Final Exam Skills Review Worksheet #1

Types of Reaction and Balancing Equations

Balance the following equations and indicate the type of reaction taking place: Choose from single replacement , double replacement, synthesis, combustion, or decomposition

1) 3 NaBr + ___ H_3PO_4 → ___ Na_3PO_4 + 3 HBr

Type of reaction: double replacement

2) 3 Mg + ___ Fe_2O_3 → 2 Fe + 3 MgO

Type of reaction: single replacement

3) ___ C_2H_4 + 3 O_2 → 2 CO_2 + 2 H_2O

Type of reaction: combustion

4) 2 $PbSO_4$ → 2 $PbSO_3$ + ___ O_2

Type of reaction: decomposition

5) 1 H_2O + 1 SO_3 → 1 H_2SO_4

Type of reaction: synthesis

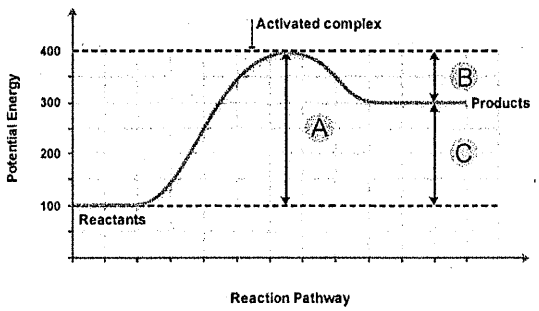
Energy Relationships

6) Use the energy diagram below to answer each.

a) identify as the reaction as endothermic or exothermic endothermic

b) identify the heat of reaction(ΔH) 300-100 = 200 kJ

c) identify the activation energy 400-100 = 300 kJ



Predicting Products of Reactions

7) Use activity series to predict whether or not a single replacement reaction should happen for each below. If it does write the products that form.

a) $Cu\ (s) + KCl\ (aq) \rightarrow$ NO REACTION Cu IS LESS REACTIVE THAN K

b) $\overset{2+}{Ca}\ (s) + \overset{3+}{Al}(\overset{1-}{NO_3})_3\ (aq) \rightarrow$ $Ca(NO_3)_2 + Al$

c) $\overset{2+}{Zn}\ (s) + \overset{1+}{Ag}\overset{1-}{Cl}\ (aq) \rightarrow$ $ZnCl_2 + Ag$

8) Predict the products of the double replacement reactions below.

a) $Ba(NO_3)_2\ (aq) + NaOH\ (aq) \rightarrow$ NO REACTION (BOTH POSSIBLE PRODUCTS DISSOLVE IN WATER)

$Na^{1+}\ PO_4^{3-}\quad Ca^{2+}\ Cl^{1-}$ $\quad Na^{1+}\ Cl^{1-}\quad Ca^{2+}\ PO_4^{3-}$

b) $Na_3PO_4\ (aq) + CaCl_2\ (aq) \rightarrow$ $NaCl_{(aq)} + Ca_3(PO_4)_2\ (s)$

↑ does not dissolve in H_2O (insoluble)

Chemical Quantity and the Mole

9) How many moles are equivalent to 2.25×10^{23} atoms of lead?

$2.25 \times 10^{23} \div 6.02 \times 10^{23} =$ mole Pb

10) What mass is represented by 2.75 moles of H_2O?

2.75 mole $H_2O \times 18.02 =$ g H_2O

11) How many liters of methane gas are equivalent to 3.6 moles?

3.6 mole $\times\ 22.4 =$ L methane

Chemical Formulas

11) Identify the empirical formula for each compound

a) N_2O_4 NO_2 b) C_4H_{10} C_2H_5 c) H_2O H_2O

* simplest ratio

12) What is the empirical formula of a compound made up of 89.17% Au and 10.83%O?

% to mass
mass to mole
÷ by small
multiply til whole

89.17g Au ÷ 196.97 = .453 / .453 = 1 mol x2

10.83g O ÷ 16 = .677 / .453 = 1.5 mol x2

(2) (3)

Au_2O_3

Chemical Formulas contd.

13) A chemical substance has an empirical formula of CH_2O and a molar mass of 180 g. What is it's molecular formula?

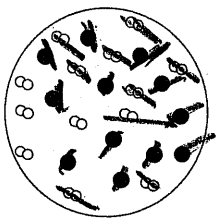
30g mass of empirical formula

$$\frac{\text{molar mass}}{\text{empirical formula mass}} \rightarrow \frac{180}{30} = 6$$

$CH_2O \times 6 = C_6H_{12}O_6$

Stoichiometry

14) Use the sketch of reactant particles available and the balanced equation to determine the limiting reagent of the chemical reaction.



$4\ Fe\ (s) + 3\ O_2\ (g) \rightarrow 2\ Fe_2O_3\ (s)$

Fe is Limiting.

15) Determine the limiting reagent if 3 ~~moles~~ grams of nitrogen gas reacts with 8 ~~moles~~ grams of oxygen gas according to the reaction below.

28
16

$O_2\ (g) + 2\ N_2\ (g) \rightarrow 2\ N_2O$

$$\frac{3g\ N_2}{x\ g\ N_2O} = \frac{2(28.02)\ g\ N_2}{2(44.02)\ g\ N_2O}$$

$$56.04x = 264.12$$

$$x = 4.7\ g\ N_2O$$

less product

$$\frac{8g\ O_2}{x\ g\ N_2O} = \frac{1 \times 32g\ O_2}{2 \times (44.02)\ g\ N_2O}$$

$$32x = 704.32$$

$$x = 22.01\ g\ N_2O$$

N_2 limiting

16) What mass of water would be produced when ~~685 g of methane~~ .85g CH_4 burns completely in excess oxygen?

$CH_4\ (g) + 2\ O_2\ (g) \rightarrow CO_2\ (g) + 2\ H_2O\ (g)$

$$\frac{.85g\ CH_4}{x\ g\ H_2O} = \frac{1(16.05g)\ CH_4}{2(18.02g)\ H_2O}$$

$$16.05x = 30.63$$

$$x = 1.9\ g\ H_2O$$

Chemistry Final Exam Skills Review 2

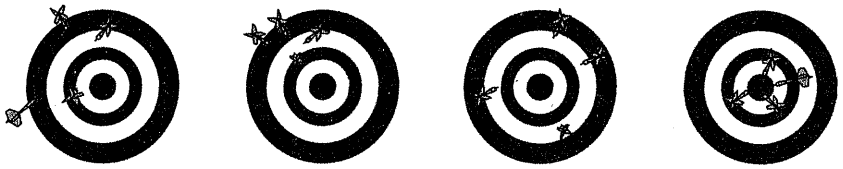
1) Four students each threw four darts at a board represented by the letters A, B, C, and D in the illustration below. The students were aiming for the bulls-eye with each toss.

a) Which students had poor precision and poor accuracy? Explain.

STUDENTS A AND C HAD POOR PRECISION AS THE GROUPS OF DARTS ARE NOT CLOSE TO EACH OTHER, AND POOR ACCURACY AS THEY ARE NOT CLOSE TO THE TARGET.

b) Which student had good precision but poor accuracy? Explain.

STUDENT B HAD ALL 4 DARTS CLOSE TO EACH OTHER (PRECISE) BUT NONE VERY CLOSE TO BULLS-EYE.



A B C D

2) Which unit of measure is 10,000 times smaller than a centimeter? centi = 10^{-2} micro = 10^{-6}

a) millimeter b) megameter c)nanometer d)micrometer

10^4 APART OR 10000

3) Which unit of measure is 10^6 times larger than a nanometer?

a) centimeter b) micrometer c)millimeter d)meter

4) Convert each metric unit into the desired unit.

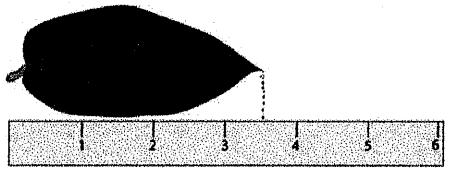
a) 0.075 mL = 75 µL b) 120 g= 0.12 kg c) 32mL= .032 L

micro is smaller make number larger

Kilogram is larger make number smaller

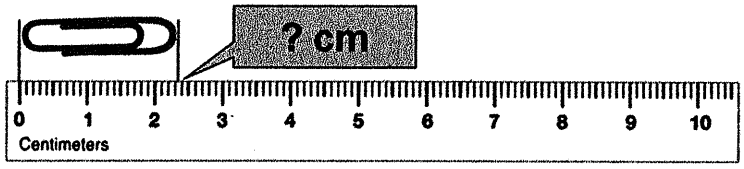
L is larger make number smaller

5) Record each measurement below using the correct number of digits.



a) 3.5 cm

marked by ones estimate tenths



b) 2.31 cm

marked by tenths estimate hundredths

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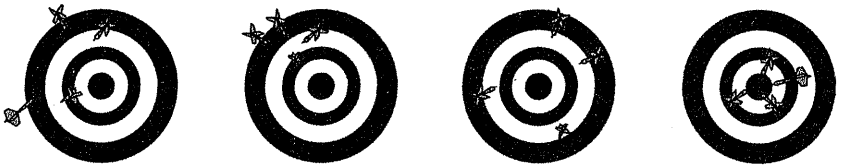

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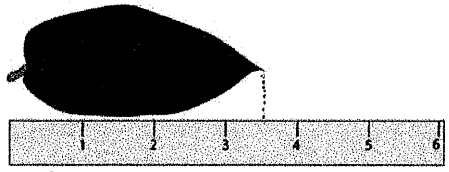
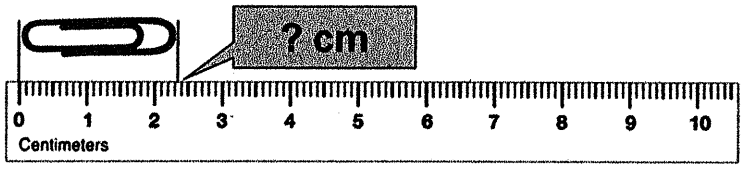
a)



3.5 cm

marked by ones estimate tenths

b)



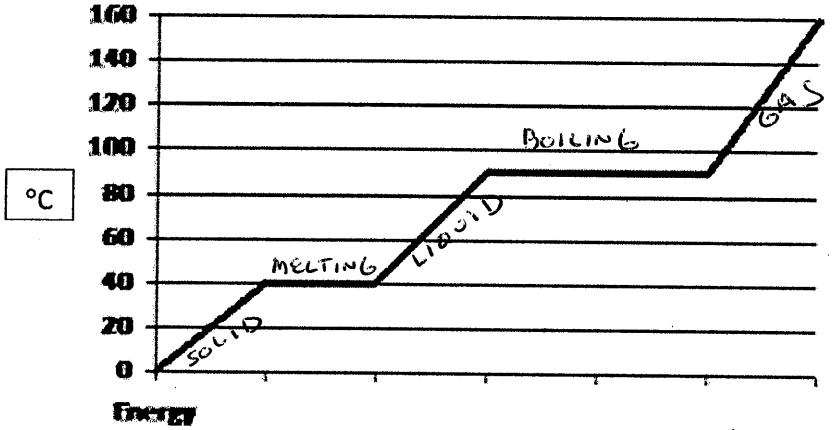
2.31 cm

marked by tenths estimate hundredths

6) How many significant figures are represented by each measurement written below?

a) 2 1300 mm b) 4 13.00 ft c) 2 0.00015 g d) 6 105.020 m

7) Use the heating curve below to answer each question.

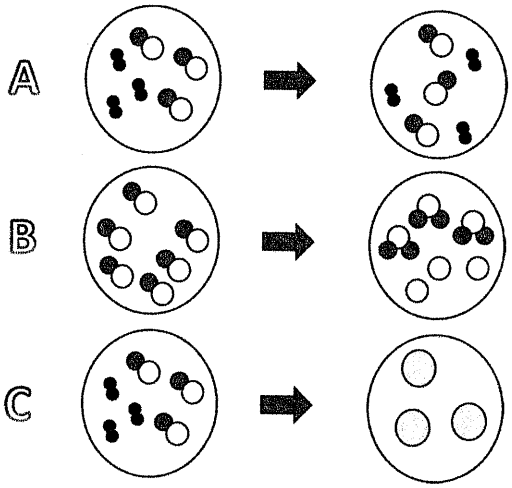


a) What state of matter is the chemical substance in at 60 degrees? LIQUID

b) What is the melting point of the chemical substance? 40°C

c) What is the boiling point of the chemical substance? 90°C

8) Match each illustration with the statement that best describes it. Briefly explain each.

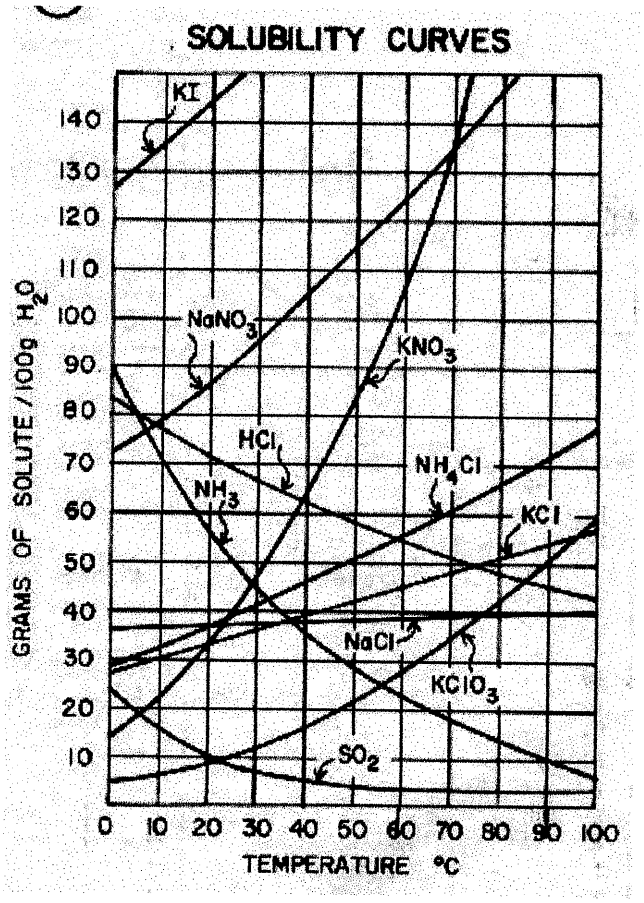


B A chemical change requires new substances to form by bonding the particles in a new arrangement

A A physical change does not create any new substance

C A change that does not obey the Law of Conservation of Matter new atoms may not form, they can only rearrange

8) Use the solubility curve data in the graph below to answer each.



a) Which chemical compound is the least soluble in water at 30°C? lowest amount dissolves

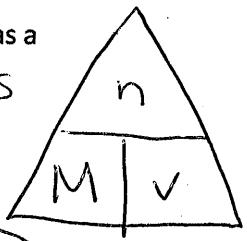
a) $NaNO_3$ b) NH_3 c) NaCl d) KI

b) How much KNO3 could dissolve in 100 g of H2O at 65°C? 120g

c) If 30g of HCl was dissolved in water that was 70°C then how much more HCl could dissolve in the water?

52 - 30 = 22g

9) What mass of sodium phosphate Na_3PO_4 is needed to form 750 mL a solution that has a concentration of 2.0 M? Solve for n, convert it to mass



(2 x .75) = 1.5 mole

(1.5 mole x 163.94) = 245.9 g Na_3PO_4

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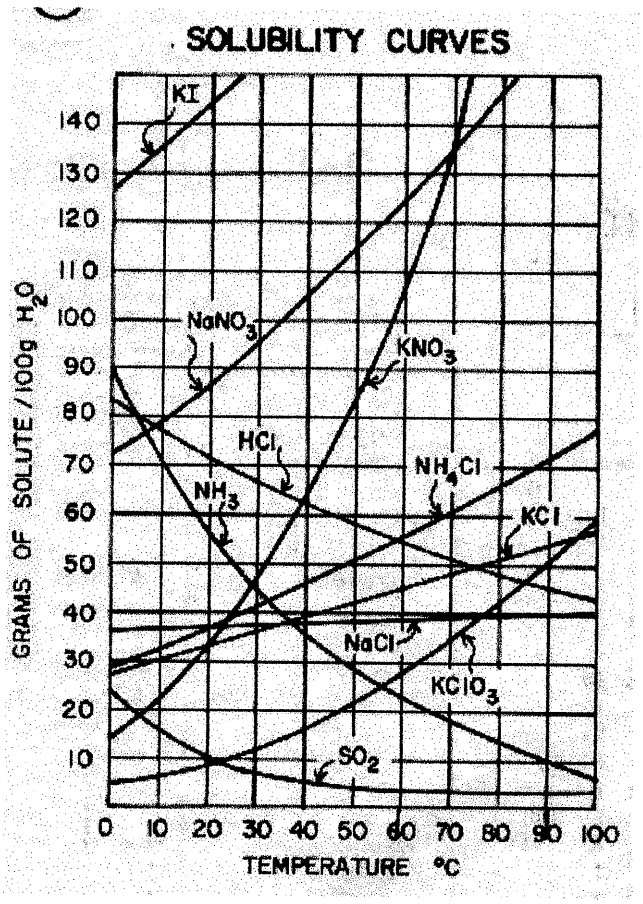

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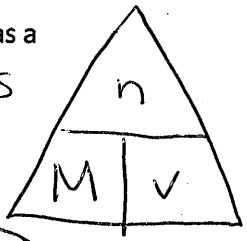

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RMIVUXG
↑
ROYGBIV

LOW LONG — HIGH SHORT

18) Which form of light energy has the greatest frequency?

a) blue b) red c) violet d) green

19) Which form of light energy on the electromagnetic spectrum has the least amount of energy?

a) Microwave b) Ultraviolet c) Radiowave d) Visible

20) What should be the formula for an ionic compound made up of each pair of ions below?

a) Al^{3+} NO_2^{1-} b) Mg^{2+} I^{1-} c) Ca^{2+} CN^{1-}

$Al(NO_2)_3$ MgI_2 $Ca(CN)_2$

21) Name each ionic compound.

a) $Cu(NO_3)_2$ b) Mg_3P_2 c) $NaClO_3$ d) $PbSO_4$

copper II nitrate magnesium phosphide sodium chlorate lead (II) sulfate

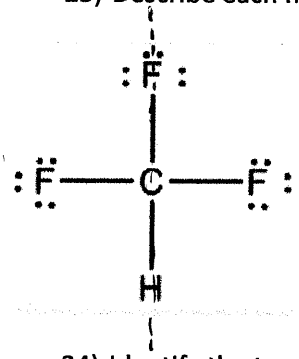
22) Describe the type of chemical bond for each compound below as ionic or covalent.

begins w/ a metal → non metals only

a) CO_2 covalent b) $FeSO_4$ ionic

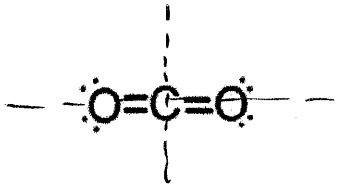
c) sulfur hexafluoride covalent d) nickel (II) oxide ionic

23) Describe each molecule illustrated below as polar or non-polar? Explain.



one line of symmetry

polar

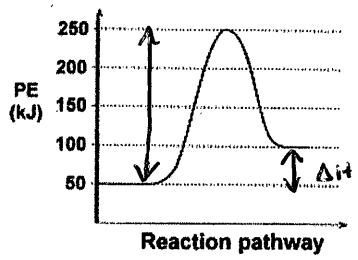


multiple lines of symmetry

non-polar

24) Identify the type of reaction below as exothermic or endothermic. Then determine the heat of reaction (ΔH) and Activation Energy for the chemical reaction.

Reaction type endothermic ΔH 50 kJ Activation Energy 200 kJ



← energy absorbed not released

Chemistry Final Exam Skills Review 3

1) Name each covalently bonded compound below.

a) N_2O_5 dinitrogen pentoxide

b) PCl_3 phosphorus trichloride

c) SF_6 sulfur hexafluoride

2) Identify the type of reaction represented by each chemical equation below. Choose from:

a) Synthesis b) Decomposition c) single replacement

d) Double replacement e) combustion

B $2\ HgO \rightarrow 2\ Hg + O_2$

C $3\ AgNO_3 + Al \rightarrow Al(NO_3)_3 + 3\ Ag$

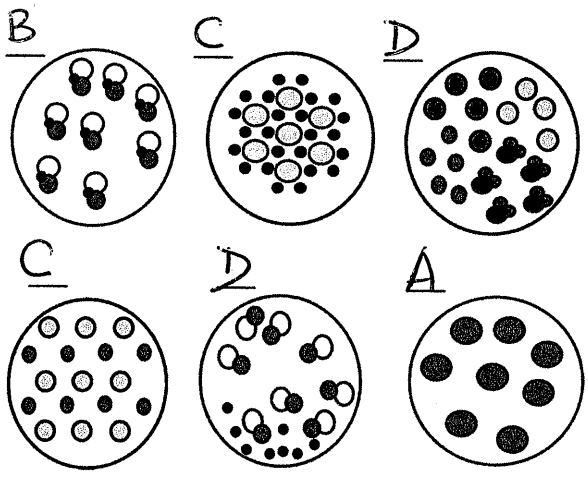
E $C_2H_2 + 2\ O_2 \rightarrow 2\ CO + 2\ H_2O$

D $2\ Na_3PO_4 + 3\ MgCl_2 \rightarrow Mg_3(PO_4)_2 + 6\ NaCl$

A $2\ Mg + Cl_2 \rightarrow 2\ MgCl$

3) Classify each illustration as either:

a) Element b) compound c) homogeneous mixture d) heterogeneous mixture



4) Draw the Lewis dot diagram for each element below.

a) N b) O c) Mg d) Na

5) Calculate the percent composition of sulfur trioxide SO_3?

S	1	32.07	32.07	$\frac{32.07}{80.07} \times 100 = 40.1\%$
O	3	16.00	48.00	$\frac{48.00}{80.07} \times 100 = 59.9\%$
			80.07	

6) Predict whether or not a single replacement reaction happens for each pair of reactants. Write the formula for the products if a reaction happened. If no reaction occurs write no reaction.

USE ACTIVITY SERIES

a) $Mg\ (s) + Al_2(SO_4)_3\ (aq) \rightarrow$ $MgSO_4 + Al$

Mg^{2+} SO_4^{2-}

b) $Cu\ (s) + FeCl_3\ (aq) \rightarrow$ NO REACTION Copper is less reactive than iron on activity series

7) Predict the products of a double replacement reaction for each pair of reactants. Identify which of the products that forms is a precipitate by using the symbol (s).

USE ION CHARGES & SOLUBILITY TABLE

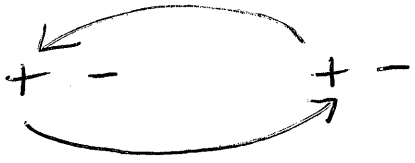
a) $Na_2CO_3\ (aq) + CaCl_2\ (aq) \rightarrow$ $NaCl_{(aq)} + CaCO_3(s)$

Na^{1+} Cl^{1-} Ca^{2+} CO_3^{2-} $CaCO_3$ is insoluble in water

b) $Na_2S\ (aq) + Pb(NO_3)_2\ (aq) \rightarrow$ $NaNO_3(aq) + PbS(s)$

Na^{1+} NO_3^{1-} Pb^{2+} S^{2-}

PbS is insoluble in water

- SWAP THE IONS 
- USE THE CHARGES TO WRITE 2 NEW FORMULA
- CHECK SOLUBILITY TABLE FOR INSOLUBLE COMPOUND
- ASSIGN SYMBOLS (s) OR (aq)

$C_1V_1 = C_2V_2$

10) What volume of 12 M HCl is needed to prepare a 250 mL of HCL with solution with a concentration of 3.0 M?

$12V = 3 \times 250$

$12V = 750$

$V = 62.5\ mL$

11) What is the percent (~~w/w~~ or ~~v/v~~) concentration of a solution prepared by mixing 120 g of sodium chloride solid in 480 g of water?

% m/m or w/w or v/v

$\frac{120\ g}{(480 + 120\ g)} \times 100 = \frac{120}{600} \times 100 = 20\%$

12) What should be the new volume of 125 mL of gas at a pressure of 1.5 atm if the pressure is reduced down to 0.6 atm?

$P_1V_1 = P_2V_2$

$125 \times 1.5 = 0.6V$

$187.5 = 0.6V$

$312.5 = V$

13) What is the new volume of gas when 2.5 L of gas at a temperature of 40°C is cooled to 10°C while its pressure reduced from 150 kPa to 70 kPa?

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$\frac{150 \times 2.5}{313} = \frac{70 \times V}{283}$

$21910V = 106125$

$V = 4.84\ L$

14) How many moles of gas are present if the gas occupies a volume of 13 L and it has a pressure of 2.0 atm at a temperature of 5°C?

(n)

$Pv = nRt$ $\quad R = 0.0821$

$2 \times 13 = n(.0821)(278)$

$26 = 22.8n$

$n = 1.14\ moles$