Name:
Score: 24 / 24 points (100%)

Review Topic 2: Equipment and Safety

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. The reaction times for three trials of an experiment are 90.3, 90.2, and 90.5 seconds. Which average time is expressed using the correct number of significant figures?
   a. 90.3
   b. 90.33
   c. 90
   d. 90.333

   ANSWER: A
   Addition is rounded to the lowest decimal place (tenths spot in this case)
   POINTS: 1 / 1

2. What is the name of the lab equipment shown above?
   a. Watch glass
   b. Crucible
   c. Beaker
   d. Evaporating dish

   ANSWER: B
   POINTS: 1 / 1

3. What is a possible cause of a large percentage of error in an experiment where MgO is produced from the combustion of magnesium?
   a. Not all of the Mg has completely reacted.
   b. The same balance was used throughout the experiment.
   c. The students were careful in their measurements.
   d. The students were careful not to spill the contents.

   ANSWER: A
   All the others would eliminate error
   POINTS: 1 / 1

4. How many liters are equivalent to five milliliters?
   a. 0.005 L
   b. 0.05 L
   c. 500 L
   d. 5000 L

   ANSWER: A
   5/1000
   POINTS: 1 / 1

5. If a student needed to obtain 8.0 mL of a liquid for an experiment, the appropriate piece of laboratory equipment to use would be a —
a. 50 mL beaker  

ANSWER: D  
It would be between the pipet and graduated cylinder and since you would have to use the pipet 8 times, the graduated cylinder would be better.  

POINTS: 1 / 1

6. The following data were collected. The volume of the gas is known to be 2.20 L.

Gas Volume Data

<table>
<thead>
<tr>
<th>Trial</th>
<th>Measured Volume (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.20</td>
</tr>
<tr>
<td>2</td>
<td>5.20</td>
</tr>
<tr>
<td>3</td>
<td>5.19</td>
</tr>
<tr>
<td>4</td>
<td>5.20</td>
</tr>
<tr>
<td>5</td>
<td>5.20</td>
</tr>
</tbody>
</table>

This data reflects —

a. low precision and low accuracy  

ANSWER: C  
close together - precise, but not close to answer - not accurate  

POINTS: 1 / 1

7. First measurement: 6.293 g  
Second measurement: 6.294 g  
Third measurement: 6.295 g

A student obtained these data after measuring the mass of an object three different times. If the true value of the object's mass is 5.550 g, these data are best described as —

a. precise but not accurate  

ANSWER: A  
close together - precise, but not close to answer - not accurate  

POINTS: 1 / 1

8. A team of chemistry students made the above measurements and density calculations of the same type of material. The accepted value (true value) of the density of the material is 5.72 g/cm³. Which trial has the least amount of absolute error?
a. 1  c. 3
b. 2  d. 4

ANSWER: A
Its answer is closest to 5.72
POINTS: 1 / 1

9. How should 0.000365 be expressed in proper scientific notation?
   a. \(3.65 \times 10^4\)  c. 3.65
   b. 365  d. \(3.65 \times 10^{-4}\)

ANSWER: D
Numbers that are less than one will have a negative exponent.
POINTS: 1 / 1

10. Which of the following pieces of glassware can be used to measure the volume of a liquid with the greatest accuracy?
    a. Test tube  c. Flask
    b. Beaker  d. Graduated cylinder

ANSWER: D
All the others are inaccurate devices
POINTS: 1 / 1

11. How is 0.00124 expressed in proper scientific notation?
    a. \(1.24 \times 10^{-3}\)  c. 1.24
    b. \(0.124 \times 10^{-2}\)  d. \(1.24 \times 10^3\)

ANSWER: A
Numbers less than 1 will have a negative exponent and the first number in scientific notation cannot be a zero. (It can only be 1-9).
POINTS: 1 / 1

12. A student spills a diluted acid solution on his hand. He should —
    a. wipe it off with a paper towel  c. apply a base solution to neutralize it
    b. let it air dry  d. rinse it off with running water

ANSWER: D
wipe it off with a paper towel - acid would still remain
let it air dry - acid would become more concentrated as the liquid evaporated
apply a base solution to neutralize it - bases can be just as bad as acids plus the reaction could make heat, which would result in more damage
rinse it off with running water - dilutes the acid and removes it from the skin.

POINTS: 1 / 1

13. A student must make a 3 M acid solution using a 5 M acid solution. Which of these is the safest way to make the solution?
    a. Slowly pour the 5 M acid into water
    b. Slowly add water to the 5 M acid solution
    c. Mix half the acid with water, then add the remaining water
    d. Mix half the water with the acid, then add the remaining acid
ANSWER: A
AAA - always add the acid to the most water as possible. The other three have you adding water to acid at some point.

POINTS: 1 / 1

14. What is the first step that should be taken when a caustic chemical gets into a person’s eye?
   a. Identify the chemical
   b. Call for an ambulance
   c. Flush the affected area with water
   d. Apply a neutralizing agent

ANSWER: C
Always start with water. If you did any of the other things, more damage would occur because the time spent doing those things would mean caustic chemical is reacting with eye.

POINTS: 1 / 1

15. The mass of an object was recorded as 9.93 g, 9.90 g, and 10.02 g, using an electronic analytical balance. What is the average of these three masses expressed to the correct number of significant figures?
   a. 9.9 g
   b. 9.95 g
   c. 10.0 g
   d. 10.00 g

ANSWER: B
When adding, go to the last decimal point the have in common and round to that place.

POINTS: 1 / 1

16. Which of these is the proper method for using a thermometer to measure the temperature of liquid in a beaker?

   a. Method F
   b. Method G
   c. Method H
   d. Method J

ANSWER: D
You want the thermometer in the water but not touching the sides.

POINTS: 1 / 1

17. Which is the safest practice when heating the contents of a test tube over a flame?
a. Wearing long hair down  

b. Having safety goggles within reach  

c. Pointing the test tube away from people  

d. Keeping the test tube securely stoppered

ANSWER: C  

- a - not safe because hair can catch on fire  

- b - not safe because they should be on the face covering the eyes  

- c - safe  

- d - not safe because pressure will build up and test tube can explode

POINTS: 1 / 1

18. How many significant figures will result when calculating density from these data?  

<table>
<thead>
<tr>
<th>Experimentally Determined Data for Be₃N₂</th>
<th>Mass (g)</th>
<th>Volume (mL)</th>
<th>Molar Mass (g/mol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>39.30</td>
<td>14.5</td>
<td>55.050</td>
</tr>
</tbody>
</table>

ANSWER: D  

Since density is mass divided by volume, we would only use the first two columns and base our answer on the number of significant figures in these numbers. Since 14.5 has 3, our answer would need 3.

POINTS: 1 / 1

19. A student measures the mass of a 1.00 g aluminum rod as 0.99g. The best estimate of the percent error associated with this measurement is -  

a. 0.01%  

b. 0.1%  

c. 1%  

d. 10%

ANSWER: C  

Percent Error = (Accepted-Experimental)/Accepted x 100  

(1.00-0.99)/1.00x100=1%

POINTS: 1 / 1

20. The most efficient way to determine whether a reaction is an exothermic chemical reaction is to use -  

a. an oxygen probe  

b. a temperature probe  

c. a pressure probe  

d. a pH probe

ANSWER: B  

Exothermic reactions release heat and will feel warm/hot to the observer. As a result, a temperature probe can be used to determine if the reaction is increasing in temperature.

POINTS: 1 / 1

21. Which of these is NOT required to ensure that stock solutions are free of contamination?  

a. Store all solutions in brown bottles  

b. Do not place dropping pipettes in stock solution bottles  

c. Never return excess chemicals to stock bottles  

d. Replace tops on reagent bottles after use

ANSWER: A
Store all solutions in brown bottles - Colored bottles can help some substances from breaking down, but it is not required to keep contaminants out of the bottle. 

Do not place dropping pipettes in stock solution bottles - any contaminant on the pipette would get into the solution and cause contamination.

Never return excess chemicals to stock bottles - any contaminant on the excess chemicals would get into the solution and cause contamination.

Replace tops on reagent bottles after use - this would prevent contaminants from falling into the bottle.

**POINTS:** 1 / 1

**D** 22. Melting Point Results (°C)

<table>
<thead>
<tr>
<th>Trial</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>113</td>
<td>114</td>
<td>116</td>
<td>110</td>
</tr>
<tr>
<td>2</td>
<td>111</td>
<td>115</td>
<td>113</td>
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<td>3</td>
<td>110</td>
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<td>114</td>
<td>111</td>
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<tr>
<td>4</td>
<td>110</td>
<td>110</td>
<td>113</td>
<td>110</td>
</tr>
</tbody>
</table>

Each of four groups of students determine and recorded the melting point of a solid compound. If the actual melting point is 113°C, which group has the best precision?

a. Group 1  
b. Group 2  
c. Group 3  
d. Group 4

**ANSWER:** D

Precision is how close your numbers are to each other, so the 113°C is irrelevant to this problem. (It would only be used for accuracy; how close the group is to the correct answer). Plus, make sure you are reading down the columns for each group. But the group with the most consistent (or precise) numbers is Group 4 with 110, 111, 111, and 110.

**POINTS:** 1 / 1

**D** 23. An experiment produced 0.10 g CO₂ with a volume of 0.056 L at STP. If the accepted density of CO₂ at STP is 1.96 g/L, what is the approximate percent error?

a. 110%  
b. 92%  
c. 71%  
d. 8.2%

**ANSWER:** D

First, we need to determine the experimental density by solving D=m/V.

\[ D = \frac{0.10g}{0.056L} = 1.8 \text{ g/L} \]

Then, we need to calculate % error by solving (accepted-experimental)/accepted x 100

\[ \left( \frac{1.96 - 1.8}{1.96} \right) \times 100 = 8.2\% \]

**POINTS:** 1 / 1

**Numeric Response**
Directions: Type your answer in the box. Your answer must use significant digits.

24. What is the density of an aqueous solution (in g/mL) that has a mass of 10.081 g and 12.5 mL?

**RESPONSE:** 0.806

**ANSWER:** .806
or 0.806

(D=m/V; D=10.081/12.5=.80648. But we also must use sig figs according to the directions. 10.081 has 5; 12.5 has 3 so our answer can only have 3 sig figs)

**POINTS:** 1 / 1