

SID Last KeyFirst Answer

Question 1 7 Points	<p>a) How many <b>significant figures</b> are there in each of the following numbers?            0.927790 <u>6</u>      0.060464 <u>5</u>      <math>1.00 \times 10^3</math> <u>3</u></p> <p>b) There are <b>12 eggs in a dozen</b>. A farm produces <b>747 dozen</b> eggs a month, how should the <b>number of eggs</b> per month be reported? <u><math>8.96 \times 10^3</math></u></p> <p>c) The number <b>447.496</b> rounded to <b>4 significant figures</b> is: <u>447.5</u></p>						
Question 2 4 Points	<p>a) When <b>17.2</b> is <b>subtracted</b> from <b>45.58</b>, the result should be reported with <b>digit(s)</b> <u>1</u> after the decimal point.</p> <p>b) When <b>85.49</b> is divided by <b>59.6</b>, the answer should be reported to significant <u>3</u> digit(s).</p>						
Question 3 3 Points	<p>A copy of your chemistry textbook is found to have a volume of <math>2.81 \times 10^3</math> mL. Using unit analysis, show what the <b>volume</b> of this copy of your chemistry textbook is in L.</p> <table border="1" data-bbox="277 890 1521 968"> <tbody> <tr> <td>1 g = 1000 mg</td> <td>1000 mL = 1 L</td> <td>100 cm = 1 m</td> </tr> <tr> <td>1000 mg = 1 g</td> <td>1 mL = 1 cm<sup>3</sup></td> <td>1000 mm = 1 m</td> </tr> </tbody> </table> <p><b>No need to do the calculation</b> - just set up the correct dimensional analysis conversions - <b>you may not need to fill in all the boxes.</b></p> $2.81 \times 10^3 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{\quad}{\quad}$	1 g = 1000 mg	1000 mL = 1 L	100 cm = 1 m	1000 mg = 1 g	1 mL = 1 cm <sup>3</sup>	1000 mm = 1 m
1 g = 1000 mg	1000 mL = 1 L	100 cm = 1 m					
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Question 4 6 Points	<p>Decide if the following statements are true (T) or false (F):  <del>You must get all three correct to obtain credit - no partial credit awarded.</del></p> <p>a) <b>Protons</b> and <b>neutrons</b> are <b>equal in mass</b>, but <b>opposite in charge</b>. <u>F</u></p> <p>b) The <b>mass of a proton</b> is <b>about the same</b> as the <b>mass of a neutron</b>. <u>T</u></p> <p>c) The <b>electron</b> acts as a <b>buffer zone</b> in the <b>nucleus</b>. <u>F</u></p>						
Question 5 6 Points	<p>a) What is the <b>mass number</b> of an atom that contains <b>31 protons</b>, <b>36 neutrons</b>, and <b>31 electrons</b>? <u>67</u></p> <p>b) How <b>many protons</b> and <b>neutrons</b> are in an atom that has an <b>atomic number of 39</b> and a <b>mass number of 90</b>? <u>51</u> Neutrons      <u>39</u> Protons</p> <p>c) What is the <b>symbol</b> of an atom that contains <b>27 protons</b>, <b>32 neutrons</b>, and <b>27 electrons</b>? <u>Co</u></p>						
Question 6 3 Points	<p>Lithium has two stable isotopes, <b>lithium-7</b>, atomic mass of <b>7.016 amu</b> and <b>lithium-6</b>, atomic mass of <b>6.015 amu</b>. From the <b>atomic weight</b> of <b>Li = 6.94</b> one can conclude that:</p> <p><input checked="" type="checkbox"/> <b>lithium-7</b> has the <b>highest percent natural abundance</b></p> <p><input type="checkbox"/> <b>both isotopes</b> have the <b>same percent natural abundance</b></p> <p><input type="checkbox"/> <b>lithium-6</b> has the <b>highest percent natural abundance</b></p>						

Question 7  
10 Points

The following questions pertain to the **periodic table** given at the front of this exam:

- a. The **atomic number** for the element that is in **group 4A** and **period 2**? 6
- b. The **atomic weight** for the element in **group 3A** and **period 4**? 69.72
- c. Check the **elements** that would be expected to have **similar properties**?
- Pb     Cl     Be     I     Rn
- d. What is the **symbol** of the **alkali metal** that is in **period 5**? Rb
- e. Check any of the following that are **metals**? (Z = atomic number)
- Fe (Z=26)     N (Z=7)     Br (Z=35)     Ba (Z=56)     None of these

Question 8  
8 Points

Give the correct **formula** for the following **polyatomic ions**:

- a) Phosphide  $P^{3-}$
- b) Phosphate  $PO_4^{3-}$
- c) Dihydrogen phosphate  $H_2PO_4^-$
- d) Ammonium  $NH_4^+$

Question 9  
8 Points

- a. Name the compound with the formula **MgS**?
- b. Name the compound with the formula **Fe(NO<sub>2</sub>)<sub>2</sub>**?
- c. What is the **formula** for **sodium hydrogen carbonate**?
- d. What is the **formula** for **copper(II) sulfite**?

Magnesium sulfide  
Iron(II) nitrite  
NaHCO<sub>3</sub>  
CuSO<sub>3</sub>

Question 10  
4 Points

If a grain of sand weighs **46 mg**, what is the weight (in **grams**) of **610 grains**?

For full credit you must show work.

$$\frac{46 \text{ mg}}{1000 \text{ mg}} \times 1 \text{ g} = 4.6 \times 10^{-2} \text{ g}$$
$$4.6 \times 10^{-2} \text{ g} (610) = 28.1 \text{ g}$$

28.1 grams

Question 11  
3 Points

How many **moles** of **nitrite ions** are present in a sample that contains **1.88 moles** of **Mg(NO<sub>2</sub>)<sub>2</sub>**?

For full credit you must show work.

$$\frac{1.88 \text{ mol Mg(NO}_2)_2}{1 \text{ Mg(NO}_2)_2} \times \frac{2 \text{ NO}_2^-}{1 \text{ Mg(NO}_2)_2} = 3.76 \text{ mol NO}_2^-$$

3.76 moles

Question 12  
4 Points

How many grams of chromium(III) hydroxide are present in 1.67 moles of this compound?

For full credit you must show work.

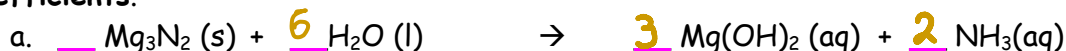
$$\text{Cr(OH)}_3 : 52.00 + 3(16.00 + 1.01) = 103.03 \text{ g}\cdot\text{mol}^{-1}$$

$$\frac{1.67 \text{ mol Cr(OH)}_3 \mid 103.03 \text{ g}}{1 \text{ mol}} = 172 \text{ g}$$

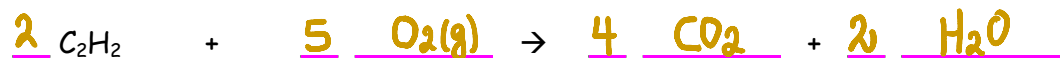
**172** grams

Question 13  
6 Points

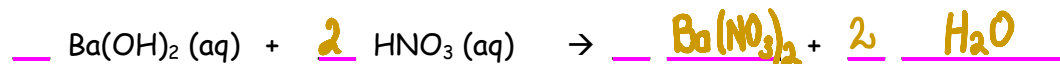
Balance the following chemical equations using the **smallest possible integer coefficients**.



b. Write a **balanced equation** for the **complete oxidation** reaction that occurs when **acetylene** ( $\text{C}_2\text{H}_2$ ) burns in air..



c. When aqueous solutions of barium hydroxide,  $\text{Ba(OH)}_2$ , and nitric acid,  $\text{HNO}_3$  are combined, **barium nitrate** and **water** are formed.



Question 14  
10 Points

a) Write the **electron configuration** for the **sodium** atom:   1s<sup>2</sup>2s<sup>2</sup>2p<sup>6</sup>3s<sup>1</sup>  

b) Write the **electronic configuration** for the **argon** atom:   1s<sup>2</sup>2s<sup>2</sup>2p<sup>6</sup>3s<sup>2</sup>3p<sup>6</sup>  

c) Write the **noble gas configuration** for **vanadium** atom:   [Ar] 4s<sup>2</sup>3d<sup>3</sup>  

d) The following Lewis diagram represents the **valence electron configuration** of a main-group element.  $\times \cdot$ . If this element is in **period 2**, its **valence electron configuration** is:   2s<sup>2</sup>  

e) The element with an **electron configuration** of  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$  is in **group IVB** and **period 4**.

Question 15  
6 Points

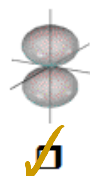
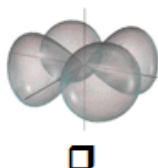
a) What is the **maximum number of electrons** possible in the shell with  $n = 4$  in an atom?   32  

b) How many **types of orbitals** are there in the shell with  $n = 2$  in an atom?   2  

c) How many **4d orbitals** are there in an atom?   5  

Question 16  
4 Points

Each of the orbitals depicted is from the **lowest energy shell possible** for its type. Which one has the **lowest shell number (n)**?



Question 17  
4 Points

Using only the periodic table **arrange** the following elements in order of **increasing** atomic radius: **S, Po, Te, O**

**O**

Smallest

**S**

**Te**

**Po**

Largest

Question 18  
4 Points

Using only the periodic table **arrange** the following elements in order of **decreasing** ionization energy: **Ca, As, K, Ge**

**As**

Highest

**Ge**

**Ca**

**K**

Smallest

Exam I Score