

Chem 130: Chemistry for Funeral Services
Unit 1 Exam, Chemistry Fundamentals

Name: **KEY**

Date: _____

Each question has a value as noted. For problems involving calculations, you must show your work to receive full credit. An answer alone is not acceptable. Please print or write legibly. Answers that cannot be read will be considered wrong.

1. Identify the following as physical (P) or chemical (C) properties or changes. Circle the letter. (1 point each, 5 total)

- P **C** a. Burning gasoline in a car engine
- P **C** b. Embalming (addition of embalming fluids to the arterial system)
- P** C c. Melting ice cream
- P** C d. Tearing paper
- P **C** e. Coagulating blood

2. Identify the following reactions as double replacement (DR), synthesis (S) or decomposition (D). Circle the letter. (1 point each, 5 total)

- DR S **D** a. $\text{H}_2\text{O}_2 \rightarrow \text{H}_2 + \text{O}_2$
- DR** S D b. $\text{Ba}(\text{NO}_3)_2 + \text{Na}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2 \text{NaNO}_3$
- DR **S** D c. $4 \text{Fe} + 3 \text{O}_2 \rightarrow 2 \text{Fe}_2\text{O}_3$
- DR **S** D d. $2 \text{K} + \text{Br}_2 \rightarrow 2 \text{KBr}$
- DR** S D e. $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ (Hint: Think of H_2O as HOH)

3. Identify the type of bonding in each of the following molecules as either covalent (C) or ionic (I). Circle the letter. (1 point each, 5 total)

- C **I** a. CaBr_2
- C **I** b. CuS
- C **I** c. AgCl
- C** I d. CCl_4
- C** I e. NO_2

4. Identify the following as an element (E), a compound (C) or a mixture (M). Circle the letter. (1 point each, 5 total)

- E C **M** a. river water
- E **C** M b. carbon monoxide
- E C **M** c. embalming fluid
- E** C M d. oxygen gas
- E** C M e. iron

Chem 130: Chemistry for Funeral Services
Unit 1 Exam, Chemistry Fundamentals

5. Fill in the blank with the correct number. (1 point each, 5 total)

- 1/100 a. centi (What number does it mean?)
1000 b. kilo (What number does it mean?)
2.739 c. 2739 mL = ?? L
0.547 d. 547 g = ?? kg
311 e. 38° C = ??? K

6. Draw the *Lewis structure* for each of these atoms in the blank. Also write in the number of valence electrons for each one. (1 pt ea, 5 total)

- $\overset{\cdot\cdot}{\text{B}}^{\cdot\cdot}$ 3 a. B
 $\overset{\cdot\cdot}{\text{Ne}}^{\cdot\cdot}$ 8 b. Ne
 $\overset{\cdot\cdot}{\text{C}}^{\cdot\cdot}$ 4 c. C
 $\overset{\cdot\cdot}{\text{Li}}$ 1 d. Li
 $\overset{\cdot\cdot}{\text{O}}^{\cdot\cdot}$ 6 e. O

7. Draw the atomic (nuclear) symbol for each of items in the blank. (1 pt ea, 5 total) (Hint: If you don't know a symbol for an element, use the chart on the back cover the text book to find it.)

- ${}^0_{-1}\text{e}$ a. Electron
 ${}^{60}_{26}\text{Fe}$ b. Iron 60
 ${}^{16}_7\text{N}$ c. Nitrogen 16
 ${}^0_{+1}\text{e}$ d. Positron
 ${}^4_2\text{He}$ e. Alpha particle

The rest of the multiple choice questions are worth two points each.

8. What is the electronic configuration of carbon?

- A a. $1s^2 2s^2$
B b. $1s^2 2s^2 3s^2$
C c. $1s^2 2s^2 2p^2$
D d. $1s^2 2s^2 2p^3$
E e. $1s^2 2s^2 3p^2$

9. Which of the following is the formula for magnesium phosphate?

- A** a. $\text{Mg}_3(\text{PO}_4)_2$
B b. $\text{Mg}_2(\text{PO}_4)_3$
C c. MgSO_4
D d. Mg_2SO_4
E e. MgPh

Chem 130: Chemistry for Funeral Services
Unit 1 Exam, Chemistry Fundamentals

10. What is an ion?

- A a. A mixture containing compounds
- B** b. A charged chemical species
- C c. A neutral chemical species
- D d. A compound containing covalent bonds
- E e. The electronic structure of iron

11. Which type of radioactivity is considered most penetrating?

- A a. Neutrons
- B b. Alpha particles
- C c. Beta particles
- D** d. Gamma rays
- E e. X-rays

12. Alpha radiation is...

- A** a. A helium nucleus
- B b. Very high energy light
- C c. A high energy electron
- D d. A high energy positron
- E e. Uranium

13. Chemistry is primarily concerned with interactions between...

- A a. Protons
- B** b. Electrons
- C c. Positrons
- D d. Neutrons
- E e. Gluons

14. Group 8A is composed of relatively unreactive gases. This is due to...

- A a. The loss of electrons in the valence shell
- B b. The gain of electrons in the valence shell
- C** c. A full valence shell
- D d. An empty valence shell
- E e. The fact that these elements are non-metals

15. Of the following list, which is the most electronegative atom?

- A a. H
- B b. Si
- C** c. N
- D d. Br
- E e. Na

16. A particular radioactive isotope has a half-life of 1 hour. If you start with 4 kg of the element, how much would you expect to have left after an hour?

- A** a. 2 kg
- B b. 1 kg
- C c. 1/2 kg
- D d. 1/4 kg
- E e. 1/8 kg

17. Which of the following best describes the atomic view of a liquid?

- A a. A slowly moving mass particles that kind of vibrate in place.
- B** b. A medium moving mass of particles that slip and slide around one another.
- C c. A fast moving group of particles that fly and crash around all over the place.
- D d. A liquid cannot be described as a group of particles.
- E e. Atomic particles don't move.

Chem 130: Chemistry for Funeral Services
Unit 1 Exam, Chemistry Fundamentals

18. Equilibrium vapor pressure can be described by ...

- A a. The pressure of a liquid on a solid in a closed container
- B** b. The pressure of a gas over a liquid in a closed container
- C c. The pressure of the air in a tire
- D d. The pressure in a hot air balloon
- E e. The pressure of a brick in a pizza oven

19. Radiation exposure is commonly measured in

- A a. Roentgens
- B b. RADs
- C c. REMs
- D** d. All of the above
- E e. None of the above

Extra Credit Question (you can skip this one if you'd like). Hydrogen can sometime form a negative ion called a hydride ion. What would you expect the charge of this ion to be? Why? (5 points)

Hydrogen has one valence electron. If it gains one electron, it would have a full valence of two electrons. So, the hydride ion would have a -1 charge from this extra electron. (We'll mostly be dealing with hydrogen in covalent bonds or hydrogen losing one electron to get an empty valence and a $+1$ charge.)

For the short answer problem, please be complete. Show your work for all calculations. Sketches are a good idea.

20. The density of helium gas is 0.179 g/L. What is the mass of 75.0 L of helium? (5 points)

$$D = M/V \text{ or } M = D \times V \quad \text{so} \quad 0.179 \text{ g/L} \times 75.0 \text{ L} = 13.4 \text{ g}$$

19. What is the difference between an endothermic and an exothermic process? (5 points)

An exothermic process is one that gives off heat during the process. An endothermic process is the opposite. It takes on heat during the process—we see that as cooling off during the process.

20. An atom has six protons and five neutrons. What is its atomic number? What is its approximate atomic mass? Write its electronic configuration. (5 points)

The atom, and its atomic number, is defined by the number of protons in its nucleus. So this atom has an atomic number of six.

Since the nucleus is made up of protons and neutrons, each with a mass of 1, the atomic mass of this atom is approximately 11 (6 for the protons + 5 for the neutrons). Remember, the electrons have a mass of about 0 so we don't consider them in the mass of the atom.

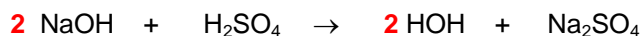
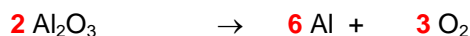
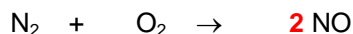
Since this atom has six protons, it also has six electrons. That means its electronic configuration (filling from the bottom of the chart until we use up six electrons) is $1s^2 2s^2 2p^2$.

Chem 130: Chemistry for Funeral Services
Unit 1 Exam, Chemistry Fundamentals

21. Show how the bonds occur in each of the following. What type of bonding is involved for each one? (5 points)

Compound	Explanation of how bonds occur	Type of bond	Drawing of bond (include formula and electrons)
Lithium Fluoride	Li metal, valence 1, gives up an electron to get an empty valence and a +1 charge. F, a non-metal, valence 7, takes on an electron to get a full valence and a -1 charge. Since opposites attract, the two ions stick together.	Ionic	$\text{Li}^+ \text{:}\ddot{\text{F}}\text{:}^-$
Ammonia (NH ₃)	N, a non-metal, valence 5 shares electrons with each of three hydrogens, H, valence 1, to form three shared bonds. Nitrogen ends up with a full valence of 8. Each hydrogen ends up with a full valence of 2.	Covalent	$\begin{array}{c} \text{H} \cdot \ddot{\text{N}} \cdot \text{H} \\ \\ \text{H} \end{array}$

22. Balance the following equations. (6 points)



23. You are heating up a frozen lunch entrée in the microwave. The directions say that you should poke holes in the plastic film before heating the entrée. Use the gas laws to explain why. What could happen if the directions aren't followed? (5 points)

Charles law says that volume of a gas varies with temperature. As the temperature increases, the volume increases. So, if you don't poke holes in the plastic and the film has a good seal on the container, the volume of the gas in the container would keep expanding. It might even explode!

24. Rank in order of importance to the embalmer the three protection measures against radiation and explain the order. (5 points)

Generally speaking, minimizing the time of exposure is the most important to minimize the total amount of exposure. Keeping distance is second most important and is related to helping to minimize the time of exposure. Since some contact with the remains is likely unavoidable, shielding is important but time and distance are more important. Always follow recommended safety procedures, and all governing regulations when handling remains containing radioactive elements.

25. What topic most interested you in this unit? Explain it in some detail. (5 points)

Many answers are possible. All are acceptable with suitable explanations.