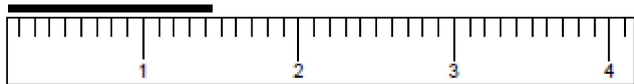


This review packet belongs to _____ and he/she is going to have fun completing it!

College Chemistry Semester One Final Exam Review Packet

These are a compilation of questions similar to those found on your final. They do NOT cover every single type of question you will see on the actual final. They are intended as a study aid, in addition to the list of topics. Your unit test reviews are also a great resource.

Unit 0: Matter and Measurement



1. What is the length of the object above (assume it's a centimeter ruler)?
a) 1 cm b) 1.4 cm c) 1.43 cm d) 1.433 cm
2. You have 279.7 g of glycerine. Its density is 1.26 g/cm³. What is its volume?
a) 5.70 cm³ b) 353 cm³ c) 222 cm³ d) 9.91 cm³
3. A water hose can spray 5.0 gallons in a minute. How many kiloliters of water would be delivered in a half hour if 3.79 liters = 1.00 gallon?
a) 570 kL b) 150 kL c) 40. kL d) 0.57 kL
4. Which set of measurements on a 2.00-gram standard would be considered precise and accurate?
a) 2.00 g, 2.01 g, 1.98 g b) 2.10 g, 2.00 g, 1.95 g c) 2.21 g, 2.19 g, 2.20 g d) 1.50 g, 2.00 g, 2.50 g

Unit 1: Gases

5. How many moles of gas occupy 85 L at 0.87 atm and 340 K?
a) 2.6 mol b) 8.3 mol c) 0.38 mol d) 46 mol
6. Identify the gas in the previous problem if it has a mass of 52.47 g.
a) O₂ b) Kr c) Cr d) Ne
7. A gas takes up 17.0 L, has a pressure of 2.30 atm, and a temperature of 26.0°C. If the temperature is raised to 77.0°C and the pressure is lowered to 1.50 atm, what is the new volume of the gas?
a) 2.6 mol b) 8.3 mol c) 0.38 mol d) 30.5 L
8. How many times faster does nitrogen dioxide gas effuse compared to sulfur dioxide gas?
a) 1.18 b) 1.39 c) 0.847 d) 0.717

Unit 2: Atomic Structure, Quantum Theory, and the Periodic Table

Atomic Structure and Quantum Theory

9. Which of these would be considered a pair of isotopes?
a) ${}_{37}^{95}\text{X}$, ${}_{36}^{95}\text{X}$ b) ${}_{37}^{95}\text{X}$, ${}_{37}^{95}\text{X}^{-2}$ c) ${}_{37}^{95}\text{X}$, ${}_{37}^{97}\text{X}$ d) ${}_{37}^{95}\text{X}$, ${}_{36}^{97}\text{X}$
10. How many neutrons would the element ${}_{36}^{95}\text{X}$ have?
a) 36 b) 95 c) 59 d) 131
11. How many electrons would the ion ${}_{8}^{16}\text{O}^{-2}$ have?
a) 8 b) 16 c) 10 d) 6
12. How many protons would the element ${}_{36}^{95}\text{X}$ have?
a) 36 b) 95 c) 59 d) 131
13. How many unpaired electrons does a ground-state nickel atom have?
a) 0 b) 1 c) 2 d) 7
14. What is the electron configuration of Ni?
a) $[\text{Ar}] 4s^2 3d^8$ b) $[\text{Ar}] 4s^2 3d^{10}$ c) $[\text{Ar}] 4s^2 3d^6$ d) $[\text{Ar}] 3d^8$
15. What is the electron configuration of Ni^{+2} ?
a) $[\text{Ar}] 4s^2 3d^8$ b) $[\text{Ar}] 4s^2 3d^{10}$ c) $[\text{Ar}] 4s^2 3d^6$ d) $[\text{Ar}] 3d^8$
16. Which set of quantum numbers is not allowed? (n, l, m_l , m_s)
a) 3, 0, 0, +1/2 b) 2, 0, 1, +1/2 c) 2, 1, 1, -1/2 d) 4, 2, 2, +1/2

The Periodic Table

17. Based on its position on the periodic table, the element V (atomic #23) would:
a) not conduct heat b) conduct electricity c) be a gas at room temp d) be brittle
18. Which comparison would be true:
a) Ca would be more reactive than K b) Sr is larger than Ba
c) Na would be more reactive than Li d) Ra is larger than Fr
19. Which of these elements has the highest ionization energy?
a) As b) S c) O d) I
20. Which of these elements has the highest electronegativity?
a) As b) S c) O d) I

Unit 3: Ionic and Covalent Bonding

Nomenclature (Naming)

21. Which of these is an ionic compound?
a) CaCl_2 b) XeF_4 c) CH_4 d) SO_2

22. Which of these is most likely to exist as a diatomic molecule?

- a) Cu b) H c) Li d) B

23. What is the formula of nitrogen dioxide?

- a) N_2O b) N_2O_2 c) NO d) NO_2

24. What is the formula of copper (I) carbonate?

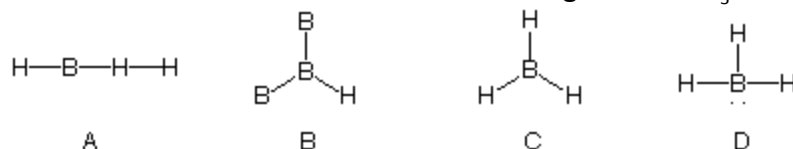
- a) $CuCO_3$ b) Cu_2CO_3 c) $Cu(CO_3)_2$ d) $Cu_2(CO_3)_2$

Chemical Bonding

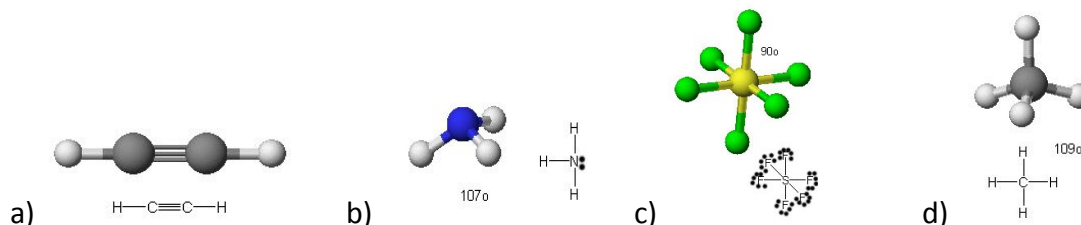
25. Which of the below is the correct Lewis diagram for HCN?



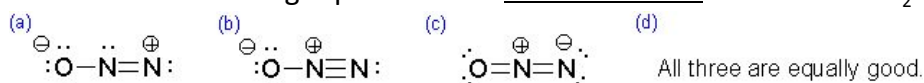
26. Which of the below is the correct Lewis diagram for BH_3 ?



27. Which molecule has a net dipole moment?



28. Which of the following represents the best resonance structure for N_2O ?



29. What is the hybridization of the carbon atom in CF_4 ?

- a) sp^2 b) sp^3 c) sp^3d d) sp^3d^2

30. How does the bond length and strength of a single bond compare to a triple bond?

- a) single is longer and stronger b) single is longer and weaker
c) single is shorter and stronger d) single is shorter and weaker

31. What is the molecular geometry of the nitrate ion, NO_3^{-1} ?

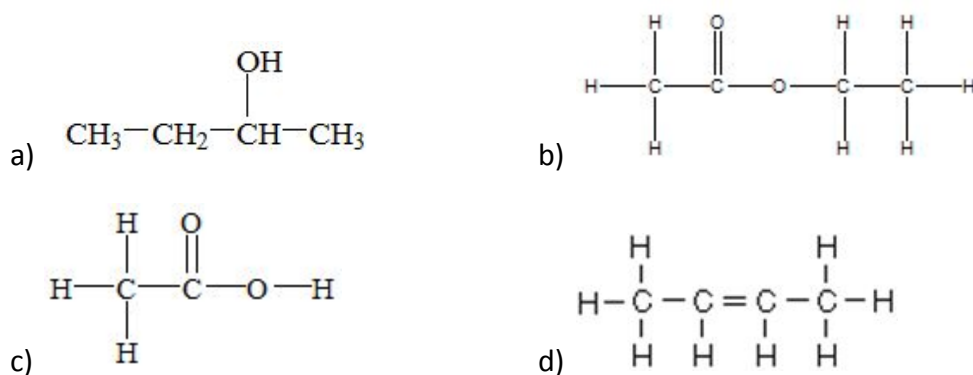
- a) trigonal planar b) bent c) linear d) pyramidal

32. Which bond is the most polar?

- a) H-C b) N-O c) Cl-Cl d) H-O

Organic Chemistry

33. Identify the functional group in each molecule. Your choices are ester, carboxylic acid, alcohol, alkene, and alkyne.



Unit 4: Chemical Reactions and Stoichiometry

Chemical Reactions

34. The net ionic equation for the reaction that occurs when aqueous solutions of copper sulfate (CuSO_4) and sodium carbonate (Na_2CO_3) are mixed is:

- a) $\text{Cu}^{2+} (aq) + \text{Na}_2\text{CO}_3 (s) \rightarrow \text{CuCO}_3 (s) + 2\text{Na}^+ (aq)$
b) $\text{CuSO}_4 (s) + \text{Na}_2\text{CO}_3 (s) \rightarrow \text{CuCO}_3 (s) + \text{Na}_2\text{SO}_4 (s)$
c) $\text{CuSO}_4 (s) + \text{CO}_3^{2-} (aq) \rightarrow \text{CuCO}_3 (s) + \text{SO}_4^{2-} (aq)$
d) $\text{Cu}^{2+} (aq) + \text{CO}_3^{2-} (aq) \rightarrow \text{CuCO}_3 (s)$

35. Iron + sulfur \rightarrow iron sulfide is an example of a...

- a) synthesis reaction
b) decomposition reaction
c) double decomposition reaction
d) single displacement reaction

36. Which one of the following salts is **insoluble** in water?

- a) Na_2SO_4 b) K_2CO_3 c) Li_3PO_4 d) BaSO_4

37. Use the activity series to predict the products of this reaction: $\text{Li}(s) + \text{AlCl}_3(aq) \rightarrow$

- a) $\text{LiCl} + \text{Al}_2$ b) LiAlCl_3 c) $\text{LiCl} + \text{Al}$ d) no reaction occurs

38. Choose the correct net ionic equation for the reaction (if a reaction occurs) between NH_4NO_3 and Na_2CO_3

- a) $2\text{NH}_4^+ (aq) + \text{CO}_3^{2-} (aq) \rightarrow (\text{NH}_4)_2\text{CO}_3 (s)$ b) $2\text{NH}_4^+ (aq) + \text{CO}_3^{2-} (aq) \rightarrow 2\text{NH}_3 (g) + \text{H}_2\text{O} (l) + \text{CO}_2 (g)$
c) $\text{Na}^+ (aq) + \text{NO}_3^- (aq) \rightarrow \text{NaNO}_3 (s)$ d) No reaction occurs

39. Will a precipitate form when 0.1 M aqueous solutions of HCl and $\text{Pb}(\text{CH}_3\text{COO})_2$ are mixed? If a precipitate does form, **identify** the precipitate and give the **net ionic** equation for the reaction.

- a) PbCl_2 precipitates; $2\text{H}^+ (aq) + 2\text{Cl}^- (aq) + 2\text{Pb}^{2+} (aq) + 2\text{CH}_3\text{COO}^- (aq) \rightarrow \text{PbCl}_2 (s) + 2\text{CH}_3\text{COOH} (aq)$
b) CH_3COOH precipitates; $\text{H}^+ (aq) + \text{CH}_3\text{COO}^- (aq) \rightarrow \text{CH}_3\text{COOH} (s)$
c) PbCl_2 precipitates; $\text{Pb}^{2+} (aq) + 2\text{Cl}^- (aq) \rightarrow \text{PbCl}_2 (s)$
d) PbCl_2 precipitates; $\text{Pb}(\text{CH}_3\text{COO})_2 (aq) + 2\text{Cl}^- (aq) \rightarrow \text{PbCl}_2 (s) + 2\text{CH}_3\text{COO}^- (aq)$
e) No precipitate forms.

Stoichiometry and Moles

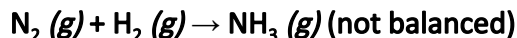
40. How many moles are in 175g of MgSO_4 ?

- a) 0.688 mol b) 1.45 mol c) 5.41 mol d) 8.75×10^{23} mol

41. How many atoms are in 0.568 moles of calcium?

- a) 3.42 atoms b) 3.42×10^{23} atoms c) 9.46×10^{-25} atoms d) 22.8 atoms

42. What is the maximum mass in grams of NH_3 that can be produced by the reaction of 1.0 g of N_2 with 3.0 g of H_2 via the equation below?



- a) 1.2 g b) 2.0 g c) 0.61 g d) 4.0 g

43. What is the limiting reactant in the previous problem?

- a) N_2 b) H_2 c) NH_3

44. What is the percent yield of water if 0.90 g of water is obtained when 29.0 g of butane (C_4H_{10}) is burned in excess oxygen? *Hint: Write and balance the chemical equation, then do stoichiometry to find the theoretical yield.*

- a) 0.02% b) 2% c) 10% d) 36%

45. What is the % composition by mass of carbon in CaCO_3 ?

- a) 12.0% b) 40.0% c) 47.9% d) 56.8%

46. For the reaction $2\text{Al} + 3\text{CuSO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + 3\text{Cu}$, how many moles of aluminum sulfate are produced if 6.0 moles Al reacts with 10.0 moles of CuSO_4 ?

- a) 0.5 mol b) 1.0 mol c) 1.5 mol d) 3.0 mol

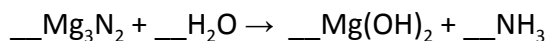
47. What is the empirical formula for a compound that contains 17.34% hydrogen and 82.66% carbon?

- a) C_5H b) C_2H_5 c) CH_3 d) CH_2

48. What is the molecular formula for a compound that is 46.16% carbon, 5.16% hydrogen and 48.68% fluorine if the molar mass of this compound is 156.12 g?

- a) $\text{C}_3\text{H}_4\text{F}_2$ b) $\text{C}_5\text{H}_{10}\text{F}_5$ c) $\text{C}_6\text{H}_8\text{F}_4$ d) $\text{C}_6\text{H}_6\text{F}_3$

49. When the following chemical equation is correctly balanced, the lowest possible whole number coefficients are:



- a) 1, 3, 3, 2 b) 1, 6, 1, 2 c) 1, 6, 3, 2 d) 3, 1, 2, 3

Unit 5: Thermodynamics (Energy and Entropy)

50. Substance A has a higher specific heat than substance B. With all other factors equal, which requires the most energy to heat equal masses of A and B to the same temperature?

- a) Substance A b) substance B
c) Both require the same amount of heat. d) Answer depends on the density of each substance.

51. How much energy (in calories and in Joules) will it take to raise the temperature of 75.0 g of water from 20.0 to 55.0 °C? (specific heat = 1 cal /g°C and 4.184 J/g°C)

- a) 2630 cal and 630. J b) 2630 cal and 1.1×10^4 J
c) 1.1×10^4 cal and 2630 J d) 630. cal and 2630 J

For questions 52-55 identify the processes as a) endothermic or b) exothermic.

52. Melting of candle wax

53. Boiling water

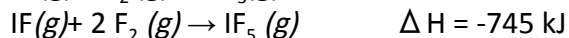
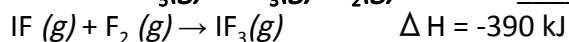
54. Combustion of a candle

55. reaction of zinc with hydrochloric acid

56. The value of ΔH for the reaction below is -72 kJ. How many kJ of heat are released when 1.0 mol of HBr is formed in this reaction: $\text{H}_2(\text{g}) + \text{Br}_2(\text{g}) \rightarrow 2\text{HBr}(\text{g})$?

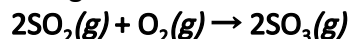
- a) 144 kJ b) -72 kJ c) -36 kJ d) 72 kJ

57. ΔH for the reaction $\text{IF}_5(\text{g}) \rightarrow \text{IF}_3(\text{g}) + \text{F}_2(\text{g})$ is _____, given the data below.



- a) -1135 kJ b) 355 kJ c) 1135 kJ d) 35 kJ

58. The values of $\Delta_f H^\circ(298 \text{ K})$ for $\text{SO}_2(\text{g})$ and $\text{SO}_3(\text{g})$ are -296.8 and -395.7 kJ/mol. What is the value of $\Delta_r H^\circ(298 \text{ K})$ per mole of SO_2 for the following reaction?



- a) -98.9 kJ/mol b) 98.9 kJ/mol c) 692.5 kJ/mol d) -692.5 kJ/mol

Answer Key – College Chemistry Semester One Final Exam Review Packet

Matter and Measurement

1. c
2. c
3. d
4. a

Gases

5. a
6. d
7. d
8. a

Atomic Structure, Quantum Theory, Periodic Table

9. c
10. c
11. c
12. a
13. c
14. a
15. d
16. b
17. b
18. c
19. c
20. c

Ionic and Covalent Bonding

21. a
22. b
23. d
24. b
25. d
26. c
27. b
28. b
29. b
30. b
31. a
32. d
33. (a) alcohol, (b) ester, (c) carboxylic acid, (d) alkene

Chemical Reactions and Stoichiometry

34. d
35. a
36. d
37. c
38. d
39. c
40. b
41. b
42. a
43. a
44. b
45. a
46. d
47. b
48. c
49. c

Thermodynamics (Energy and Entropy)

50. a
51. b
52. a
53. a
54. b
55. b
56. c
57. b
58. a