General Chemistry I: Final Exams Review Packet

Winter 2020 | Remote Final Exams Review Session

NOTICE: This Final Exams Review packet consists of 49 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. Express the number 0.00340 in scientific notation.

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

   a) 23.7 x 3.8

   b) 43.678 x 64.1

   c) 1. 678 / 0.42

   d) 32.567 + 135.0 + 1.4567

   e) 246.24 + 238.278 + 98.3

5. Carry out the following conversions:
   a) 65.2 mg = _____g = _____pg

   b) 1.25×10^4 kHz into MHz

   c) 95.0 °C into F

   d) 37 °F into K

6. Name the principal groups on the periodic table. Predict the expected charges for:
   1) Na
   2) Rb
   3) Br
   4) Fe
   5) Ni

7. Complete the following chart:

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

8. Calculate the molar mass of the compound (provide 3 significant figures):

   $Ca(HCO_3)_2$

9. Calculate number of moles in the following samples:
   a) 15.0 g of $ZnSO_4$

   b) Calculate the mass of 3.16 moles of NaOH

10. Calculate the number of molecular units in 1.80 mol of Al

11. Calculate the number of molecular units in 54. 0 g of Na_2CO_3

12. Indicate the type of reactions:

$Cm_{96}^{246} + C_6^{12} \rightarrow No_{102}^{254} + 4n_0^1$

$Th_{90}^{236} \rightarrow Ra_{88}^{232} + He_2^4$

$H_1^2 + H_1^1 \rightarrow He_2^3$

$U_{92}^{235} \rightarrow Y_{39}^{95} + I_{53}^{137} + 3n_0^1$

13. Write the complete nuclear equation:

$_{84}^{210}Po$ --------> $_{2}^{4}He$ + _____ Type of reaction:

$_{78}^{190}Pt + _{-1}^{0}e$ --------> _____ Type of reaction:

$^{116}_{50}Sn$ --------> _____ + $^{116}_{49}Sn$ Type of reaction:

14. Find the mass defect of a copper-63 nucleus if the actual mass of a copper-63 nucleus is 62.91367 amu.

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

16. What is the wavelength of a 1.528×10^{-13} J wave?

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

n	ℓ	m_ℓ	m_s	Valid or Invalid?
1	0	0	½	
1	1	+1	-½	
2	0	0	-½	
2	2	-2	½	
2	1	-1	½	
3	2	-1	½	
3	1	0	0	
3	0	1	½	
3	0	0	-½	
1	2	-3	½	

18. Provide complete electronic configuration for the following elements:
    a) Ca

    b) Cl^-

    c) Mg^{2+}

    d) Ta (#73)

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

    a) Ag

    b) Sr

    c) Mo

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

    a) 1s2 2s2 2p6 3s2 3p6

    b) 1s2 2s2 2p6 3s2 3p6 3d10 3s2 4d10 4f14 4p6 5s2 5p6 6s2 5d7

21. Order the following elements in increasing order of electronegativity:
    AL, P, Ca, Ba

22. Order the following elements in increasing order of ionization energy:
    B, F, Rb, K

23. Order the following elements in increasing order of atomic radius:
O, Cs, Ca, Be

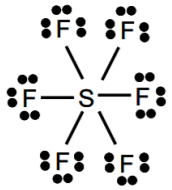
24. Order the following elements in increasing order of electron affinity:
F, Cs, Li, O

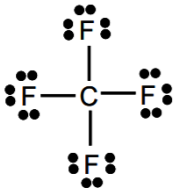
25. Draw the Lewis Dot Structure for the following molecules.
CF_4, ICl_4^-, NH_3

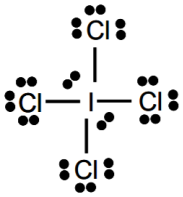
BrF_5 BrF_3

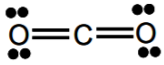
26. Indicate the shapes of the molecules above. State their formal charges.

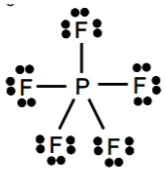
27. Indicate the geometry and shapes of the following molecules with angles:

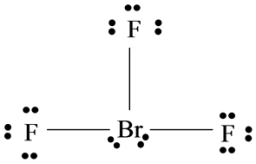












28. Determine the type of bonds (non-polar covalent, polar covalent, ionic):

Li-F

Ca-O

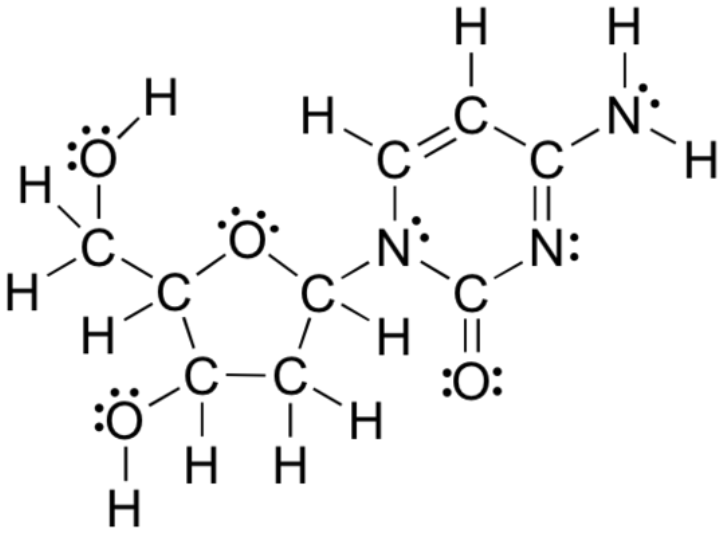
C-H

Mg-Cl

Pd-O

I-Cl

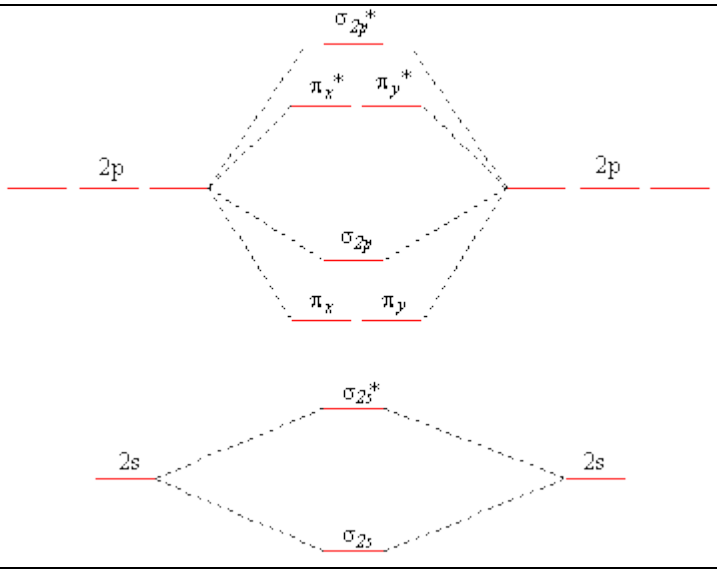
29. Count all sigma and pi bonds.



2'-deoxycytidine

30.

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



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

CH_4

CH_3OH

CO_2

SO_2

32. Name the following molecules:

CaF2

NaNO3

$Pb(ClO_2)_2$

S_2F_{10}

Co_2O_3

Na_2CrO_4

$NiCr_2O_7$

$AlPO_4$

AgCN

HI(aq)

H2CO3(aq)

Aluminum Carbonate

Iron (3) nitrate

Magnesium Hydroxide

Zinc phosphate

33. Determine the intermolecular forces of the compounds:

a) H_2O

b) CCl_4

c) CO_2

d) PCl_3

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

C_5H_{12} + O_2 -> CO_2 + H_2O

$AgNO_3$ + K_3PO_4 -> Ag_3PO_4 + KNO_3

Al + O_2 -> Al_2O_3

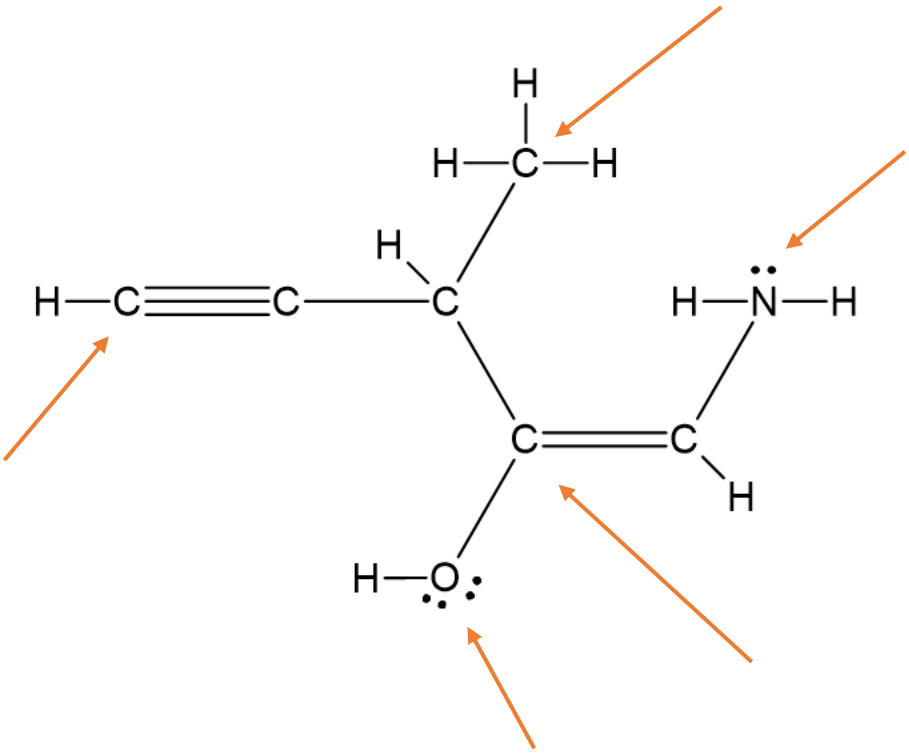
Ag_2O -> Ag + O_2

C_6H_{14} + O_2 - > CO_2 + H_2O

35. Write the complete ionic and net ionic equations:

NaOH + $Al(NO)_3$ -> $Na(NO_3)$ + $Al(OH)_3$

36. Indicate the hybridization of the following atoms:

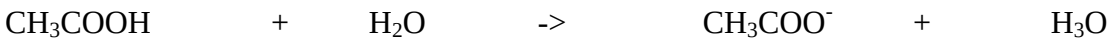


37. If 23 grams of iron (III) chloride reacts with 41 grams of sodium phosphate, how much sodium chloride can be formed?

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?

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



39. 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?

40. Determine the molarity of H_2SO_4 solution if 40.0 ml of 2.50 NaOH solution was used to titrate 20.0 ml of H_2SO_4 solution.

Equation:

41. 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_2SO_4	

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

$Sn^{2+} + IO_3^- \rightarrow Sn^{4+} + I^-$

43. 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?

44. Write Ionic equation and net ionic equation for the following precipitation reaction:

$$BaBr_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + NaBr(aq)$$

45. Predict if the following reactions will occur:

a) $2H^{+}_{(aq)} + Pt_{(s)} \rightarrow H_{2(g)} + Pt^{2+}_{(aq)}$

b) $Ca^{2+}_{(aq)} + Mg_{(s)} \rightarrow Ca_{(s)} + Mg^{2+}_{(aq)}$

46. Predict if the following reactions will give precipitates:

a) $2Na^{+}_{(aq)} + CO_3^{-}{}_{(aq)} \rightarrow$

b) $2Ag^{+}_{(aq)} + SO_3^{2-}{}_{(aq)} \rightarrow$

c) $Ba^{2+}_{(aq)} \rightarrow CrO_4^{-}{}_{(aq)} \rightarrow$

47. 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?

48. 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?

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