

TEST 1, VERSION A

CHEM 1110.24492

Spring 2016, Dr. Potts

Put your **NAME**, **TEST VERSION**, and **ALL YOUR ANSWERS** on the **SCANTRON** and submit the scantron for grading.

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<table border="1"> <tr> <td>57</td> <td>58</td> <td>59</td> <td>60</td> <td>61</td> <td>62</td> <td>63</td> <td>64</td> <td>65</td> <td>66</td> <td>67</td> <td>68</td> <td>69</td> <td>70</td> </tr> <tr> <td>La</td> <td>Ce</td> <td>Pr</td> <td>Nd</td> <td>Pm</td> <td>Sm</td> <td>Eu</td> <td>Gd</td> <td>Tb</td> <td>Dy</td> <td>Ho</td> <td>Er</td> <td>Tm</td> <td>Yb</td> </tr> <tr> <td>138.9</td> <td>140.1</td> <td>140.9</td> <td>144.2</td> <td>[145]</td> <td>150.4</td> <td>152</td> <td>157.3</td> <td>158.9</td> <td>162.5</td> <td>164.93</td> <td>167.3</td> <td>168.9</td> <td>173</td> </tr> <tr> <td>89</td> <td>90</td> <td>91</td> <td>92</td> <td>93</td> <td>94</td> <td>95</td> <td>96</td> <td>97</td> <td>98</td> <td>99</td> <td>100</td> <td>101</td> <td>102</td> </tr> <tr> <td>Ac</td> <td>Th</td> <td>Pa</td> <td>U</td> <td>Np</td> <td>Pu</td> <td>Am</td> <td>Cm</td> <td>Bk</td> <td>Cf</td> <td>Es</td> <td>Fm</td> <td>Md</td> <td>No</td> </tr> <tr> <td>[227]</td> <td>232</td> <td>[231]</td> <td>238</td> <td>[237]</td> <td>[244]</td> <td>[243]</td> <td>[247]</td> <td>[247]</td> <td>[251]</td> <td>[252]</td> <td>[257]</td> <td>[258]</td> <td>[259]</td> </tr> </table>																			57	58	59	60	61	62	63	64	65	66	67	68	69	70	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	157.3	158.9	162.5	164.93	167.3	168.9	173	89	90	91	92	93	94	95	96	97	98	99	100	101	102	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	[227]	232	[231]	238	[237]	[244]	[243]	[247]	[247]	[251]	[252]	[257]	[258]	[259]
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Part I (64pts). 16 multiple-choice questions worth 4 points each. Choose the ***best*** answer from the options given, and ***record your final answer on your scantron.***

- How many significant figures are in 0.006570?
A. 7
B. 3
C. 4
D. 5
E. 6
- Liquid nitrogen boils at -195.8°C . Express the boiling point of liquid nitrogen in kelvin.
A. -469.0 K
B. -77.4 K
C. 469.0 K
D. 77.4 K
E. all temperatures are 0 K on the Kelvin scale
- An automobile engine has a piston displacement of $1,600\text{ cm}^3$. Express this volume in cubic inches. (1 in = 2.54 cm)
A. $2.6 \times 10^6\text{ in}^3$
B. 4100 in^3
C. 98 in^3
D. 630 in^3
E. None of these
- Who is credited with discovering the atomic nucleus?
A. Millikan
B. Dalton
C. Gay-Lussac
D. Thomson
E. Rutherford
- Which of these elements is chemically similar to oxygen?
A. sulfur, S
B. nickel, Ni
C. potassium, K
D. calcium, Ca
E. iron, Fe
- The elements in Group 2A are known by what name?
A. halogens
B. alkaline earth metals
C. noble gases
D. alkali metals
E. transition metals
- Which of these elements is most likely to be a good conductor of electricity?
A. N
B. Fe
C. He
D. Cl
E. S
- Which isotope is *not* possible?
A. ${}^1_1\text{H}$
B. ${}^2_1\text{H}$
C. ${}^{52}_{24}\text{Cr}$
D. ${}^{25}_{54}\text{Mn}$
E. All of these isotopes are possible.
- How many micrograms are in 65.3 kg?
A. $0.653\text{ }\mu\text{g}$
B. $6.53 \times 10^{10}\text{ }\mu\text{g}$
C. $6.53 \times 10^4\text{ }\mu\text{g}$
D. $6.53 \times 10^7\text{ }\mu\text{g}$
E. $6.53 \times 10^{-8}\text{ }\mu\text{g}$

10. Complete the following chart, in order from left to right

Isotope	Mass Number	Protons	Neutrons
	4	2	

- A. ${}^4\text{He}$, 4
B. ${}^2\text{H}$, 2
C. ${}^4\text{He}$, 2
D. ${}^4\text{Be}$, 4
E. ${}^4\text{Be}$, 2
11. Bromine is a red liquid at 25°C . Its density is 3.12 g/cm^3 . What is the volume of 28.1 g of liquid bromine?
A. 87.7 cm^3
B. 0.111 cm^3
C. 9.01 cm^3
D. 28.1 cm^3
E. None of these
12. Which of the following does *not* represent a *chemical* change?
A. a freshly cut apple turns brown
B. fermentation of sugar to alcohol
C. milk turns sour on standing at room temperature
D. when cooled to 0°C , liquid water becomes ice
E. frying an egg
13. What is defined as a tentative explanation for observations that are made that result in the formulation of this concept?
A. Theory
B. Law
C. Hypothesis
D. Prediction
E. Phenomena
14. Five vials each contain 12 grams of a solid metal sample. The samples include calcium, platinum, barium, gold, and silver. Which vial has the fewest moles of metal atoms?
A. barium, Ba
B. calcium, Ca
C. platinum, Pt
D. silver, Ag
E. gold, Au
15. The shape of an atomic orbital is associated with
A. the magnetic and spin quantum numbers, together.
B. the angular momentum quantum number (l).
C. the principal quantum number (n).
D. the magnetic quantum number (m_l).
E. the spin quantum number (m_s).
16. Atoms X, Y, Z, and R have the following nuclear compositions:



- Which two are isotopes?
A. Z & R
B. X & Y
C. Y & R
D. X & Z
E. X & R

Part 2 (40 pts). Calculations: Clearly show all work on the blank space on the scantron answer sheet for full credit.

1. (10 pts) Determine the mass of magnesium (in grams) that contains 5.08×10^{15} magnesium atoms.
2. (10 pts) A radio wave has a frequency of $8.6 \times 10^8 \text{ s}^{-1}$. What is the energy of **one photon** of this radiation in J ($h = 6.63 \times 10^{-34} \text{ J} \cdot \text{s}$)?
3. (10 pts) Diamond is composed of carbon atoms. Jewelers commonly use the carat as to weigh diamonds. One carat is exactly 200.0 mg, 1.00 carat diamond = 200.0 mg C. How many carbon atoms are present in a 2.5 carat diamond? (Molar mass of carbon = 12.011 g/mol)
4. (10 pts) We know that atoms are composed of protons, neutrons or electrons. Select **one** of these types of subatomic particles and in **4 – 6 grammatically correct sentences**, explain how the subatomic particle that you selected was discovered. (pick-one and discuss; don't discuss all three).

PUT ALL ANSWERS AND SHOW ALL WORK FOR PART 2 ON THE BLANK SPACE ON THE SCANTRON.