

**Test Form 3**

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 =  $6.02 \times 10^{23}$

centi c 1/100  
milli m 1/1000  
kilo k 1000  
micro  $\mu$   $10^{-6}$   
nano n  $10^{-9}$

1 H Hydrogen 1.0079																2 He Helium 4.0026	
3 Li Lithium 6.941	4 Be Beryllium 9.01218																
11 Na Sodium 22.98977	12 Mg Magnesium 24.305																
5 B Boron 10.81	6 C Carbon 12.011	7 N Nitrogen 14.0067	8 O Oxygen 15.9994	9 F Fluorine 18.9984	10 Ne Neon 20.179												
13 Al Aluminum 26.9815	14 Si Silicon 28.0855	15 P Phosphorus 30.97376	16 S Sulfur 32.06	17 Cl Chlorine 35.453	18 Ar Argon 39.948												
19 K Potassium 39.0983	20 Ca Calcium 40.08	21 Sc Scandium 44.9559	22 Ti Titanium 47.88	23 V Vanadium 50.9415	24 Cr Chromium 51.996	25 Mn Manganese 54.9380	26 Fe Iron 55.847	27 Co Cobalt 58.9332	28 Ni Nickel 58.70	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.72	32 Ge Germanium 72.59	33 As Arsenic 74.9216	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80
37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.9059	40 Zr Zirconium 91.22	41 Nb Niobium 92.9064	42 Mo Molybdenum 95.94	43 Tc Technetium 98.906	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.9055	46 Pd Palladium 106.4	47 Ag Silver 107.868	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.69	51 Sb Antimony 121.75	52 Te Tellurium 127.60	53 I Iodine 126.9045	54 Xe Xenon 131.30
55 Cs Cesium 132.9054	56 Ba Barium 137.33	57-71 *Rare earths	72 Hf Hafnium 178.49	73 Ta Tantalum 180.9479	74 W Tungsten 183.85	75 Re Rhenium 186.207	76 Os Osmium 190.2	77 Ir Iridium 192.22	78 Pt Platinum 195.09	79 Au Gold 196.9665	80 Hg Mercury 200.59	81 Tl Thallium 204.37	82 Pb Lead 207.2	83 Bi Bismuth 208.9804	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
87 Fr Francium (223)	88 Ra Radium 226.0254	89-103 *Actinides	104 Rf Rutherfordium (261)	105 Ha Hahnium (262)	106 Sg Seaborgium (263)	107 Ns Neilsbohrium (262)	108 Hs Hassium (265)	109 Mt Meitnerium (266)	110 †	111 †			114				

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

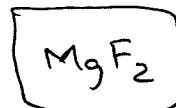
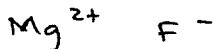
2. Consider the following operation:  $42214.37 \text{ g} + 8.114 \text{ g}$ . The correct answer with the proper number of significant figures is:

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

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

3. Which of the following chemical formulae is incorrect?

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



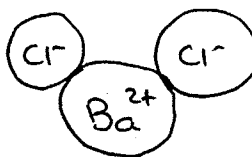
4. Which of the following contains a statement that is false?

- (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)

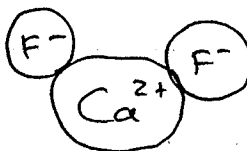
5. Which of the following chemical formulae is incorrect?

- (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



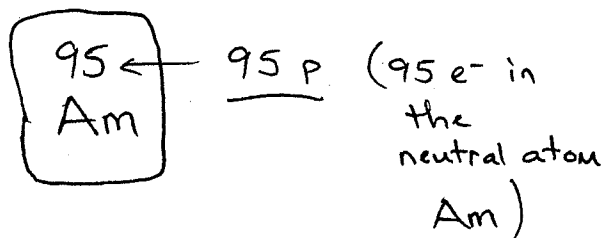
8. Which of the following pairs are isotopes?

- (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.



$$241 - 95 = \underline{146 n}$$

$\text{Am}^{2+}$  has 2 less  $e^-$  than Am  $\longrightarrow 95 - 2 = \underline{93 e^-}$

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.

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

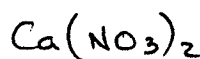
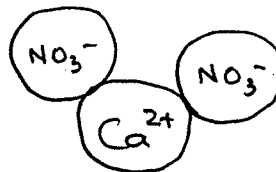
11. Two elements that will form 2- ions in ionic compounds are:

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

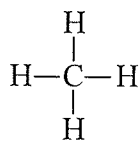
$\downarrow$  Group 16  
O  
S  
Se

12. The chemical formula of calcium nitrate is:

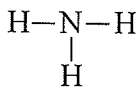
- (A) CaN.
- (B)  $\text{Ca}_3\text{N}_2$ .
- (C)  $\text{Ca}_2\text{N}_3$ .
- (D)  $\text{Ca}(\text{NO}_3)_2$ .
- (E)  $\text{CaNO}_6$ .



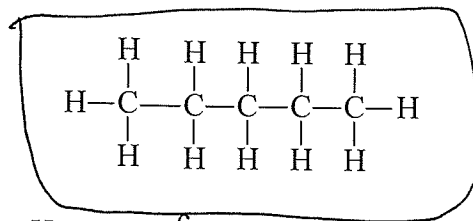
13. Which of the following drawings represents the structure of pentane?



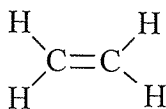
a



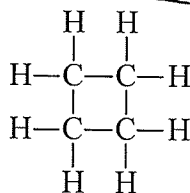
b



c



d

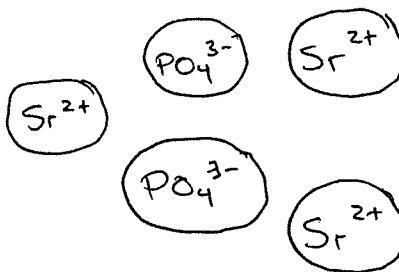


e

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

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.

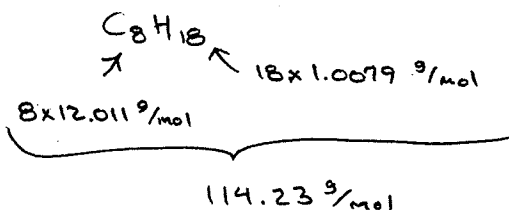
Different throughout

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.

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

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:

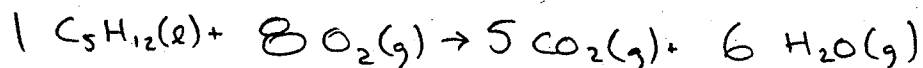
- (A) 8.27 g/mL.
- (B) 0.121 g/mL.
- (C) 1.121 g/mL.
- (D) 1.10 g/mL.
- (E) 5.62 g/mL.

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

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,

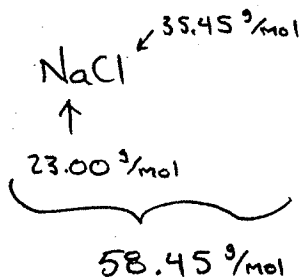


- (A) 5  $O_2$  are consumed.
- (B) 12  $O_2$  are consumed.
- (C) 6  $O_2$  are consumed.
- (D) 8  $O_2$  are consumed.
- (E) 10  $O_2$  are consumed.

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.

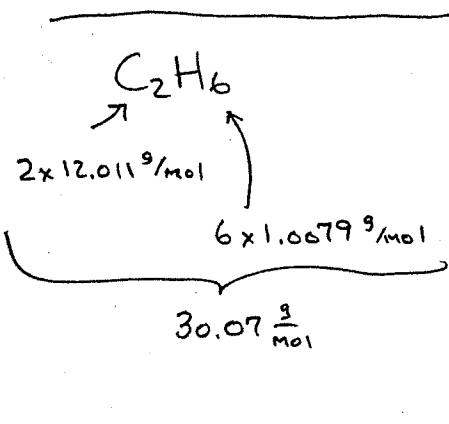
$$360.0 \text{ g NaCl} \left( \frac{1 \text{ mol NaCl}}{58.45 \text{ g NaCl}} \right) = 6.159 \text{ mol NaCl}$$



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 ~~5/10~~.  
 (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.]