Take-Home Quiz
Topic 1: Atomic Structure and Significant Figures

Objective:

This is to assess your comprehension of the material we have covered so far and to help prepare you for the exam.

Instructions and Notes:

- Most of the quiz problems are from or adapted from "Exercises" at the end of the chapters in the Chemistry: Atoms First 2e Online Textbook (OpenStax)
- You must *CLEARLY LABEL* all problems and *SHOW ALL WORK* neatly and legibly to receive credit. If the problems do not require calculations/work then you must explain how you got the answer. (can be a few words up to a few sentences or even a few arrows)
- If the problem requires calculations, the answers should be highlighted or boxed.
- Book sections covered: 2.1, 2.2, 2.3, 3.6, 1.5

Submission:

The quiz is usually due ~1 week after we start this section (see our due date schedule). Summer session is due sooner. This should be scanned as a single PDF and submitted online through Canvas. The file cannot be larger than 20 Mb (20,000 kB).

Helpful Tips:

- Start as soon as we're done with the lecture.
- Refer to the lecture and/or videos (if available).
- Use the corresponding chapter in the book to help you through difficult problems/concepts.
- There are answers and solutions available to the odd numbered problems (book number not quiz number) on the OpenStax website under "Student Resources". It is not advised to rely on the solutions because you will not have access to the solutions during the exam. Only use the solutions as a last resort. Struggling is good and that is when you are learning the most!
- Work together with your classmates
- Go to tutoring in the ASTC or MESA, ask your classmates in our Discord room, watch YouTube Videos, come to office hours, etc.
- To ensure your mastery of the material, do the quiz multiple times.

2.2 Evolution of Atomic Theory

1) (From Chapter 2.2 #6) How are electrons and protons similar? How are they different?

2) (From Chapter 2.2 #7) How are protons and neutrons similar? How are they different?

2.3 Atomic Structure and Symbolism

3) (From Chapter 2.3 #10) In what way are isotopes of a given element always different? In what way(s) are they always the same?

4) (From Chapter 2.3 #14) Open the Build an Atom simulation (http://openstax.org/l/16PhetAtomBld)

Drag protons, neutrons, and electrons onto the atom template to make a neutral atom of Oxygen-16 and give the isotope symbol for this atom.

5) (From Chapter 2.3 #15) Open the Build an Atom simulation (http://openstax.org/l/16PhetAtomBld)

Drag protons, neutrons, and electrons onto the atom template to make a neutral atom of Lithium-6 and give the isotope symbol for this atom.

(From Chapter 2.3 #18) Give the number of protons, electrons, and neutrons in neutral atoms of each of the following isotopes:

6) $^{10}_{5}\text{B}$ 7) $^{199}_{80}\text{Hg}$ 8) $^{63}_{29}\text{Cu}$ 9) $^{13}_{6}\text{C}$ 10) $^{77}_{34}\text{Se}$

(From Chapter 2.3 #19) Give the number of protons, electrons, and neutrons in neutral atoms of each of the following isotopes:

11) $^{7}_{3}\text{Li}$ 12) $^{125}_{52}\text{Te}$ 13) $^{109}_{47}\text{Ag}$ 14) $^{15}_{7}\text{N}$ 15) $^{31}_{15}\text{P}$

1.5 Measurement Uncertainty, Accuracy, and Precision

(From Chapter 1.5 #44) Examine the following numbers and state correct number of significant figures:

16) 711.0 17) 0.239 18) 90743 19) 134.2

20) 0.05499 21) 10000.0 22) 0.000000738592

(From Chapter 1.5 #48) How many significant figures are contained in each of the following measurements?

23) 38.7 g 24) 2 m 25) 3,486,002 kg 26) 9.74150 J

27) 0.0613 cm^3 28) 17.0 kg 29) 0.01400 g/mL

(From Chapter 1.5 #49) How many significant figures are contained in each of the following measurements?

30) 53 cm 31) 2.05 m 32) 86,002 J 33) 9.740 m/s

34) 10.0613 m^3 35) 0.17 g/mL 36) 0.88400 s

(From Chapter 1.5 #50) The following quantities were reported on the labels of commercial products. Determine the number of significant figures in each.

37) 0.0055 g active ingredients 38) 12 tablets

39) 3% hydrogen peroxide 40) 5.5 ounces

41) 473 mL 42) 1.75% bismuth

43) 0.001% phosphoric acid 44) 99.80% inert ingredients

(From Chapter 1.5 #51) Round off each of the following numbers to two significant figures:

45) 0.436 46) 9.000 47) 27.2

48) 135 49) 0.445

(From Chapter 1.5 #52) Round off each of the following numbers to two significant figures:

50) 517 51) 86.3 52) 6.382

53) 5.0008 54) 22.497 55) 0.885

2.3 Atomic Structure and Symbolism

56) (From Chapter 2.3 #22) An element has the following natural abundances and isotopic masses: 90.92% abundance with 19.99 amu, 0.26% abundance with 20.99 amu, and 8.82% abundance with 21.99 amu. Calculate the average atomic mass of this element.

57) (From Chapter 2.3 #23) Average atomic masses listed by IUPAC are based on a study of experimental results. Bromine has two isotopes, ^{79}Br and ^{81}Br, whose masses (78.9183 and 80.9163 amu, respectively) and abundances (50.69% and 49.31%, respectively) were determined in earlier experiments. Calculate the average atomic mass of bromine based on these experiments.

1.5 Measurement Uncertainty, Accuracy, and Precision

(From Chapter 1.5 #53) Perform the following calculations and report each answer with the correct number of significant figures.

58) 628×342

59) $(5.63) \times (7.4)$

60) $\frac{28.0}{13.483}$

61) 8119×0.000023

62) $14.98 + 27{,}340 + 84.7593$

63) $42.7 + 0.259$

(From Chapter 1.5 #54) Perform the following calculations and report each answer with the correct number of significant figures.

64) 62.8×34

65) $0.147 + 0.0066 + 0.012$

66) $38 \times 95 \times 1.792$

67) $15 - 0.15 - 0.6155$

68) $8.78 \times \left(\frac{0.0500}{0.478}\right)$

69) $140 + 7.68 + 0.014$

70) $28.7 - 0.0483$

71) $\frac{(88.5-87.57)}{45.13}$

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Extra Questions Not In Book:

How many significant figures in the following numbers?

72) 101

73) 1010

74) 10101

75) 101010

75) 101010.

76) 101010.0

77) 101010.00

78) Calculate the average atomic mass of neon using the information below. (See chapter 2.3: Isotopes)

Element	Symbol	Atomic Number	Number of Protons	Number of Neutrons	Mass (amu)	% Natural Abundance
neon	$^{20}_{10}Ne$	10	10	10	19.9924	90.48
	$^{21}_{10}Ne$	10	10	11	20.9938	0.27
	$^{22}_{10}Ne$	10	10	12	21.9914	9.25