

Name: KEY  
Block: \_\_\_\_\_

## Chemistry 11 Final Exam Review

1. What are the three things needed for a fire to occur? (1.5 marks)
2. Describe the proper way to use a fire extinguisher. What are two hazards associated with a fire extinguisher? (2.5 marks)
3. Describe two important things to do before starting a lab experiment. (2 marks)

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EXAM

4. Give the correct metric symbol for each of the following: (1 mark each)

hectoseconds	<u>hs</u>
decimetres	<u>dm</u>
micrograms	<u>µg</u>

5. How many significant figures in each of the following? (1 mark each)

2.60	<u>3</u>
0.002050	<u>4</u>
1000	<u>1</u>
100.0	<u>4</u>
$2.10 \times 10^{-2}$	<u>3</u>

6. Complete the following metric conversions: (1 mark each)

A)  $4.2 \text{ cg} = \underline{0.0042} \text{ dag}$        $\frac{4.2 \text{ cg}}{10^2 \text{ cg}} \cdot \frac{1 \text{ dag}}{10^1 \text{ g}}$

B)  $7.5 \times 10^{-3} \text{ km} = \underline{75} \text{ dm}$        $\frac{7.5 \times 10^{-3} \text{ km}}{1 \text{ km}} \cdot \frac{10^3 \text{ m}}{1 \text{ km}} \cdot \frac{10 \text{ dm}}{1 \text{ m}}$

C)  $2.2 \times 10^2 \text{ cg/L} = \underline{2.2 \times 10^{-4}} \text{ hg/cL}$        $\frac{2.2 \times 10^2 \text{ cg}}{10^2 \text{ cg}} \cdot \frac{1 \text{ kg}}{10^2 \text{ g}} \cdot \frac{1 \text{ hg}}{10^2 \text{ g}} \cdot \frac{1 \text{ L}}{10^2 \text{ cL}}$

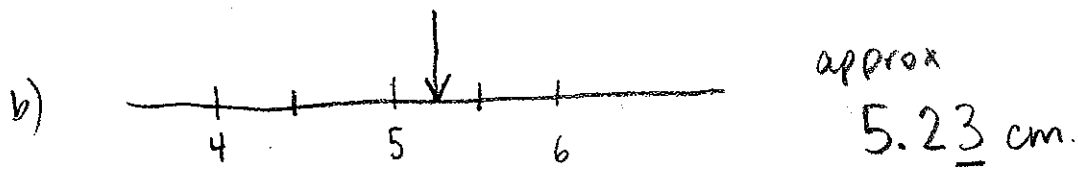
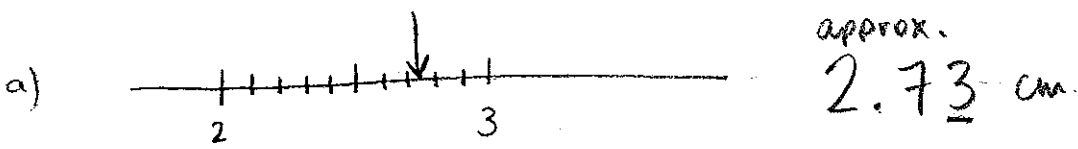
7. Complete the following calculations to the correct number of significant figures. Put your answers in scientific notation (1 mark each)

A)  $2.489 \times 0.0563 \times .210 = \underline{0.0294}$  (3 sig figs)

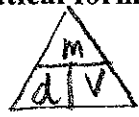
B)  $17.1 - 16.53 + 9.5 = \underline{10.1}$  (nearest tenth)

C)  $\frac{3.70 \times 10^{-1} \times 34}{2.12 \times 10^1} = \underline{0.59}$  (2 sig figs)

8. Determine the measurements indicated on the ruler to the correct number of significant figures. (2 marks)



9. Give the mathematical formula for density in a triangle. (1 mark)



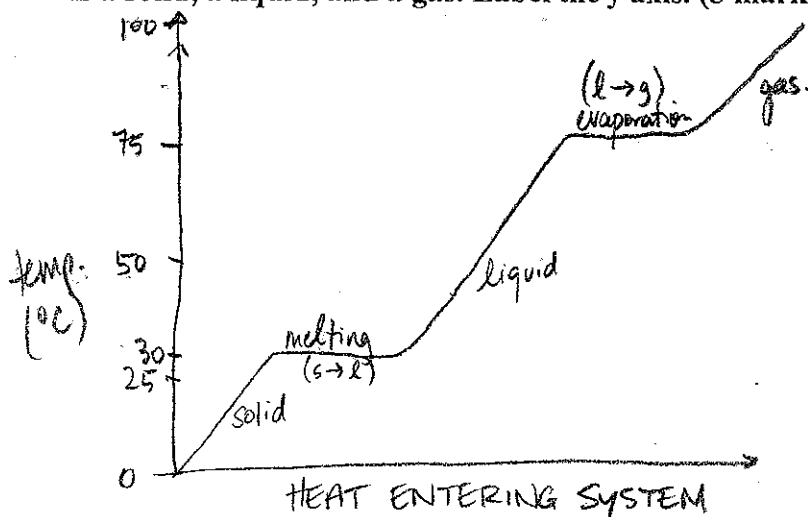
10. If the density of ethanol is 0.792 g/mL, and you have a  $7.37 \times 10^{-2} \text{ L}$  sample, what will the mass of the ethanol be? (2 marks)

$\frac{7.37 \times 10^{-2} \text{ L}}{1 \text{ L}} \cdot \frac{10^3 \text{ mL}}{1 \text{ L}} = 73.7 \text{ mL}$        $m = dV = (0.792 \text{ g/mL})(73.7 \text{ mL})$   
 $= 58.4 \text{ g ethanol}$

11. Describe the difference between qualitative and quantitative. (2 marks)

QUALITATIVE - non-numerical info/observations/data.  
 QUANTITATIVE - numerical info/obs./data.

12. Draw a phase change graph for a substance that melts at  $30^{\circ}\text{C}$  and boils at  $75^{\circ}\text{C}$ . Indicate where the phase changes are occurring and where the substance is a solid, a liquid, and a gas. Label the y axis. (5 marks)



13. How do elements differ from compounds? Be specific. (2 marks)

Elements consist of one type of atom.

Compounds consist of  $> 1$  type of atom.

14. How do pure substances differ from mixtures? Be specific. (2 marks)

Pure substances consist of one type of molecule.

Mixtures consist of  $> 1$  type of molecule.

15. Avogadro's number is  $6.02 \times 10^{23}$ . What does this represent? (1 mark)

The number of PARTICLES (atoms/molecules) existing in 1 MOLE of a substance.

16. How many molecules are in 1.57 mol of oxygen? (2 marks)

$$\frac{1.57 \text{ mol } \text{O}_2}{1 \text{ mol } \text{O}_2} \times 6.02 \times 10^{23} \text{ molec. } \text{O}_2 = 9.45 \times 10^{23} \text{ MOLEC. } \text{O}_2$$

17. Find the molar mass of  $\text{Ca}(\text{OH})_2$ . (1 mark)

$$1 \times \text{Ca} = 1 \times 40.1 \text{ g} = 40.1 \text{ g}$$

$$2 \times \text{O} = 2 \times 16.0 = 32.0 \text{ g}$$

$$2 \times \text{H} = 2 \times 1.0 = 2.0 \text{ g}$$

$$\boxed{74.1 \text{ g}} \text{ or } \boxed{74.1 \text{ g/mol}}$$

18. Calculate the mass of  $5.62 \times 10^{-2}$  moles of carbon dioxide. (2 marks)

$$\frac{5.62 \times 10^{-2} \text{ mol CO}_2 \quad | \quad 44.0 \text{ g CO}_2}{1 \text{ mol CO}_2} = \boxed{2.47 \text{ g CO}_2}$$

19. What volume (in litres) would  $1.32 \times 10^{22}$  molecules of hydrogen gas take up at STP? (2 marks)

$$\frac{1.32 \times 10^{22} \text{ molec. H}_2 \quad | \quad 1 \text{ mol H}_2 \quad | \quad 22.4 \text{ L H}_2}{6.02 \times 10^{23} \text{ molec. H}_2 \quad | \quad 1 \text{ mol H}_2} = \boxed{0.491 \text{ L H}_2}$$

20. Find the percent composition of  $\text{C}_6\text{H}_{12}\text{O}_6$ . (3 marks)

Assume 1 mol.

$$6 \times \text{C} = 6 \times 12.0 = 72.0 \text{ g C}$$

$$12 \times \text{H} = 12 \times 1.0 = 12 \text{ g H}$$

$$6 \times \text{O} = 6 \times 16.0 = 96.0 \text{ g O}$$

molar mass  $180.0 \text{ g C}_6\text{H}_{12}\text{O}_6$

(always nearest tenth)

$$\% \text{ C} = \frac{72.0 \text{ g}}{180.0 \text{ g}} = 40.0\%$$

$$\% \text{ H} = \frac{12 \text{ g}}{180.0 \text{ g}} = 6.7\%$$

$$\% \text{ O} = \frac{96.0 \text{ g}}{180.0 \text{ g}} = 53.3\%$$

21. If the molar mass of a compound is  $56.0 \text{ g/mol}$ , and the empirical formula is  $\text{CH}_2$ , what is the molecular formula of the compound? (2 marks)

$$\text{Molecular Multiplier} = \frac{\text{MOLAR MASS}}{\text{EMPIRICAL MASS}} = \frac{56.0 \text{ g/mol}}{14.0 \text{ g/mol}} = 4$$



22. Name the following compounds: (1 mark each)

A)  $\text{Fe}_2\text{O}_3$  Iron (III) oxide

B)  $\text{PCl}_3$  Phosphorus trichloride.

C)  $(\text{NH}_4)_2\text{CO}_3$  Ammonium carbonate

D)  $\text{PbS}_2$  Lead (IV) sulfide

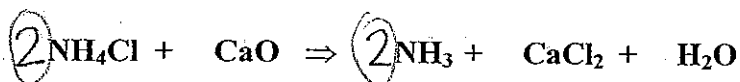
23. Write formulas for the following compounds: (1 mark each)

A) Ammonium sulphate  $(\text{NH}_4)_2\text{SO}_4$

B) dinitrogen pentoxide  $\text{N}_2\text{O}_5$

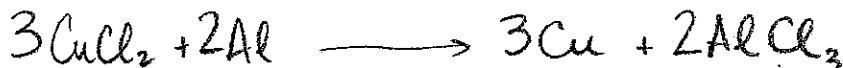
C) Copper II phosphate  $\text{Cu}_3(\text{PO}_4)_2$

24. Balance: (1 mark)



25. Convert the word equation into a balanced chemical equation. (2 marks)

Copper II chloride reacts with aluminum metal to produce copper metal and aluminum chloride.



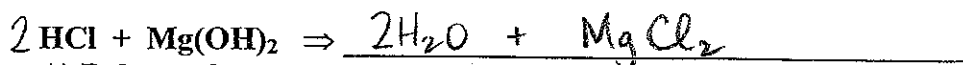
26. Identify the reaction type (e.g. synthesis etc.) (1 mark each)

A)  $\text{BaCl}_2 + \text{Na}_2\text{SO}_4 \Rightarrow \text{BaSO}_4 + \text{NaCl}$  DOUBLE REPLACEMENT

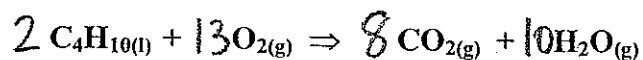
B)  $2\text{C}_2\text{H}_2 + 5\text{O}_2 \Rightarrow 4\text{CO}_2 + 2\text{H}_2\text{O}$  COMBUSTION OF HYDROCARBONS

C)  $2\text{H}_2\text{O}_2 \Rightarrow 2\text{H}_2\text{O} + \text{O}_2$  DECOMPOSITION

27. Predict the products for the following reaction. (2 marks)



28. A) Balance the equation (1 mark)



B) If 5.0 moles of  $\text{C}_4\text{H}_{10}$  are used, how many moles of  $\text{H}_2\text{O}$  are produced? (2 marks)

$$\frac{5.0 \text{ mol } \text{C}_4\text{H}_{10}}{2 \text{ mol } \text{C}_4\text{H}_{10}} \times \frac{10 \text{ mol } \text{H}_2\text{O}}{1 \text{ mol } \text{C}_4\text{H}_{10}} = \boxed{25 \text{ mol } \text{H}_2\text{O}}$$

C) How many moles of  $\text{CO}_2$  could be produced from 52.0g of  $\text{O}_2$ ?  
(3 marks)

$$52.0 \text{ g } \overset{\text{O}_2}{\cancel{\text{O}_2}} \left| \frac{1 \text{ mol } \overset{\text{O}_2}{\cancel{\text{O}_2}}}{32.0 \text{ g } \text{O}_2} \right| \frac{8 \text{ mol } \text{CO}_2}{13 \text{ mol } \text{O}_2} = \boxed{1.00 \text{ mol } \text{CO}_2}$$

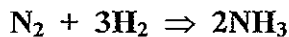
D) How many grams of  $\text{C}_4\text{H}_{10}$  are needed to produce 17.5 L of  $\text{CO}_2$ ?  
(3 marks)

$$17.5 \text{ L } \text{CO}_2 \left| \frac{1 \text{ mol } \text{CO}_2}{22.4 \text{ L } \text{CO}_2} \right| \frac{2 \text{ mol } \text{C}_4\text{H}_{10}}{8 \text{ mol } \text{CO}_2} \frac{58.0 \text{ g } \text{C}_4\text{H}_{10}}{1 \text{ mol } \text{C}_4\text{H}_{10}} = \boxed{11.3 \text{ g } \text{C}_4\text{H}_{10}}$$

29. A) Define limiting reactant. (1 mark)

A reactant that limits how much product can be formed.

B) In the reaction below, what is the limiting reactant if 36.7g of  $\text{N}_2$  reacts with 2.6g of  $\text{H}_2$ ? (2 marks)

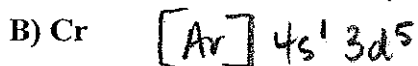
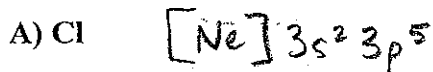


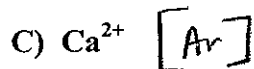
$$\frac{36.7 \text{ g } \text{N}_2}{28.0 \text{ g } \text{N}_2} \left| \frac{1 \text{ mol } \text{N}_2}{1 \text{ mol } \text{N}_2} \right| \frac{2 \text{ mol } \text{NH}_3}{1 \text{ mol } \text{N}_2} = 2.62 \text{ mol } \text{NH}_3$$

$$\frac{2.6 \text{ g } \text{H}_2}{2.0 \text{ mol } \text{H}_2} \left| \frac{1 \text{ mol } \text{H}_2}{3 \text{ mol } \text{H}_2} \right| \frac{2 \text{ mol } \text{NH}_3}{3 \text{ mol } \text{H}_2} = 0.867 \text{ mol } \text{NH}_3$$

$\text{H}_2$  is the  
LIMITING  
REACTANT.

30. Write electron configurations using core notation for each of the following:  
(1 mark each)





E) Are any of the above particles isoelectronic with a noble gas? Which one(s) and what noble gas are they isoelectronic with? (2 marks)

C) is  $\Rightarrow$  ARGON      D) is also  $\Rightarrow$  ARGON

31. If a uranium atom has a mass of 238, how many protons, electrons, and neutrons does it have? (3 marks)

$$P = 92$$

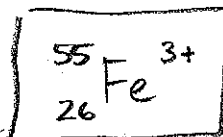
$$E = 92$$

$$N = 238 - 92 = 146$$

32. Write an isotope symbol for a species with 26 protons, 23 electrons, and 29 neutrons. (2 marks)

e.g.  $\underline{\quad} ? \underline{\quad}$

Answer:



33. What type of intramolecular bond would be formed between the following atoms? (nonpolar, polar, or ionic) (1 mark each)

A) two chlorine atoms

NONPOLAR

B) a calcium atom and a fluorine atom

IONIC

C) a hydrogen and oxygen atom

POLAR

34. Indicate what type of bond is formed below (ionic, polar, nonpolar) and write the proper symbols for charges on each side depending on the type of bond. (1 mark each)

A)



POLAR

B)



IONIC

4. IONIC - complete electron transfer and subsequent electrostatic attraction.

35. Name and describe one type of intermolecular bond. (2 marks)

- 1 LONDON FORCES - attraction between protons and electrons of DIFFERENT particles
- 2 DIPOLE-DIPOLE FORCES - exist in molecules w/ polar bonds; attract between partial neg. & partial pos. atoms
- 3 HYDROGEN BONDS - same as dipole-dipole but only in H-O and/or H-N bonds

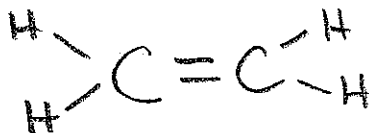
36. Draw Lewis structures for: (2 marks each)

A)  $\text{NCl}_3$   
 h 26  
 n 32  
 s 6  
 b 3  
 nb 20

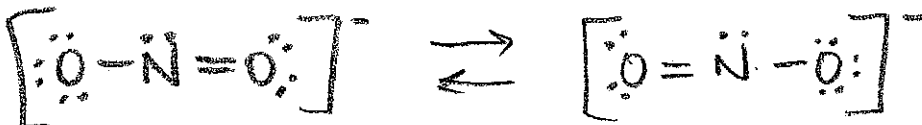


B)  $\text{H}_2\text{CCH}_2$

h 12  
 n 24  
 s 12  
 b 6  
 nb 0



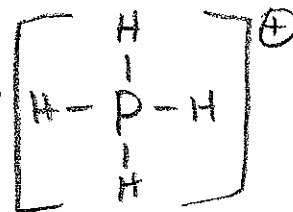
37. Draw the resonating structures for  $\text{NO}_2^-$  (2 marks)



38. Draw the Lewis structures for and predict the shape of the following molecules (2 marks each)

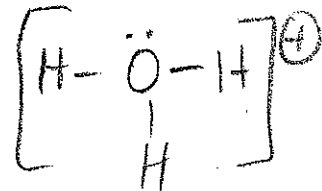
A)  $\text{PH}_4^+$   
 h 8  
 n 16  
 s 8  
 b 4  
 nb 0

tetrahedral

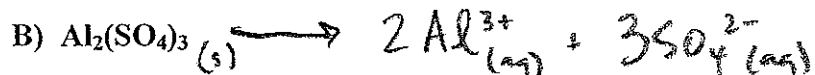
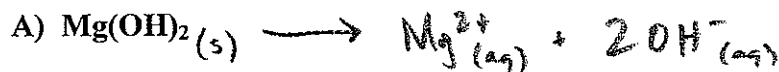


B)  $\text{H}_3\text{O}^+$

trigonal pyramidal



39. Write dissociation equations (don't forget states) (1 mark each)



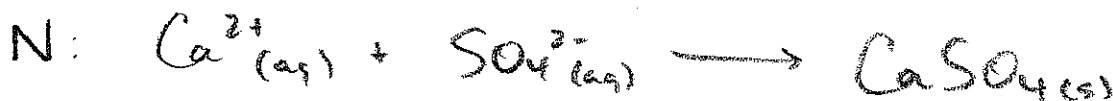
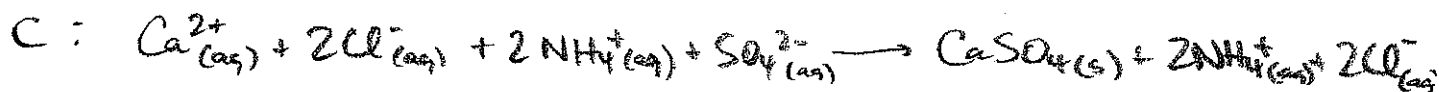
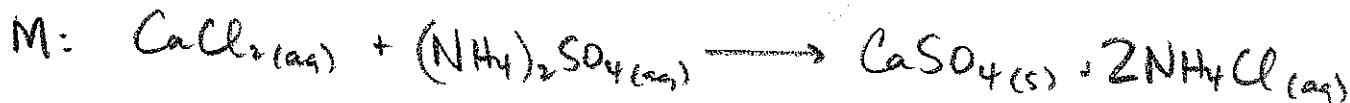


40. Define solute and solvent. (1 mark each)

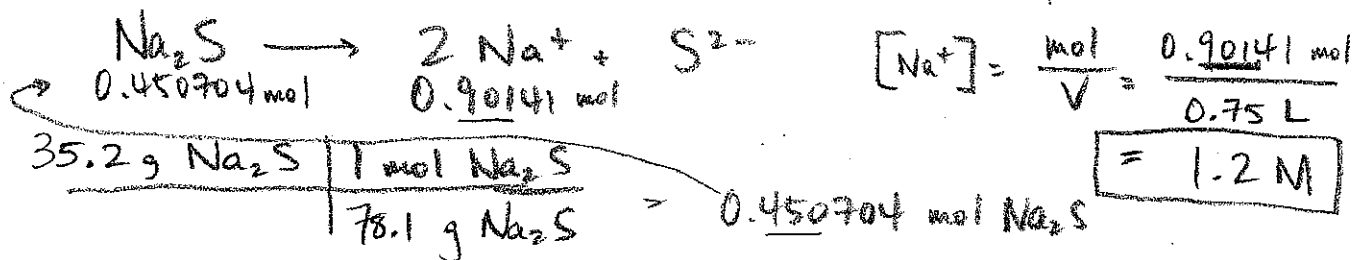
Solute - the component of a solution that exists in the smaller quantity

Solvent - the component of a solution present in the greater quantity

41. Write a formula equation, complete ionic equation, and net ionic equation when  $\text{CaCl}_2$  is mixed with  $(\text{NH}_4)_2\text{SO}_4$ . Don't forget to balance and write states! (3 marks)



42. Calculate the  $[\text{Na}^+]$  if a solution made by mixing 35.2g of  $\text{Na}_2\text{S}$  is added to enough water to make a 750mL solution. (3 marks)



43. How much water must be added to 250mL of a 0.750M solution of  $\text{LiCl}$  to dilute it to 0.250M? (2 marks)

$$V_f = \frac{M_i V_i}{M_f} = \frac{(0.750 \text{ M})(0.25 \text{ L})}{0.250 \text{ M}} = 0.75 \text{ L final}$$

$$0.75 - 0.25 = 0.50 \text{ L added}$$

$$\text{or } 5.0 \times 10^2 \text{ mL}$$

44. Draw a flow chart to show how to separate a solution that could contain neither, one, two or all three of  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ , and  $\text{Ag}^+$ . (3 marks)

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