

CHE 105 Exam 2 Spring 2017

Your Name: _____

Your ID: _____

Question #: 1

What is the chemical formula of chromium(III) bromide?

- A. CrBr
 - B. CrBr₂
 - C. Cr₂Br
 - D. Cr₃Br
 - E. CrBr₃
 - F. Cr₂Br₃
-

Question #: 2

What is the correct chemical name for N₂O₅?

- A. nitrogen(V) oxide
 - B. nitrogen pentoxide
 - C. dinitrogen oxide
 - D. dinitrogen pentoxide
-

Question #: 3

How many grams are there in 5.50 moles of propane, C₃H₈?

- A. 13.0 grams
 - B. 71.5 grams
 - C. 243 grams
 - D. 48.6 grams
-

Question #: 4

How many grams of oxygen are contained in 30. grams of acetic acid, $C_2H_4O_2$ (molar mass = 60.05 g/mol)?

Report your answer to **two** significant figures. Do **NOT** include units in your answer.

1 grams

1. _____

Question #: 5

Caffeine has a percent by mass of 49.48% C, 5.19% H, 16.47% O, and 28.86% N. What is the empirical formula of caffeine?

- A. CHON
 - B. $C_5H_5O_5N_5$
 - C. $C_4H_5ON_2$
 - D. $C_2H_4O_2N$
 - E. $C_3H_2O_3N_2$
-

Question #: 6

When iron rusts, solid iron (Fe) reacts with gaseous molecular oxygen (O_2) to form solid iron(III) oxide. In the balanced chemical equation for this reaction with the smallest integer coefficients for the reactants and products, what is the coefficient for oxygen?

Enter your answer as a **whole** number. Do **NOT** include any symbols or formulas in your answer.

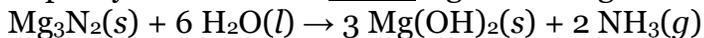
1

1. _____

Question #: 7

When 2.00 moles of H₂O react in the following chemical reaction, how many grams of NH₃ are produced?

Report your answer to **three** significant figures. Do **NOT** include units in your answer.

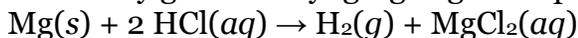


1 grams

1. _____

Question #: 8

If 10.0 grams of magnesium are added to a solution containing 1.00 mole of hydrochloric acid, how many grams of hydrogen gas are produced?

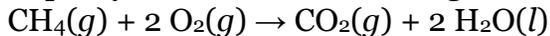


- A. 0.551 grams of H₂
 - B. 0.829 grams of H₂
 - C. 1.008 grams of H₂
 - D. 2.106 grams of H₂
-

Question #: 9

According to the following chemical equation, when 3.05 moles of CH₄ are mixed with 5.03 moles of O₂, the limiting reagent will be 1 [CH₄ or O₂]. The amount of **unreacted excess** reagent will be 2 moles.

Report your answer to **three** significant figures. Do **NOT** include units in your answer.

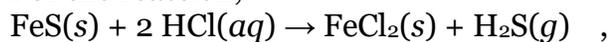


1. _____

2. _____

Question #: 10

For the reaction,



what is the percent yield if 0.223 moles of FeS reacts with an excess of HCl to produce 7.00 grams of H₂S?

- A. 77.3 %
 - B. 82.1 %
 - C. 92.1 %
 - D. 96.6 %
-

Question #: 11

A 255.0 mL aqueous solution contains 275 grams of BaCl₂. What is the molarity (M) of the solution?

Report your answer to **three** significant figures. Do **NOT** include units in your answer.

 1 molar

1. _____

Question #: 12

How many grams of NaOH (molar mass = 40.00 g/mol) are in 600.0 mL of a 0.650 M NaOH solution?

- A. 6.8 grams
 - B. 11.5 grams
 - C. 15.6 grams
 - D. 20.9 grams
-

Question #: 13

What is the molarity (M) of a KCl solution made by diluting 100. mL of a 0.250 M solution to a final volume of 750. mL?

- A. 0.150 M
 - B. 5.00×10^{-3} M
 - C. 3.33×10^{-2} M
 - D. 1.35 M
-

Question #: 14

Which one of the following ionic compounds is **insoluble** in water?

- A. NH_4OH
 - B. KOH
 - C. Ag_2SO_4
 - D. $\text{Pb}(\text{NO}_3)_2$
-

Question #: 15

Which one of the following equations best represents the reaction that occurs when KCl and $\text{Pb}(\text{NO}_3)_2$ solutions are mixed?

- A. $\text{KCl}(aq) + \text{Pb}(\text{NO}_3)_2(aq) \rightarrow \text{KNO}_3(aq) + \text{PbCl}_2(s)$
 - B. $\text{K}^+(aq) + \text{NO}_3^-(aq) \rightarrow \text{KNO}_3(aq)$
 - C. $2 \text{KCl}(aq) + \text{Pb}(\text{NO}_3)_2(aq) \rightarrow \text{PbCl}_2(s) + 2 \text{KNO}_3(aq)$
 - D. $\text{KCl}(aq) + 2 \text{Pb}(\text{NO}_3)_2(aq) \rightarrow \text{KNO}_3(s) + 2 \text{PbCl}_2(aq)$
-

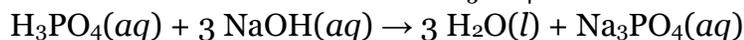
Question #: 16

What is the **net ionic equation** for the reaction of ammonium chloride with silver nitrate?

- A. $\text{NH}_4^+(aq) + \text{Cl}^-(aq) + \text{Ag}^+(aq) + \text{NO}_3^-(aq) \rightarrow \text{NH}_4^+(aq) + \text{Cl}^-(aq) + \text{AgNO}_3(s)$
 - B. $\text{NH}_4^+(aq) + \text{Cl}^-(aq) \rightarrow \text{NH}_4\text{Cl}(s)$
 - C. $\text{Ag}^+(aq) + \text{Cl}^-(aq) \rightarrow \text{AgCl}(s)$
 - D. $\text{Ag}^+(aq) + \text{Cl}^-(aq) + \text{NO}_3^-(aq) \rightarrow \text{AgClNO}_3(s)$
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Question #: 17

A 25.00 mL sample of a H_3PO_4 solution requires titration with 22.62 mL of 0.2000 M NaOH to reach its equivalence point. According to the following chemical equation, what is the concentration of the unknown H_3PO_4 solution?



- A. 1.490 M
 - B. 0.06032 M
 - C. 0.01981 M
 - D. 1.023 M
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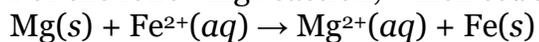
Question #: 18

In Na_2SO_3 the oxidation numbers are 1 for Na, 2 for S, and 3 for O. You must include a number **and** a sign (+ or -) for each answer.

- 1. _____
 - 2. _____
 - 3. _____
-

Question #: 19

For the following reaction, which substance is reduced?



- A. $\text{Mg}(s)$
 - B. $\text{Fe}^{2+}(aq)$
 - C. $\text{Mg}^{2+}(aq)$
 - D. $\text{Fe}(s)$
-

Question #: 20

A pressure of 630 torr:

- A. is greater than one atmosphere.
 - B. cannot be measured with a manometer.
 - C. is due to a noble gas.
 - D. is typically found at altitudes above sea level.
-

Question #: 21

When the amount of an ideal gas in a sample increases at constant temperature and pressure, the sample volume _____proportion to the number of moles of the gas.

- A. increases in direct
 - B. increases in inverse
 - C. decreases in direct
 - D. decrease in inverse
-

Question #: 22

What is the volume of 1.50 moles of an ideal gas at 100. °C and 740. torr?
Report your answer with **three** significant figures. Do **NOT** include units in your answer.
 1 liters

1. _____

Question #: 23

A sample of an ideal gas has a volume of 650. mL at a pressure of 1.85 atm and a temperature of 37.0 °C. What will the new volume of the gas be if the pressure is reduced to 1.50 atm and the temperature is increased to 50.0 °C?
Report your answer to **three** significant figures. Do **NOT** include units in your answer. Use the format 2.22E2 or 2.22E-2 for answers in scientific notation.
 1 mL

1. _____

Question #: 24

Which of the following gases has the greatest volume at STP?

- A. 66.0 grams of O₂
 - B. 1.50 moles of CO₂
 - C. 10.0 grams of He
 - D. 2.0 moles of Cl₂
-

Question #: 25

A 3.50 liter vessel contains 6.05 grams of a gas at 1.50 atm and 300. K. What is the molar mass of the gas?
Report your answer with **three** significant digits. Do **NOT** include units in your answer.
 1 grams/mole

1. _____

Question #: 26

A mixture of four noble gases in a 1.00 L container at 300 K exhibits a total pressure of 760 torr with three of the gases contributing a combined pressure of 600 torr. The amount of the fourth gas in the container was measured to be 0.717 grams. What is the fourth gas?

- A. Xe
 - B. Ne
 - C. Ar
 - D. Kr
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Question #: 27

According to the kinetic molecular theory of gases, which one of the following statements is **incorrect**?

- A. Gas molecules have mass, but negligible volume.
 - B. Collisions among molecules result in a decrease in the average kinetic energy of the gas.
 - C. Gas molecules are in constant motion.
 - D. A gas is composed of molecules that are separated from each other by distances far greater than their own dimensions.
-

Question #: 28

According to the kinetic molecular theory of gases, the average kinetic energy of a gas particle is:

- A. unrelated to the temperature.
 - B. decreases as the temperature increases.
 - C. proportional to the temperature in kelvins.
 - D. unrelated to the identity of the gas particle.
-

Question #: 29

Which two of the following conditions result in non-ideal behavior of gases?

- A. high temperature
 - B. low temperature
 - C. low pressure
 - D. high pressure
-

Question #: 30

Choose the **two** phrases that correctly complete the sentence. The van der Waals equation for nonideal gases:

- A. takes into account the effects of intermolecular forces between gas particles.
- B. is only applicable to monatomic gases.
- C. corrects for the volume occupied by the gas particles.
- D. cannot be applied to monatomic gases.

DRAFT
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CHE 105 Exam 2 Spring 2017 - Confidential

Your Name: _____

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Periodic Table of the Elements

1	2											13	14	15	16	17	18			
1	IA											IIIA	IVA	VVA	VI A	VII A	VIIIA			
1	H											B	C	N	O	F	Ne			
2	3	4											5	6	7	8	9	10		
2	Li	Be											10.81	12.01	14.01	16.00	19.00	20.18		
3	11	12											13	14	15	16	17	18		
3	Na	Mg	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
3	22.99	24.31	II B	IV B	VB	VI B	VII B	VIII B	VIII B	VIII B	IB	II B	28.98	28.09	30.97	32.07	35.45	39.95		
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr		
4	39.10	40.08	44.96	47.87	50.94	52.00	54.94	55.85	58.93	58.69	63.55	65.41	69.72	72.64	74.92	78.96	79.90	83.80		
5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54		
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe		
5	85.47	87.62	88.91	91.22	92.91	95.94	98	101.1	102.9	106.4	107.9	112.4	114.8	118.7	121.8	127.6	126.9	131.3		
6	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72		
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn		
6	132.9	137.3	175.0	178.5	180.9	183.8	186.2	190.2	192.2	195.1	197.0	200.6	204.4	207.2	209.0	209	210	222		
7	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104		
7	Fr	Ra	Lr	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	Fl	Uup	Lv	Uus	Uuo		
7	223	226	261	262	265	268	271	274	277	280	283	286	289	292	295	298	299	294		
			57	58	59	60	61	62	63	64	65	66	67	68	69	70				
			lanthanides (rare earths)	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb			
				138.9	140.1	140.9	144.2	145	150.4	152.0	157.3	158.9	162.5	164.9	167.3	168.9	173.0			
			actinides	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No			
				227	232.0	231.0	238.0	237	239	243	247	247	251	252	257	258	259			

Molar volume of ideal gas at STP = 22.4 L	Ideal gas constant: $R = 8.314 \text{ J}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$	Speed of light, $c = 3.00 \times 10^8 \text{ m}\cdot\text{s}^{-1}$
Faraday constant, $F = 9.6485 \times 10^4 \text{ C}\cdot\text{mol}^{-1}$	$R = 1.987 \text{ cal}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$	Rydberg constant, $R_H = 2.18 \times 10^{-18} \text{ J}$
Avogadro's number, $N = 6.022 \times 10^{23} \text{ mol}^{-1}$	$R = 8.206 \times 10^{-2} \text{ L}\cdot\text{atm}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$	Electron charge, $e = 1.602 \times 10^{-19} \text{ C}$
Planck's constant, $h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$		Atomic mass unit, $u = 1.6605 \times 10^{-24} \text{ g}$

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Question #: 1

What is the chemical formula of chromium(III) bromide?

- A. CrBr
- B. CrBr₂
- C. Cr₂Br
- D. Cr₃Br
- ✓ E. CrBr₃
- F. Cr₂Br₃

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Report your answer to **two** significant figures. Do **NOT** include units in your answer.

1 grams

1. 16

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 - B. $C_5H_5O_5N_5$
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 - E. $C_3H_2O_3N_2$
-

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When iron rusts, solid iron (Fe) reacts with gaseous molecular oxygen (O₂) to form solid iron(III) oxide. In the balanced chemical equation for this reaction with the smallest integer coefficients for the reactants and products, what is the coefficient for oxygen?

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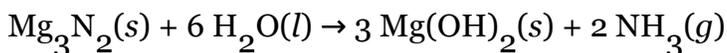
1

1. 3

Question #: 7

When 2.00 moles of H₂O react in the following chemical reaction, how many grams of NH₃ are produced?

Report your answer to three significant figures. Do NOT include units in your answer.

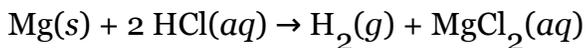


1 grams

1. 11.4|11.3|11.5|

Question #: 8

If 10.0 grams of magnesium are added to a solution containing 1.00 mole of hydrochloric acid, how many grams of hydrogen gas are produced?



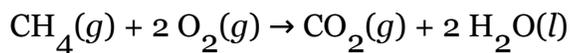
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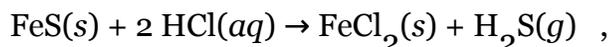


1. O2|oxygen|O|

2. 0.535|.535|

Question #: 10

For the reaction,



what is the percent yield if 0.223 moles of FeS reacts with an excess of HCl to produce 7.00 grams of H₂S?

A. 77.3 %

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1 molar

1. 5.18

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Question #: 14

Which one of the following ionic compounds is insoluble in water?

- A. NH_4OH
 - B. KOH
 - ✓ C. Ag_2SO_4
 - D. $\text{Pb}(\text{NO}_3)_2$
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Which one of the following equations best represents the reaction that occurs when KCl and $\text{Pb}(\text{NO}_3)_2$ solutions are mixed?

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 - B. $\text{K}^+(aq) + \text{NO}_3^-(aq) \rightarrow \text{KNO}_3(aq)$
 - ✓ C. $2 \text{KCl}(aq) + \text{Pb}(\text{NO}_3)_2(aq) \rightarrow \text{PbCl}_2(s) + 2 \text{KNO}_3(aq)$
 - D. $\text{KCl}(aq) + 2 \text{Pb}(\text{NO}_3)_2(aq) \rightarrow \text{KNO}_3(s) + 2 \text{PbCl}_2(aq)$
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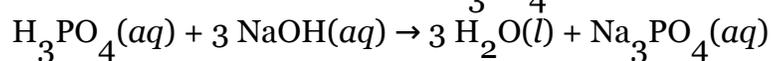
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What is the net ionic equation for the reaction of ammonium chloride with silver nitrate?

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B. $\text{NH}_4^+(aq) + \text{Cl}^-(aq) \rightarrow \text{NH}_4\text{Cl}(s)$
✓C. $\text{Ag}^+(aq) + \text{Cl}^-(aq) \rightarrow \text{AgCl}(s)$
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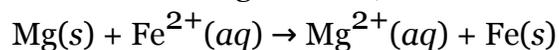
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In Na_2SO_3 the oxidation numbers are 1 for Na, 2 for S, and 3 for O.
You must include a number **and** a sign (+ or -) for each answer.

1. +1|1+
2. +4|4+
3. -2|-2
-

Question #: 19

For the following reaction, which substance is reduced?



- A. $\text{Mg}(s)$
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Question #: 22

What is the volume of 1.50 moles of an ideal gas at 100. °C and 740. torr?

Report your answer with **three** significant figures. Do **NOT** include units in your answer.

 1 liters

1. 47.2

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A sample of an ideal gas has a volume of 650. mL at a pressure of 1.85 atm and a temperature of 37.0 °C. What will the new volume of the gas be if the pressure is reduced to 1.50 atm and the temperature is increased to 50.0 °C?

Report your answer to **three** significant figures. Do **NOT** include units in your answer. Use the format 2.22E2 or 2.22E-2 for answers in scientific notation.

 1 mL

1. 835|8.35E2|

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Which of the following gases has the greatest volume at STP?

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1. 28.4|28.3|28.5|

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- D. cannot be applied to monatomic gases.