Chemistry 2202 Midterm Exam Review 2025

Students should review all class notes, sample problems, labs and evaluations in preparation for the exam. The following questions are additional practice.

Section I: Selected Response

1. What is the correct IUPAC name for $KHSO_4$?
   A) potassium hyposulfide
   B) potassium sulfite
   C) potassium sulfate
   D) potassium hydrogen sulfate

2. Which formula correctly represents potassium nitrate?
   A) KNO_2
   B) KNO_3
   C) KNO_4
   D) KNO

3. Which formula correctly represents the important industrial chemical phosphoric acid?
   A) HP(aq)
   B) H_3PO_4 (aq)
   C) HPO (aq)
   D) HPO_3 (aq)

4. What is the correct IUPAC name for $CuSO_4 \cdot 5H_2O$?
   A) copper sulfate pentahydrate
   B) copper(I) sulfate pentahydrate
   C) copper(II) sulfate pentahydrate
   D) copper(II) sulfate tetrahydrate

5. Which subatomic particles give an atom its mass?
   A) protons and electrons
   B) protons and neutrons
   C) neutrons and electrons
   D) electrons and ions

6. An atom of an element has an atomic mass of 64 and its nucleus contains 34 protons. How many electrons will this atom have?
   A) 30
   B) 34
   C) 64
   D) 94

7. How many neutrons are in the atom in #7 above?
   A) 30
   B) 34
   C) 64
   D) 94

8. What is the isotope name of $_{41}^{93}Nb$?
   A) niobium - 41
   B) niobium - 93
   C) neptunium - 41
   D) neptunium – 93

9. Titanium has several stable isotopes. Given that the average atomic mass of Titanium is 47.90 amu, which of the following is likely the most abundant isotope?
   A) $_{22}^{47}Ti$
   B) $_{22}^{48}Ti$
   C) $_{22}^{49}Ti$
   D) $_{22}^{50}Ti$

10. Which of the following best describes a mole?
   A) 12 g of carbon-12
   B) 1/12 the mass of one atom of carbon-12
   C) 45.4 L of N_2(g) at STP
   D) 6.02×10^{23} atoms of Na in NaCl

11. Molar mass is represented by the symbol _____ and has units of _____.
   A) M, mol/g
   B) M, g/mol
   C) n, mol/g
   D) n, g/mol

12. Determine the molar mass of sulfuric acid, H_2SO_4 (aq)
   A) 49.08 g/mol
   B) 50.09 g/mol
   C) 97.08 g/mol
   D) 98.09 g/mol

Chemistry 2202 Midterm Exam Review 2025

13. What is the molar mass, in g/mol, of lead(IV) oxide?
    A) 223.19
    B) 239.19
    C) 430.38
    D) 844.76

14. What is the molar mass of $BaCl_2 \cdot 2H_2O$?
    A) 190.80 g/mol
    B) 208.23 g/mol
    C) 226.25 g/mol
    D) 244.27 g/mol

15. An ionic compound has formula, MgX_2, and Molar Mass 95.21 g/mol. What is unknown element, X?
    A) Fluorine
    B) Chlorine
    C) Bromine
    D) Gallium

16. The formula for sucrose is $C_{12}H_{22}O_{11}$. How many moles are in 10.0 g of sucrose?
    A) 0.0292 mol
    B) 10.0 mol
    C) 34.2 mol
    D) 342 mol

17. What mass of copper(II) sulfate pentahydrate is needed to give 0.0800 mol?
    A) 12.8 g
    B) 17.3 g
    C) 20.0 g
    D) 22.0 g

18. To lighten the mood, calculate the mass of one mole of laughing gas, N_2O.
    A) 30.0 g
    B) 36.0 g
    C) 44.0 g
    D) 55.0 g

19. What is the number of molecules in 0.30 moles of sucrose?
    A) 1.8×10^{22}
    B) 1.8×10^{23}
    C) 1.8×10^{24}
    D) 1.8×10^{25}

20. A sample of sulfur trioxide, $SO_{3(g)}$, has a volume of 5.6 L at STP. How many moles are in the sample?
    A) 0.25 mol
    B) 4.1 mol
    C) 28 mol
    D) 130 mol

21. A 5.00 carat diamond, C, has a mass of 1.00 g. How many carbon atoms are in a 5.00 carat diamond?
    A) 4.95×10^{22}
    B) 5.01×10^{22}
    C) 6.02×10^{23}
    D) 1.66×10^{-24}

22. One litre of a certain gas has a mass of 3.03 g at STP. What is the molar mass of this gas?
    A) 3.03 g/mol
    B) 25.73 g/mol
    C) 68.71 g/mol
    D) 68.78 g/mol

23. Hydrogen sulfide, $H_2S_{(g)}$, is present in some sources of natural gas. Natural gas that contains hydrogen sulfide is called sour gas because of its powerful stench. What is the mass of 20.0 L of hydrogen sulfide at STP?
    A) 0.0258 g
    B) 0.881 g
    C) 30.0 g
    D) 35.0 g

24. Sucrose is dissolved in water to make cooking syrup. Which term best describes sucrose?
    A) solute
    B) solvent
    C) solution
    D) saturate

Chemistry 2202 Midterm Exam Review 2025

25. Which method could be used to increase the concentration of solid solute in solution?
    A) decrease the temperature
    B) increase the temperature
    C) decrease the pressure
    D) increase the pressure

26. Which solution contains the greatest number of moles?
    A) 50.0 mL of 0.150 mol/L HNO_3
    B) 100 mL of 0.100 mol/L CH_3OH
    C) 150 mL of 0.500 mol/L NaCl
    D) 200 mL of 1.00 mol/L CH_3COOH

27. What is the molar concentration of a solution that contains 0.460 mol of solute dissolved in a volume of 200 mL?
    A) 0.000297 mol/L
    B) 0.0267 mol/L
    C) 0.0891 mol/L
    D) 0.297 mol/L

28. What is the molar concentration of a solution made by dissolving 5.00 g of KOH in 300.0 mL of solution?
    A) 0.0167 mol/L
    B) 0.417 mol/L
    C) 16.7 mol/L
    D) 37.5 mol/L

29. What mass of $AgNO_3$ is used to make 25.0 mL of a solution with a concentration of 2.00 mol/L?
    A) 2.94×10^{-4} g
    B) 0.0500 g
    C) 8.49 g
    D) 3390 g

30. How many milliliters of 1.25 mol/L $Mg(OH)_2$ are needed to obtain 5.00 g of $Mg(OH)_2$?
    A) 53.2 mL
    B 68.6 mL
    C) 465 mL
    D) 686 mL

31. What volume of 0.0125 mol/L solution can be made from 10.0 g of $CuSO_4 \cdot 5H_2O$?
    A) 5.00×10^{-4} L
    B) 3.20 L
    C) 80.0 L
    D) 7.90×10^{3} L

32. How much water would have to be ***added*** to 4.0 L of a 0.500 mol/L solution to dilute it to 0.200 mol/L?
    A) 4.0 L
    B) 6.0 L
    C) 10.0 L
    D) 14.0 L

33. Limestone, $CaCO_3$ can be decomposed into calcium oxide and carbon dioxide by heating it to 800^0C. The reaction is:

$$CaCO_{3\,(S)} \rightarrow CaO_{(S)} + CO_{2\,(g)}$$

If 0.500 g of $CaCO_{3\,(S)}$ was heated and 0.280 g of CaO was produced, what mass of $CO_{2\,(g)}$ would have formed?

    A) 0.140 g
    B) 0.220 g
    C) 0.780 g
    D) 1.79 g

34. How would the reaction between magnesium sulfate and sodium phosphate be classified?
    A) decomposition
    B) formation
    C) single replacement
    D) double replacement

Chemistry 2202 Midterm Exam Review 2025

35. Which IUPAC names correctly represent the following formation reaction?

$$CaO\ (s) + CO_2\ (g) \rightarrow CaCO_3\ (s)$$

A) calcium oxide + carbon dioxide calcium carbonate

B) calcium oxide + carbon dioxide calcium carbide

C) calcium monoxide + carbon oxygen calcium monocarbon trioxide

D) calcium monoxide + carbon dioxide calcium carbon trioxide

36. When correctly balanced, what are the coefficients (from left to right) of this chemical equation?

___ C_3H_8 (g) + ___ O_2 (g) → ___ CO_2 (g) + ___ H_2O (g)

A) 1,1,1,1
B) 1,1,3,8
C) 1,2,6,12
D) 1,5,3,4

37. What are the products in the following balanced equation?

__ CaS + __ $Al(OH)_3$ → _____ + _____

A) AlS + 3 CaOH
B) 3 Al_2S_3 + 2 $Ca(OH)_2$
C) 3 Al_2S_3 + 2 Ca(OH)
D) Al_2S_3 + 3 $Ca(OH)_2$

38. What is the state of Na_2S which is produced from a single replacement reaction?

A) solid
B) liquid
C) gas
D) aqueous

39. What is the correct net ionic equation when aqueous solutions of $CuCl_2$ and Na_2S are mixed?

A) $Cu^{2+} + S^{2-} \rightarrow CuS$
B) $CuCl_2 + S^{2-} \rightarrow CuS + 2Cl^-$
C) $Na_2S + CuCl_2 \rightarrow CuS + 2NaCl$
D) $Na_2S + Cu^{2+} \rightarrow CuS + 2Na^+$

40. Given the balanced chemical equation: $8F_2 + S_8 \rightarrow 8SF_2$
What mole ratio would be used to convert a given number of moles of sulfur (S_8) to moles of SF_2?

(A) $\frac{8\ mol\ SF_2}{8\ mol\ F_2}$

(B) $\frac{8\ mol\ S_8}{8\ mol\ F_2}$

(C) $\frac{1\ mol\ S_8}{8\ mol\ SF_2}$

(D) $\frac{8\ mol\ SF_2}{1\ mol\ S_8}$

41. Given the reaction: $4\ NH_{3\ (g)} + 5\ O_{2\ (g)} \rightarrow 4\ NO_{\ (g)} + 6\ H_2O_{\ (l)}$
When 1.20 mol of ammonia, $NH_{3(g)}$ reacts, the total number of moles of water formed is?

A) 0.800 mol
B) 1.20 mol
C) 1.50 mol
D) 1.80 mol

42. Aluminum bromide can be prepared by reacting small pieces of aluminum foil with liquid bromine at room temperature. The reaction is accompanied by flashes of red light.

$$2\ Al_{(s)} + 3\ Br_{2(l)} \rightarrow 2\ AlBr_{3(s)}$$

The number of moles of Br_2 needed to produce 5.00 mol of $AlBr_3$, if sufficient Al is present is?

A) 2.00 mol
B) 3.33 mol
C) 5.00 mol
D) 7.50 mol

43. Powdered zinc reacts rapidly with powdered sulfur in a highly exothermic reaction below:

$$8\ Zn_{(s)} + S_{8(s)} \rightarrow 8\ ZnS_{(s)}$$

The mass of zinc sulfide expected when 16.0 g of S_8 reacts with excess zinc is?

A) 0.0624g
B) 0.499 g
C) 6.08 g
D) 48.6 g

Chemistry 2202 Midterm Exam Review 2025

44. Given balanced equation for the combustion of propane gas below:

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$

Which is the limiting reagent if 2 mol of C_3H_8 react with 8 mol of O_2?

A) C_3H_8
B) O_2
C) CO_2
D) H_2O

45. What is the limiting reagent for the following reaction, given 3.40 moles of $Ca(NO_3)_2$ and 2.40 moles of Li_3PO_4?

$$3\ Ca(NO_3)_2 + 2\ Li_3PO_4 \rightarrow 6\ LiNO_3 + Ca_3(PO_4)_2$$

A) $Ca(NO_3)_2$
B) Li_3PO_4
C) $LiNO_3$
D) $Ca_3(PO_4)_2$

Use the following reaction for questions 46 and 47:

$$4\ Ag_{(s)} + 2\ H_2S_{(g)} + O_{2(g)} \rightarrow 2\ Ag_2S_{(s)} + 2\ H_2O_{(g)}$$

46. If you are given 0.208 mol of Ag and excess dihydrogen sulfide and oxygen gas, how many moles of water can be produced?

A) 0.104 mol
B) 0.208 mol
C) 2.00 mol
D) 8.02 mol

47. What volume of $H_2O_{(g)}$ should be produced at STP by the reaction of 0.208 mol of Ag with sufficient quantities of H_2S and O_2 ?

A) 0.104 L
B) 2.36 L
C) 4.58 mL
D) 9.16 mL

48. Which term represents the amount of product that is expected to be formed when at least one reactant is completely consumed during a chemical reaction?

A) actual yield
B) percent yield
C) theoretical yield
D) mole ratio

49. A solution of potassium borate, K_3BO_3 (aq), has a potassium ion concentration of 0.750 mol/L. What is the concentration of the borate ion?

A) 0.250 mol/L
B) 0.750 mol/L
C) 2.25 mol/L
D) 3.00 mol/L

Section II: Constructed Response

1. Make the following conversions:

a) 1.75 g to mg
b) 2.40 g to kg
c) 0.057 L to mL
d) 364 mL to L

2. Complete the following operations and give the answer to the correct number of significant digits:

a) 1.23 m + 3.674 m + 8.2 m
b) 74.372 g – 23.4 g
c) 6.43 m X 0.27 m
d) 0.474 g / 0.020 mol

3. Convert the following measurements to scientific notation, each with 2 significant digits.

a) 2730 m
b) 347 g
c) 0.00456 L

4. Complete the following table:

Isotope Name	Isotope Symbol	Mass Number	Atomic Number	Number of protons	Number of neutrons	Number of electrons
Magnesium-24						
		14		6		
			47		60	

5. a) How many moles are in 3.42 X 10^{24} atoms of copper?
b) How many molecules are in 2.65 mol of CO_2?
c) How many formula units are in 0.67 mol of NaCl?

Chemistry 2202 Midterm Exam Review 2025

6. Calculate the moles present in each of the following:
   a) 32.0 g of methane
   b) 168.0 g of mercury(II) sulfide

7. Calculate the mass in grams of each of the following:
   a) 0.200 mol of $MgCl_2$
   b) 1.500 mol of potassium dichromate

8. a) Calculate the volume, at STP, of 8.356 mol of oxygen.
   b) Find the number of moles of helium gas present in a 3.75 L balloon at STP.

9. Review each of the following terms: *solution, solute, solvent, aqueous solution, dilute solution, concentrated solution, saturated solution, unsaturated solution, supersaturated solution, alloy, miscible, immiscible*

10. a) What is the concentration of a lithium nitrate solution that contains 2.50 mol of lithium nitrate dissolved in water to a final volume of 750.0 mL?
    b) What volume of 2.50 mol/L sulfuric acid solution would contain 2.00 mol of sulfuric acid?
    c) Find the number of moles of sodium phosphate in 6.00 L of a 0.0125 mol/L cleaning solution.
    c) What is the molar concentration of a solution in which 120.0 g of sodium hydrogen sulfite, $NaHSO_3$, is dissolved in water to form 8.00 L of solution?
    d) What mass of sodium hydroxide is required to prepare 400.0 mL of a 0.200 mol/L cleaning solution?
    e) What volume of a 1.0 mol/L calcium chloride solution could be prepared from 1.00 kg of calcium chloride?
    f) What is the final concentration of 125 mL of a 2.50 mol/L solution which is diluted to a final volume of 0.500 L?

11. For each of the following reactions: identify the reaction type, predict products, include states of reactants and products, balance the reaction

    a) ____ NaBr + ____ H_3PO_4 →

    b) ____ $Ca(OH)_2$ + ____ $Al_2(SO_4)_3$ →

    c) ____ Mg + ____ Fe_2O_3 →

    d) ____ C_2H_4 + ____ O_2 →

    e) ____ $PbSO_4$ →

12. Write dissociation equations for each of the following compounds:
    a) barium nitrate
    b) strontium hydroxide

13. For each of the following, write balanced nonionic equations, total ionic equations and net ionic equations.
    a) tin(II) chloride solution and potassium phosphate solution
    b) aqueous chromium(III) sulfate and aqueous ammonium sulfide

14. When 20.4 g of sodium metal are combined with sufficient chlorine gas, what mass of sodium chloride is produced?

$$2\ Na_{(s)} + Cl_{2\ (g)} \rightarrow 2\ NaCl_{(s)}$$

17. What volume of 0.125 mol/L sodium hydroxide solution is required to completely react with 15.0 mL of 0.100 mol/L silver sulfate? Give your answer in mL.

$$2\ NaOH_{(aq)} + Ag_2SO_{4\ (aq)} \rightarrow 2\ AgOH_{(s)} + Na_2SO_{4(aq)}$$

18. Coal can undergo an incomplete combustion in the absence of a plentiful supply of oxygen to produce deadly carbon monoxide gas (the only product). What volume of carbon monoxide is produced at STP by the incomplete combustion of 1.20×10^5g of coal?

$$2\ C_{(s)} + O_{2\ (g)} \rightarrow 2\ CO_{(g)}$$