

**DRAFT**  
Do Not Use Until Posted.

## CHE 105 Spring 2017 Exam 1 - Confidential

Your Name: \_\_\_\_\_

Your ID: \_\_\_\_\_

**Periodic Table of the Elements**

atomic # --> 29 atomic symbol --> Cu atomic weight (IUPAC 2009)															
63.55															

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

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### Question #: 1

Which state of matter is compressible and allows for molecules to flow past one another?

- A. solid
- B. liquid
- ✓C. gas

### Question #: 2

Which of the following is a compound?

- ✓A. water
- B. oxygen

- C. helium
  - D. air
- 

**Question #: 3**

Which two of the following mixtures are homogeneous?

- A. chocolate chip ice cream shake
  - ✓B. soft drink
  - ✓C. dilute saltwater
  - D. Mississippi River
  - E. noodle soup
- 

**Question #: 4**

Which one is a chemical property?

- A. melting point
  - B. color
  - ✓C. toxicity
  - D. density
- 

**Question #: 5**

How many centimeters are in 15 kilometers?

- A. 15,000 cm
  - B. 150,000 cm
  - ✓C. 1,500,000 cm
  - D. 15,000,000 cm
- 

**Question #: 6**

In scientific notation, 0.00614 is 1 .

Report your answer in scientific notation with the format 2.22E2 or 2.22E-2.

1. 6.14E-3

---

**Question #: 7**

What is the answer to the following calculation?

$$4.5 \times 10^6 - 6.7 \times 10^5 = \underline{\quad 1 \quad} ?$$

Report your answer with **two** significant figures. Report your answer in scientific notation with the format 2.2E2 or 2.2E-2.

1. 3.8 E6|3.8E6|

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**Question #: 8**

A 10.00 kg iron bar has dimensions of 200.00 cm x 6.350 cm x 1.000 cm. What is the density of iron?

- A. 3.825 g/cm<sup>3</sup>
  - B. 5.887 g/cm<sup>3</sup>
  - ✓C. 7.874 g/cm<sup>3</sup>
  - D. 12.99 g/cm<sup>3</sup>
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**Question #: 9**

Which **two** of the following are intensive properties?

- A. length
  - ✓B. density
  - C. volume
  - ✓D. color
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**Question #: 10**

How many significant figures are shown in 1070.030 ?

- A. 4
  - B. 5
  - C. 6
  - ✓D. 7
- 

**Question #: 11**

Complete the following calculation. Pay particular attention to significant figures and rounding rules.

$$\frac{(4.623 + 3.42)}{2.40} + (6.092 \times 1.25)$$

1

Report your answer to the **correct** number of significant figures. Only answers with the **correct** number of significant figures will be counted correct.

1. 10.97
- 

**Question #: 12**

If a runner has a pace of 7.5 miles per hour, how long will it take her to run a 10.0 km race?

- A. 44 minutes
  - B. 47 minutes
  - ✓C. 50. minutes
  - D. 54 minutes
- 

**Question #: 13**

How many mL of water are in a full container that measures 3.5 in<sup>3</sup>?

- A. 3.5 mL
- ✓B. 57 mL
- C. 1.4 mL
- D. 43 mL

---

Question #: 14

Which statement from Dalton's Atomic Theory is now known to be incorrect?

- A. Elements are composed of extremely small particles called atoms.
- ✓B. All atoms of a given element are identical.
- C. Compounds are composed of atoms of more than one element.
- D. Chemical reactions only involve the rearrangement of atoms.

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Question #: 15

Millikan was able to calculate the mass of an electron after he discovered (measured) the ...

- A. charge to mass ratio of an electron.
- ✓B. charge of an electron.
- C. mass of the hydrogen atom.
- D. charge of a neutron.
- E. mass of a proton.

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Question #: 16

Which one could Rutherford not conclude by scattering alpha particles from a gold foil?

- A. The atom contains a tiny, dense center.
- B. The atomic nucleus contains most of the mass of the atom.
- ✓C. The atomic nucleus contains neutrons and protons.
- D. The atomic nucleus is positively charged.

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Question #: 17

Isotopes of an element have the same number of 1, but different numbers of 2.

1. protons

2. neutrons

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**Question #: 18**

The nucleus of a  $^{136}\text{Xe}$  atom contains   1   protons and   2   neutrons.

1. 54|fifty-four|fifty four
  2. 82|eighty-two|eighty two
- 

**Question #: 19**

The ion of an element with 48 protons in its nucleus has 45 electrons when dissolved in water. What will be the charge on the ion?

  1  

Include both a charge (+ or -) and a number in your answer.

1. +3|3+
- 

**Question #: 20**

Which element is classified as a metalloid?

- A. Te
  - B. S
  - C. Zn
  - D. Rn
- 

**Question #: 21**

What is the charge on the most common ion formed from potassium?

- A. +3
- B. +2
- C. +1
- D. -1

E. -2

F. -3

---

**Question #: 22**

An actinide element has three naturally occurring isotopes with masses of 243.99 amu, 244.99 amu, and 245.98 amu and natural abundances of 78.99%, 10.00%, and 11.01%, respectively. What is the atomic mass of this element?

A. 245.81 amu

B. 244.93 amu

C. 244.68 amu

✓D. 244.31 amu

---

**Question #: 23**

Chlorine exists as two naturally occurring isotopes,  $^{35}\text{Cl}$  (34.96 amu) and  $^{37}\text{Cl}$  (36.96 amu). What is the natural abundance of  $^{35}\text{Cl}$ ?

✓A. 75.5 %

B. 26.2 %

C. 35.8 %

D. 73.8 %

E. 50.0 %

---

**Question #: 24**

In which of the following examples does each species have the same number of neutrons?

A.  $^{16}\text{O}$ ,  $^{17}\text{O}$ ,  $^{18}\text{O}$

✓B.  $^{27}\text{Na}$ ,  $^{30}\text{Si}$ ,  $^{32}\text{S}$

C.  $^{36}\text{Ar}$ ,  $^{36}\text{Ca}$ ,  $^{36}\text{S}$

D.  $^{12}\text{C}$ ,  $^{14}\text{N}$ ,  $^{16}\text{O}$

---

**Question #: 25**

How many moles are in  $2.278 \times 10^{25}$  atoms of boron? 1

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

1. 37.83

---

**Question #:** 26

How many atoms are in 228.0 grams of lead (Pb)?

- A.  $2.641 \times 10^{22}$  atoms
  - B.  $2.280 \times 10^{23}$  atoms
  - C.  $6.022 \times 10^{23}$  atoms
  - ✓D.  $6.627 \times 10^{23}$  atoms
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**Question #:** 27

In general, what type of bond occurs between elements from opposite sides of the periodic table?

- ✓A. ionic
  - B. covalent
  - C. elemental
  - D. metallic
- 

**Question #:** 28

Which pair has compounds with the same empirical formula?

- A.  $C_2H_4$  and  $C_4H_4$
  - B.  $CO$  and  $CO_2$
  - ✓C.  $C_3H_6$  and  $C_9H_{18}$
  - D.  $C_4H_6$  and  $C_4H_{10}$
- 

**Question #:** 29

Nitrogen naturally exists in the following form. This is an example of ...





Nitrogen  
(N<sub>2</sub>)

- A. an atomic element.
- ✓B. a molecular element.
- C. a molecular compound.
- D. an ionic compound.

---

Question #: 30

Which one of the following contains a polyatomic ion ?

- A. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>
- B. NH<sub>3</sub>
- ✓C. NaHCO<sub>3</sub>
- D. AlCl<sub>3</sub>

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1	2											13	14	15	16	17	18			
1	IA											IIIA	IVA	VVA	VIA	VIIA	VIIIA			
1	H											B	C	N	O	F	Ne			
1	1.008											10.81	12.01	14.01	16.00	19.00	20.18			
2	Li	Be																		
2	6.941	9.012																		
3	Na	Mg	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
3	IIA	IIIB	IVB	VB	VIB	VII B	VIII B	VIII B	VIII B	IB	II B	IIIA	IVA	VVA	VIA	VIIA	VIIIA			
3	22.99	24.31											26.98	28.09	30.97	32.07	35.45	39.95		
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	50.04	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	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	Cs	Ba	Lu	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	Fr	Ra	Lr	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	Fl	Uup	Lv	Uus	Uuo		
7	223	226	262	261	262	265	264	277	288	291	272	285	284	289	288	292	293	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			

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