

General Chemistry I: Final Exams Review Packet

Final Exams Review Session

NOTICE: This Final Exams Review packet consists of questions to support with concepts listed on the CHEM 111 study guide. The questions in this review guide students through important concepts learned throughout the course. This review and questions listed were created by a student employee: Learning Center tutor and CHEM 111 PAL Leader. The questions were acquired through various resources and/or created by the student.

Instructions: Follow along with the session facilitator as they review questions in this packet. To ask questions, raise your hand, or send a message in the chat box. A tutor will be available via chat to support with questions or concerns during the event.

1. A student is calculating the density of acetic acid. After several experiments he obtains the following values: 0.88 g/ml, 0.81 g/ml, 0.79 g/ml, 0.83 g/ml. The real value of acetic acid is 1.05 g/ml.

Are the calculations precise?

Are they accurate?

2. Indicate the number of significant figures.

700000

0.678

14.600

0.00340

1.0000

2.80×10^3

3. Provide the answer to the following calculations using the proper number of significant figures.

a) 23.7×3.8

b) 43.678×64.1

c) $32.567 + 135.0 + 1.4567$

4. Carry out the following conversions:

a) $65.2 \text{ mg} = \underline{\hspace{2cm}} \text{ g} = \underline{\hspace{2cm}} \text{ pg}$

b) $95.0 \text{ }^\circ\text{C}$ into F

5. Name the principal groups on the periodic table. Predict the expected charges for:

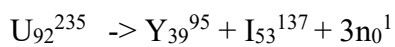
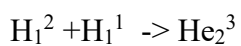
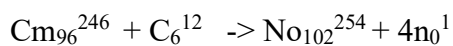
- 1) Na
- 2) Rb
- 3) Br
- 4) Fe
- 5) Ni

6. Complete the following chart:

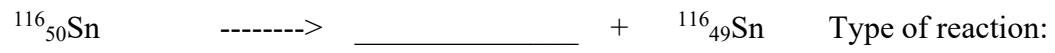
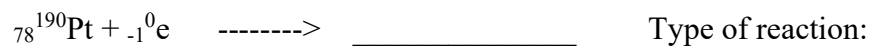
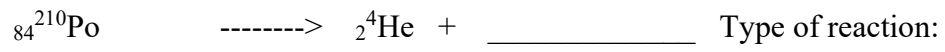
Isotope name	atomic #	mass #	# of protons	# of neutrons	# of electrons
uranium-235					
${}_{20}^{48}\text{Ca}^{2+}$					
${}_{8}^{17}\text{O}^{2-}$					

7. Calculate the number of formula units in 54.0 g of Na_2CO_3

8. Indicate the type of reactions:



9. Write the complete nuclear equation:



10. Draw the Born-Haber cycle for CsF. Calculate the lattice energy.

$$H_f = -553.5 \text{ kJ/mol}$$

$$H_s, \text{ Cs (s)} = 76.5 \text{ kJ/mol}$$

$$H_{ie}, \text{ Cs (g)} = 375.7 \text{ kJ/mol}$$

$$H_{be}, \text{ F}_2 \text{ (g)} = 158.8 \text{ kJ/mol}$$

$$EA = -328.2 \text{ kJ/mol}$$

11. Find the mass defect of U-235 if its predicted mass is 235.0349 amu.

Mass of a proton: 1.00727647 amu, neutron: 1.0086654 amu, mass of electron: 0.0005486 amu.

12. What is the energy of a 9,330 cm wave?

13. Label each sets of quantum numbers as valid or invalid.

(4,2,3,+1/2)

(2,0,0,-1/2)

(3,3,-2,-1/2)

(3,1,-1,+1/2)

14. Provide complete electronic configuration for the following elements.

a) Ca

b) Cl⁻

c) Ni²⁺

Orbital diagram for valence electrons:

d) Ta (#73)

15. Choose the species that is isoelectronic with Ar

a) Kr

b) O²⁻

c) S²⁻

d) K⁺

e) Cl⁻

16. Provide noble gas notation electron configuration for the following elements:

a) Ag

b) Zn^{2+}

17. What is the neutral element with the following electron configuration?

a) $1s^2 2s^2 2p^6 3s^2 3p^6$

b) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4d^{10} 4f^{14} 5s^2 5p^6 6s^2 5d^7$

18. Order the following elements in increasing order of electronegativity:

Al, P, Ca, Ba

19. Order the following elements in increasing order of ionization energy:

B, F, Rb, K

20. Order the following elements in increasing order of atomic radius:

O, Cs, Ca, Be

21. Order the following elements in increasing order of electron affinity:

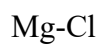
F, Cs, Li, O

22. Draw the Lewis Dot Structure for the following molecules.

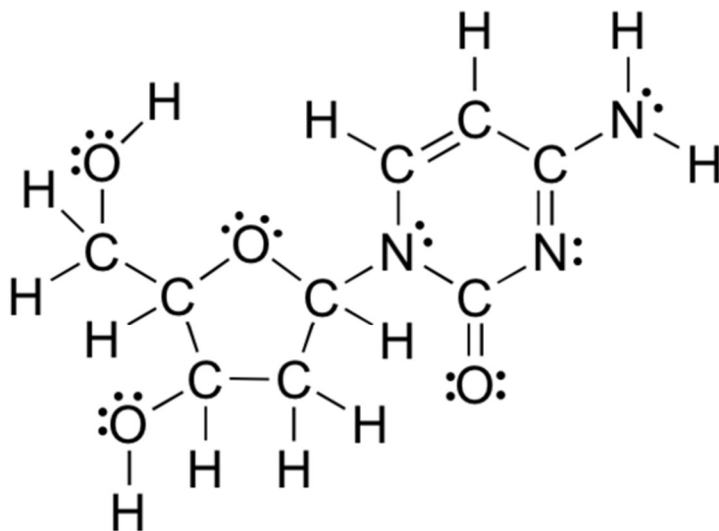


23. Indicate the shapes of the molecules above. State their formal charges.

24. Determine the type of bonds (non-polar covalent, polar covalent, ionic):



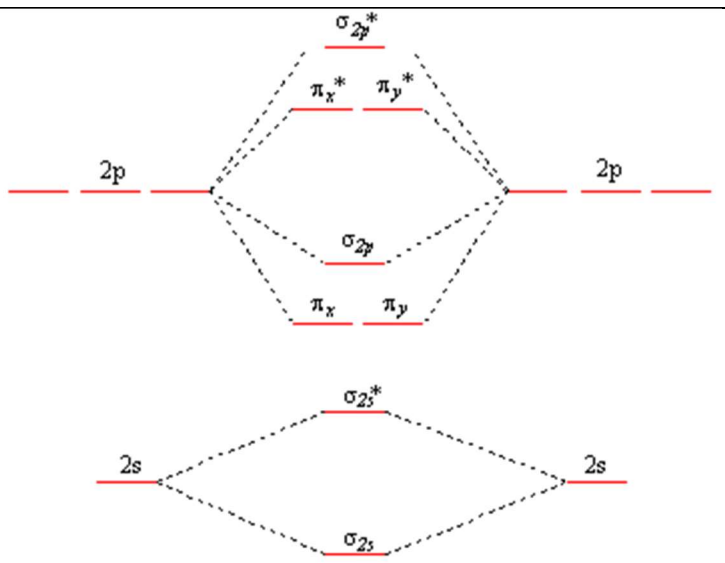
25. Count all sigma and pi bonds.



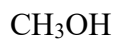
2'-deoxycytidine

26.

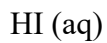
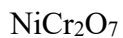
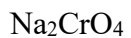
1. Draw the MO diagram for N_2^{2-}
2. Calculate the bond order.
3. Indicate if the molecule is diamagnetic or paramagnetic



27. Indicate if the following molecules are polar or non-polar:



28. Name the following compounds:

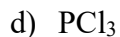


Aluminum Carbonate

Iron (3) nitrate

Magnesium Hydroxide

29. Determine the intermolecular forces of the compounds:

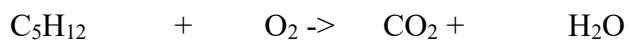


30. Arrange each series of substances in order of increasing boiling point:

dimethyl ether (CH_3OCH_3), ethanol ($\text{CH}_3\text{CH}_2\text{OH}$), and propane ($\text{CH}_3\text{CH}_2\text{CH}_3$)



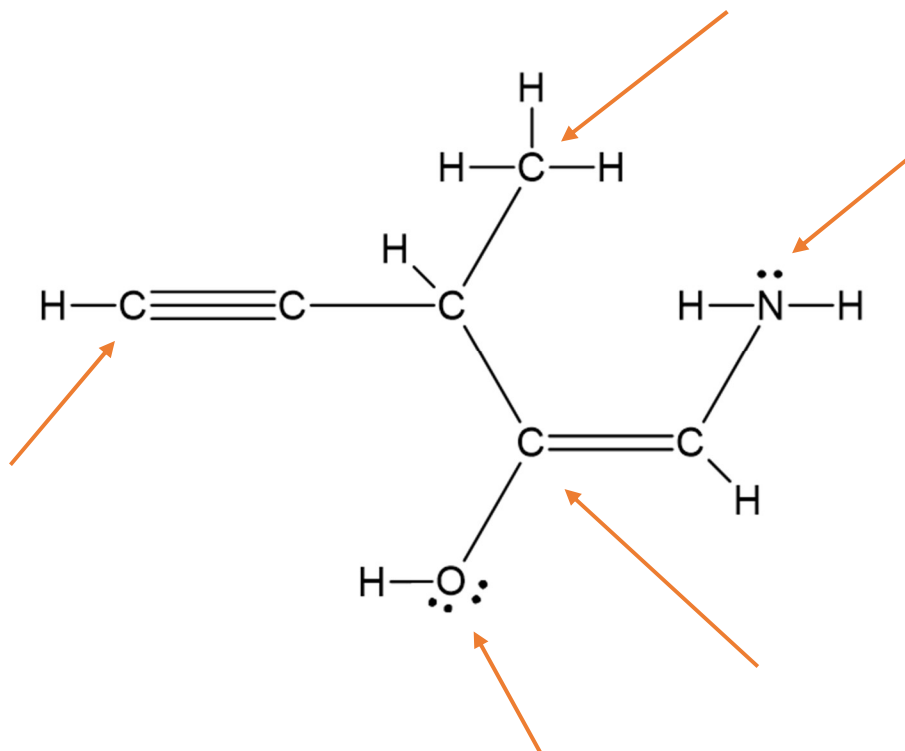
31. Balance the following equations. Identify the type of the reactions (combination, decomposition, combustion, single replacement, or double replacement).



32. Write the complete ionic and net ionic equations:



33. Indicate the hybridization of the following atoms:

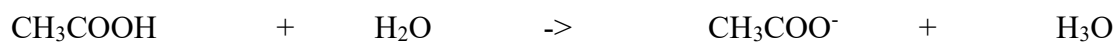


34. If 23 grams of iron (II) chloride reacts with 41 grams of sodium phosphate, how much sodium chloride can be formed?

How much excess reagent remains when this reaction is complete?

If 15.3 grams of sodium chloride are formed in the reaction, what is the percent yield?

35. Identify Bronsted acid, base, conjugate acid, and conjugate base:



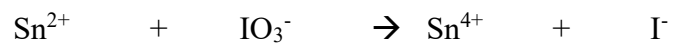
36. If 665 mL of a 0.875 M KBr solution are boiled gently to concentrate the solute to 1.45 M, what will be its final volume?

37. A 50.00 mL sample of a sodium hydroxide solution is titrated with a 1.605 M solution of sulfuric acid. The titration requires 24.09 mL of the acid solution to reach the equivalence point. What is the molarity of the base solution?

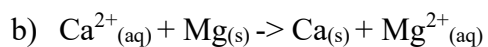
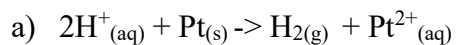
38. Indicate if the compound is soluble or insoluble in water

Ba(OH) ₂	MgSO ₄
FeCO ₃	ZnCl ₂
NaOH	Zn(OH) ₂
RbNO ₃	Zn ₃ (PO ₄) ₂
Cs ₂ SO ₄	

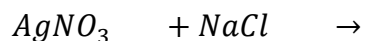
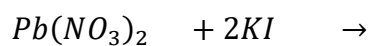
39. State elements reduced, oxidized, reducing agent, oxidizing agent, half reaction, and the final balanced equation for the following skeleton equation:



40. Predict if the following reactions will occur:



41. Predict if the following reactions will give precipitates:



42. Dry ice is carbon dioxide in the solid state. 1.28 grams of dry ice is placed in 5.00 L chamber that is maintained at 35.1° C. What is the pressure in the chamber after the gas sublime?

43. A sample of chlorine gas is loaded into 0.25 L bottle at STP. How many grams of Cl_2 is loaded to the bottle?

44. Compare the rate of diffusion C_4H_{10} and I_2 .

45. Calculate the vapor pressure of a solution made by dissolving 50.0 g glucose, $\text{C}_6\text{H}_{12}\text{O}_6$, in 500 g of water. The vapor pressure of pure water is 47.1 torr at 37°C .

46. 1.60 g of naphthalene ($C_{10}H_8$) is dissolved in 20.0 g of benzene. The freezing point of pure benzene is $5.5\text{ }^{\circ}\text{C}$, and the freezing point of the mixture is $2.8\text{ }^{\circ}\text{C}$. What is the molal freezing point depression constant, K_f of benzene?

47. Calculate the molality of 15.00 M HCl with a density of 1.0745 g/cm^3

