

**Test Form 5**

Instructions: You should have with you several number two pencils, an eraser, your 3" x 5" note card, a calculator, and your University ID Card. If you have notes with you, place them in a sealed backpack and place the backpack OUT OF SIGHT or place the notes directly on the table at the front of the room.

Fill in the front page of the Scantron answer sheet with your test form number (listed above), last name, first name, middle initial, and student identification number. **Leave the class section number and the test form number blank.**

This exam consists of 25 multiple-choice questions. Each question has four points associated with it. Select the best multiple-choice answer by filling in the corresponding circle on the rear page of the answer sheet. If you have any questions before the exam, please ask. If you have any questions during the exam, please ask the proctor. Open and start this exam when instructed. When finished, place your Scantron form and note card in the appropriate stacks. You may keep the exam packet, so please show your work and mark the answers you selected on it.

1 inch = 2.54 cm (exact)  
1 kg = 2.2 pounds

1 foot = 12 inches (exact)  
1 mole =  $6.02 \times 10^{23}$

|                                 |                                 |                                 |                                     |                                  |                                  |                                   |                                 |                                  |                                |                               |                               |                                |                                |                                 |                                 |                               |                              |
|---------------------------------|---------------------------------|---------------------------------|-------------------------------------|----------------------------------|----------------------------------|-----------------------------------|---------------------------------|----------------------------------|--------------------------------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|---------------------------------|---------------------------------|-------------------------------|------------------------------|
| 1<br>H<br>Hydrogen<br>1.0079    |                                 |                                 |                                     |                                  |                                  |                                   |                                 |                                  |                                |                               |                               |                                |                                |                                 |                                 |                               | 2<br>He<br>Helium<br>4.0026  |
| 3<br>Li<br>Lithium<br>6.941     | 4<br>Be<br>Beryllium<br>9.01218 |                                 |                                     |                                  |                                  |                                   |                                 |                                  |                                |                               |                               |                                |                                |                                 |                                 |                               |                              |
| 11<br>Na<br>Sodium<br>22.98977  | 12<br>Mg<br>Magnesium<br>24.305 |                                 |                                     |                                  |                                  |                                   |                                 |                                  |                                |                               |                               |                                |                                |                                 |                                 |                               |                              |
| 19<br>K<br>Potassium<br>39.0983 | 20<br>Ca<br>Calcium<br>40.08    | 21<br>Sc<br>Scandium<br>44.9559 | 22<br>Ti<br>Titanium<br>47.88       | 23<br>V<br>Vanadium<br>50.9415   | 24<br>Cr<br>Chromium<br>51.996   | 25<br>Mn<br>Manganese<br>54.9380  | 26<br>Fe<br>Iron<br>55.847      | 27<br>Co<br>Cobalt<br>58.9332    | 28<br>Ni<br>Nickel<br>58.70    | 29<br>Cu<br>Copper<br>63.546  | 30<br>Zn<br>Zinc<br>65.38     | 31<br>Ga<br>Gallium<br>69.72   | 32<br>Ge<br>Germanium<br>72.59 | 33<br>As<br>Arsenic<br>74.9216  | 34<br>Se<br>Selenium<br>78.96   | 35<br>Br<br>Bromine<br>79.904 | 36<br>Kr<br>Krypton<br>83.80 |
| 37<br>Rb<br>Rubidium<br>85.4678 | 38<br>Sr<br>Strontium<br>87.62  | 39<br>Y<br>Yttrium<br>88.9059   | 40<br>Zr<br>Zirconium<br>91.22      | 41<br>Nb<br>Niobium<br>92.9064   | 42<br>Mo<br>Molybdenum<br>95.94  | 43<br>Tc<br>Technetium<br>98.906  | 44<br>Ru<br>Ruthenium<br>101.07 | 45<br>Rh<br>Rhodium<br>102.9055  | 46<br>Pd<br>Palladium<br>106.4 | 47<br>Ag<br>Silver<br>107.868 | 48<br>Cd<br>Cadmium<br>112.41 | 49<br>In<br>Indium<br>114.82   | 50<br>Sn<br>Tin<br>118.69      | 51<br>Sb<br>Antimony<br>121.75  | 52<br>Te<br>Tellurium<br>127.60 | 53<br>I<br>Iodine<br>126.9045 | 54<br>Xe<br>Xenon<br>131.30  |
| 55<br>Cs<br>Cesium<br>132.9054  | 56<br>Ba<br>Barium<br>137.33    | 57-71<br>*Rare earths           | 72<br>Hf<br>Hafnium<br>178.49       | 73<br>Ta<br>Tantalum<br>180.9479 | 74<br>W<br>Tungsten<br>183.85    | 75<br>Re<br>Rhenium<br>186.207    | 76<br>Os<br>Osmium<br>190.2     | 77<br>Ir<br>Iridium<br>192.22    | 78<br>Pt<br>Platinum<br>195.09 | 79<br>Au<br>Gold<br>196.9665  | 80<br>Hg<br>Mercury<br>200.59 | 81<br>Tl<br>Thallium<br>204.37 | 82<br>Pb<br>Lead<br>207.2      | 83<br>Bi<br>Bismuth<br>208.9804 | 84<br>Po<br>Polonium<br>(209)   | 85<br>At<br>Astatine<br>(210) | 86<br>Rn<br>Radon<br>(222)   |
| 87<br>Fr<br>Francium<br>(223)   | 88<br>Ra<br>Radium<br>226.0254  | 89-103<br>*Actinides            | 104<br>Rf<br>Rutherfordium<br>(261) | 105<br>Ha<br>Hahnium<br>(262)    | 106<br>Sg<br>Seaborgium<br>(263) | 107<br>Ns<br>Nilsbohrium<br>(262) | 108<br>Hs<br>Hassium<br>(265)   | 109<br>Mt<br>Meitnerium<br>(266) | 110<br>†                       | 111<br>†                      |                               |                                | 114                            |                                 |                                 |                               |                              |

centi c 1/100  
milli m 1/1000  
kilo k 1000  
micro μ 10<sup>-6</sup>  
nano n 10<sup>-9</sup>

|                                   |                                 |                                      |                                 |                                   |                                |                                |                                  |                                 |                                  |                                  |                               |                                   |                                 |                                 |
|-----------------------------------|---------------------------------|--------------------------------------|---------------------------------|-----------------------------------|--------------------------------|--------------------------------|----------------------------------|---------------------------------|----------------------------------|----------------------------------|-------------------------------|-----------------------------------|---------------------------------|---------------------------------|
| 57<br>La<br>Lanthanum<br>138.9055 | 58<br>Ce<br>Cerium<br>140.12    | 59<br>Pr<br>Praseodymium<br>140.9077 | 60<br>Nd<br>Neodymium<br>144.24 | 61<br>Pm<br>Promethium<br>145     | 62<br>Sm<br>Samarium<br>150.4  | 63<br>Eu<br>Europium           | 64<br>Gd<br>Gadolinium<br>157.25 | 65<br>Tb<br>Terbium<br>158.9254 | 66<br>Dy<br>Dysprosium<br>162.50 | 67<br>Ho<br>Holmium<br>164.9304  | 68<br>Er<br>Erbium<br>167.26  | 69<br>Tm<br>Thulium<br>168.9342   | 70<br>Yb<br>Ytterbium<br>173.04 | 71<br>Lu<br>Lutetium<br>174.967 |
| 89<br>Ac<br>Actinium<br>227.0278  | 90<br>Th<br>Thorium<br>232.0381 | 91<br>Pa<br>Protactinium<br>231.0359 | 92<br>U<br>Uranium<br>238.029   | 93<br>Np<br>Neptunium<br>237.0482 | 94<br>Pu<br>Plutonium<br>(244) | 95<br>Am<br>Americium<br>(243) | 96<br>Cm<br>Curium<br>(247)      | 97<br>Bk<br>Berkelium<br>(247)  | 98<br>Cf<br>Californium<br>(251) | 99<br>Es<br>Einsteinium<br>(254) | 100<br>Fm<br>Fermium<br>(257) | 101<br>Md<br>Mendelevium<br>(258) | 102<br>No<br>Nobelium<br>259    | 103<br>Lr<br>Lawrencium<br>262  |

1. A student measures the mass of a zinc sample to be 0.09040 g.

- (A) There are two significant figures in this measured quantity.
- (B) There are three significant figures in this measured quantity.
- (C) There are four significant figures in this measured quantity.
- (D) There are five significant figures in this measured quantity.
- (E) There are six significant figures in this measured quantity.

0.09040 g

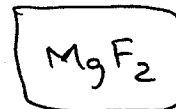
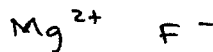
2. Consider the following operation:  $42214.37 \text{ g} + 8.114 \text{ g}$ . The correct answer with the proper number of significant figures is:

- (A)  $4.2222 \times 10^4 \text{ g}$ .
- (B) 42222. g.
- (C) 42222.5 g.
- (D) 42222.48 g.
- (E) 42222.484 g.

$$\begin{array}{r|l} 42214.37 & 9 \\ 8.114 & 4 \\ \hline 42222.48 & 4 \end{array}$$

3. Which of the following chemical formulae is incorrect?

- (A) MgF.
- (B)  $\text{CaSO}_4$ .
- (C)  $\text{NaOH}$ .
- (D)  $\text{BaCO}_3$ .
- (E)  $\text{Li}_2\text{O}$ .



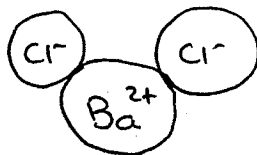
4. Which of the following contains a statement that is false?

- (A) Calcium fluoride is an ionic compound and carbon dioxide is a molecule.
- (B) Lithium is an element and dinitrogen tetroxide is a molecule.
- (C)  $\text{NH}_3$  is a molecule and  $\text{C}_8\text{H}_{18}$  is a molecule.
- (D) Orange juice with pulp is heterogeneous and brass is an alloy.
- (E) Carbon tetrachloride is an ionic compound and fluorine is a non-metal.

$\text{CCl}_4$  is molecular (non-metals)

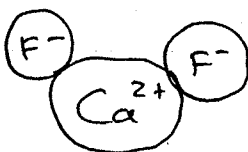
5. Which of the following chemical formulae is **incorrect**?

- (A) NaBr. ✓
- (B) Ba<sub>2</sub>Cl.
- (C) NH<sub>4</sub>F. ✓
- (D) CaS. ✓
- (E) AlCl<sub>3</sub>. ✓



6. When combined with calcium, a Group 17 element will tend to:  
[F, Cl, Br, I, and At are Group 17 elements]

- (A) Gain one electron.
- (B) Gain two electrons.
- (C) Lose one electron.
- (D) Lose two electrons.



Group 17 Gain 1 e<sup>-</sup>

F

Cl

Br

I

At

7. Which of the following pairs of elements will form an ionic compound?

- (A) Sodium and calcium.
- (B) Carbon and oxygen.
- (C) Carbon and nitrogen.
- (D) Fluorine and neon.
- (E) Calcium and sulfur.

metal + non-metal



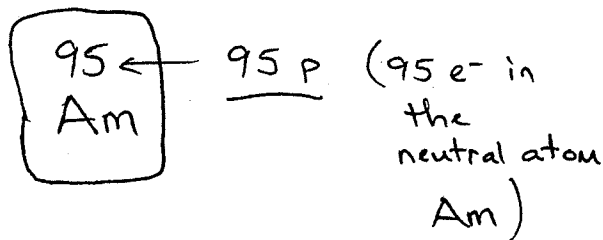
8. Which of the following pairs are isotopes?

- (A) <sup>12</sup>C and <sup>12</sup>C.
- (B) <sup>14</sup>C and <sup>14</sup>N.
- (C) <sup>12</sup>C and <sup>14</sup>N.
- (D) <sup>14</sup>N and <sup>15</sup>N.
- (E) <sup>14</sup>C and <sup>28</sup>Si.

Same element (same number of p)  
different number of n

9.  $^{241}\text{Am}^{2+}$  has:

- (A) 95 protons, 241 neutrons, 95 electrons.
- (B) 146 protons, 146 neutrons, 97 electrons.
- (C) 95 protons, 146 neutrons, 97 electrons.
- (D) 95 protons, 146 neutrons, 95 electrons.
- (E) 95 protons, 146 neutrons, 93 electrons.



$$241 - 95 = 146n$$

$\text{Am}^{2+}$  has 2 less e<sup>-</sup> than Am →  $95 - 2 = 93 e^-$

10. A student measures the mass of a piece of laboratory glassware to be 3.78 pounds. Expressed in milligrams, this mass is:

- (A) 1.7 mg.
- (B)  $8.3 \times 10^3$  mg
- (C)  $1.7 \times 10^9$  mg.
- (D)  $1.7 \times 10^6$  mg.
- (E)  $1.7 \times 10^3$  mg.

$$3.78 \text{ lbs} \left( \frac{1 \text{ kg}}{2.2 \text{ lbs}} \right) \left( \frac{1000 \text{ g}}{1 \text{ kg}} \right) \left( \frac{1000 \text{ mg}}{1 \text{ g}} \right) = 1718181.818$$
$$= 1.7 \times 10^6 \text{ mg}$$

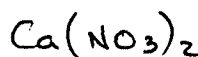
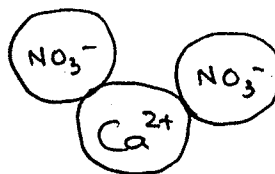
11. Two elements that will form 2- ions in ionic compounds are:

- (A) F and Cl.
- (B) Mg and Al.
- (C) Ca and Mg.
- (D) Al and S.
- (E) S and O.

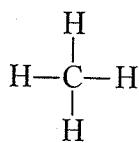
↓ Group 16  
O  
S  
Se

12. The chemical formula of calcium nitrate is:

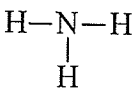
- (A) CaN.
- (B)  $\text{Ca}_3\text{N}_2$ .
- (C)  $\text{Ca}_2\text{N}_3$ .
- (D)  $\text{Ca}(\text{NO}_3)_2$ .
- (E)  $\text{CaNO}_6$ .



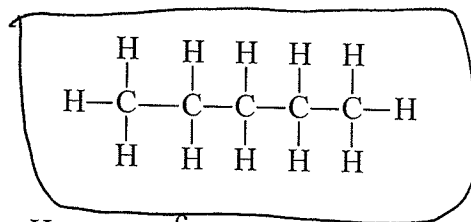
13. Which of the following drawings represents the structure of pentane?



a

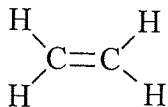


b

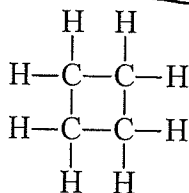


c

$\text{C}_5\text{H}_{12}$



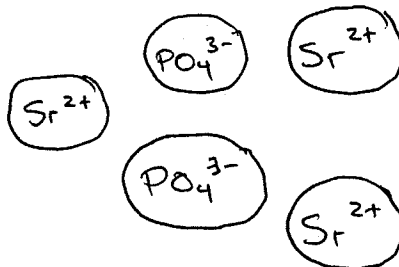
d



e

14. The chemical formula of strontium phosphate is:

- (A)  $\text{Sr}_2\text{P}_3$ .
- (B)  $\text{Sr}_2(\text{PO}_4)_3$ .
- (C)  $\text{SrPO}_8$ .
- (D)  $\text{Sr}_3\text{P}_2$ .
- (E)  $\text{Sr}_3(\text{PO}_4)_2$ .



15. Which of the following is heterogeneous?

- (A)  $\text{C}_8\text{H}_{18}$  (l).
- (B)  $\text{Mg}(\text{NO}_3)_2$  (s).
- (C) Granite.
- (D) Hexane.
- (E) Water.

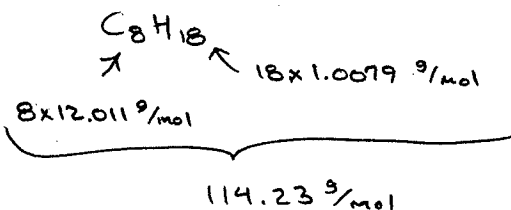
Different throughout

16. The name of  $\text{PCl}_5$  is?

- (A) Phosphorous chloride.
- (B) Phosphorous chlorite.
- (C) Phosphorous chloride.
- (D) Phosphorous pentachloride.
- (E) Monopotassium pentacarbonate.

17. The molar mass of octane is:


- (A)  $6.02 \times 10^{23}$  g/mol.
- (B) 13.02 g/mol.
- (C) 96.09 g/mol.
- (D) 114.23 g/mol.
- (E) 8 g/mol.



18. Europium has two naturally occurring isotopes.  $^{151}\text{Eu}$  has a mass of 150.92 g/mol and is 47.799% abundant.  $^{153}\text{Eu}$  has a mass of 152.92 g/mol and is 52.201% abundant. What is the average atomic mass of Europium?

- (A) 151.72 g/mol.
- (B) 151.96 g/mol.
- (C) 152.17 g/mol.
- (D) 152.83 g/mol.
- (E) 153.83 g/mol.

$$(150.92 \frac{\text{g}}{\text{mol}})(0.47799) + (152.92 \frac{\text{g}}{\text{mol}})(0.52201) = 151.96 \frac{\text{g}}{\text{mol}}$$

19. A student (  ) obtains a sample of metal. They measure the mass of the sample to be 435.7 g. They place the sample into a graduated cylinder containing 500.0 mL of water. The water level rises to 552.7 mL. The density of the metal sample is:

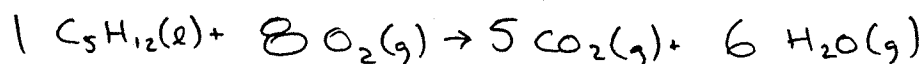
- (A) 8.27 g/mL.
- (B) 0.121 g/mL.
- (C) 1.121 g/mL.
- (D) 1.10 g/mL.
- (E) 5.62 g/mL.

$$d = \frac{m}{V} = \frac{435.7 \text{ g}}{552.7 \text{ mL} - 500.0 \text{ mL}} = 8.27 \frac{\text{g}}{\text{mL}}$$

20. Which of the following is a non-metal?

- (A) Oxygen.
  - (B) Francium.
  - (C) Aluminum.
  - (D) Lithium.
  - (E) Magnesium.
- } Metals

21. When the reaction  $C_5H_{12}(l) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$  is correctly balanced,

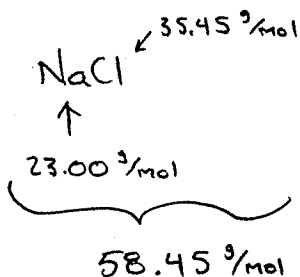


- (A) 5  $O_2$  are consumed.
- (B) 12  $O_2$  are consumed.
- (C) 6  $O_2$  are consumed.
- (D) 8  $O_2$  are consumed.
- (E) 10  $O_2$  are consumed.

22. A student obtains 360.0 grams of sodium chloride, NaCl. How many moles of NaCl are present?

- (A)  $1.384 \times 10^4$  mol NaCl.
- (B) 9.365 mol NaCl.
- (C) 6.159 mol NaCl.
- (D) 1.384 mol NaCl.
- (E)  $1.672 \times 10^{21}$  mol NaCl.

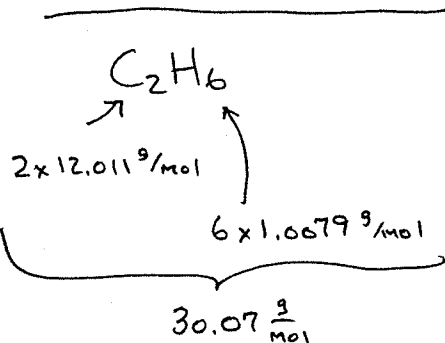
$$360.0 \text{ g NaCl} \left( \frac{1 \text{ mol NaCl}}{58.45 \text{ g NaCl}} \right) = 6.159 \text{ mol NaCl}$$



23. A student obtains 60.14 grams of ethane,  $C_2H_6$ . How many hydrogen atoms are present?

- (A)  $7.22 \times 10^{23}$  oxygen atoms.  
(B)  $2.40 \times 10^{23}$  oxygen atoms.  
(C)  $3.60 \times 10^{23}$  oxygen atoms.  
(D)  $6.68 \times 10^{22}$  oxygen atoms.  
(E)  $1.20 \times 10^{23}$  oxygen atoms.

$$60.14 \text{ g } C_2H_6 \left( \frac{1 \text{ mol}}{30.07 \text{ g}} \right) = 2.000 \text{ mol } C_2H_6$$



$$2.000 \text{ mol } C_2H_6 \left( \frac{6.02 \times 10^{23} \text{ } C_2H_6 \text{ molecules}}{1 \text{ mol } C_2H_6} \right) = 1.20 \times 10^{24} \text{ } C_2H_6 \text{ molecules}$$

$$1.20 \times 10^{24} \text{ } C_2H_6 \text{ molecules} \left( \frac{6 \text{ H atoms}}{1 \text{ } C_2H_6 \text{ molecule}} \right) = 7.22 \times 10^{24} \text{ H atoms}$$

24. Which of the following statements is **FALSE**?

- (A) Electrons are located outside of the nucleus.  
(B) Protons and neutrons have similar masses.  
(C) Electrons carry a negative charge; protons carry a positive charge.  
(D) A neutral atom has an equal number of protons and electrons.  
(E) Electrons are roughly 2000 times as massive as protons and neutrons; therefore, most of the mass in an atom is located outside the nucleus.

25. Because of Chemistry 121...

- (A) I get invited to way more parties. I'm headed to one right now ~~6/10~~.  
(B) I live with constant abdominal discomfort.  
(C) I discovered Skill Builder and wish it was available for *all* my courses.  
(D) I have attained a level of confidence that will allow me to succeed in all I attempt.  
(E) I am changing my major to chemistry... 8am tomorrow morning!  
[Any response will receive full credit; even no response.]