable purposes for food additives, which of the following is not a legitimate purpose (according to Canadian guidelines):

a) maintain nutritional quality
b) enhance the keeping quality
c) make food more attractive
d) aid in food processing
e) hide flaws in appearance

40. The energy equivalent of one pound of adipose tissue is approximately:

a) 500 Calories
b) 1000 Calories
c) 1500 Calories
d) 2600 Calories
e) 3500 Calories

41. Specific dynamic action is the energy needed to:
    a) carry out a specific set of moving exercises
    b) exist for 24 hours under normal conditions, with no exercise
    c) digest and metabolize food
    d) convert one kilogram of adipose tissue into energy
    e) maintain life for one hour, with neither exercise nor food

42. Molecules of virtually all commercial soaps and detergents contain:
    a) a carboxylate functional group
    b) a sulfonate functional group
    c) a benzene ring
    d) a long hydrocarbon chain
    e) a nitrogen atom

43. Hard water is usually formed when:
    a) sea water enters our natural water supply
    b) industrial contamination pollutes our natural water supply
    c) commercial detergents cause eutrophication
    d) agricultural fertilizers contaminate our natural water supply
    e) acidic rainwater passes through the minerals of the soil

44. Soap results from the chemical reaction of NaOH, water and:
    a) fats
    b) alkylbenzenesulfonates
    c) benzene and sulfuric acid
    d) surfactant micelles
    e) hydrocarbons

45. A micelle is:
    a) a substance that makes water wetter
    b) a group of molecules that disrupt surface forces and lower the surface tension of a liquid
    c) the head of a hydrocarbon chain
    d) the tail of a hydrocarbon chain
    e) a microscopic sphere of one substance that is distributed throughout another substance, usually a liquid

46. The percentage of the atmosphere that consists of nitrogen is about:
    a) 5 %
    b) 20 %
    c) 50 %
    d) 80 %
    e) 99 %

47. Adding one proton to the nucleus of an atom:
    a) converts it to an isotope of the same element
    b) increases its atomic mass by one unit, but does not change its atomic number
    c) increases its atomic number by one unit but does not change its atomic mass
    d) does not change either its atomic number or its atomic mass
    e) converts it to an atom of a different element

48. The origin or original meaning of the word "atom" reflects the belief that atoms:
    a) consist of a nucleus and surrounding electron shells
    b) are composed of protons, neutrons and electrons
    c) combine to form compounds
    d) can be assigned both atomic numbers and mass numbers
    e) cannot be split into smaller fragments

49. A solution is prepared by dissolving 2.8 g of potassium chloride in 320 g of water. What is the percent potassium chloride in the solution, as m/m %? **(2 marks)**

50. Ocean water contains 3.3 g of magnesium ions, Mg^{2+}, per 500 grams of ocean water. Calculate the concentration of magnesium ions as parts per million (ppm) in the ocean water. **(2 marks)**

51. Solanine is a substance that can be found in green potatoes. It has a LD_{50} of 42 mg/kg.
    a) How much solanine must be consumed by an average 50 kg female human to obtain a dose equal to the LD_{50} value? **(2marks)**

    b) If one green potato contains 0.2 mg solanine, how many potatoes would the person mentioned above have to consume in one sitting to obtain a dose equal to the LD_{50} value? **(2marks)**

    c) Substance X has a LD_{50} of 0.21 mg/kg while substance Y has a LD_{50} of 1 mg/kg. Which is more toxic? **(1 mark)**

52. Three glasses, each containing a clear colourless liquid, sit on a table. Without tasting the contents, describe how you could determine which glass contains distilled water, which contains sodium cyanide dissolved in water, and which contains table sugar dissolved in water. Assume that you have access to any sort of equipment or chemicals that you need. **(3 marks)**

53. Draw the Lewis structure for each of the following: **(3 marks)**

a) chloride anion b) sodium atom c) magnesium cation

54. List two of the three macronutrients. **(1 mark)**

55. List two micronutrients and a source of food in which they are found. **(2 marks)**

56. Give an example of an acid and a base, and an example of a household product in which each can be found. **(2 marks)**

57. Fill in the blanks with an appropriate word or phrase from the list below. **(5 marks)**

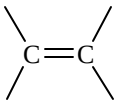
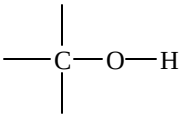
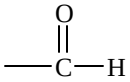
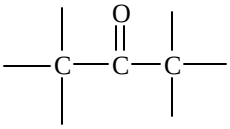
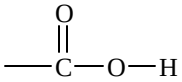
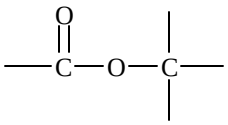
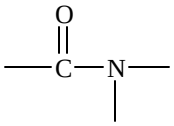
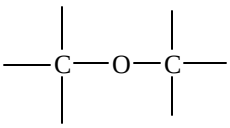
Dietary _____ provides us with the _____ we need to form our bodily enzymes and structures such as skin, hair and nails. In generating our own protein, we use some 20 amino acids. Those we can form ourselves, through chemical reactions that take place in our own bodies, are called the _____ amino acids. An example of this type of amino acid is _____. Those we cannot form but must obtain from our foods are called the _____ amino acids. An example of this type of amino acid is leucine. With the single exception of _____, all of the naturally occurring amino acids are _____ and are classified as members of the _____. The actual sequence of amino acids along a protein or polypeptide structure chain represents the chain's primary structure. In this structure the individual amino acids are joined to each other through _____ links, which are incorporated within the _____ functional groups of simpler molecules.

alanine	complementary protein	L-series	incomplete protein
amide	dipeptide	D-series	carbohydrates
amino acids	essential	protein	polypeptide
chiral	glycine	peptide	hemoglobin
denatured	leucine	non-essential	oxytocin

The First 10 Alkanes

Name	Formula	Name	Formula
methane	CH_4	hexane	C_6H_{14}
ethane	C_2H_6	heptane	C_7H_{16}
propane	C_3H_8	octane	C_8H_{18}
butane	C_4H_{10}	nonane	C_9H_{20}
pentane	C_5H_{12}	decane	$C_{10}H_{22}$

Organic Functional Groups

Structure	Functional Class
	alkene “ene”
	alkyne “yne”
	aromatic
	alcohol “ol”
	aldehyde “al”
	ketone “one”
	carboxylic acid “oic acid”
	carboxylic ester “oate”
	amide
	ether