PRACTICE EXAM 1
100 POINTS

INSTRUCTIONS:

a. Write your answers to the multiple choice questions in the answer box below IN CAPITAL LETTERS. Failure to do so will result in the loss of 4 points.
BE LEGIBLE when transferring answers to the box. If I am unable to distinguish between similar letters, you will receive no credit for that answer.

b. Cheating of any form will not be tolerated. Any student caught cheating will automatically receive a zero for this exam.

Multiple Choice Answer Box

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
</table>

Section 1: Multiple Choice.

Directions: Place the letter of the correct answer, IN CAPITAL LETTERS, on the answer sheet on the front page of this exam. Failure to do so will result in the loss of 4 points.

1. The results of many experiments are summarized in the statement that the force of attraction between two masses is proportional to the distance between the masses. This is an example of a scientific
   a. law
   b. theory
   c. hypothesis
   d. myth
2. “Laughing gas” can be decomposed into two simpler substances, nitrogen and oxygen. Therefore, laughing gas
   a. is an intoxicant  b. must be a mixture
   c. cannot be an element  d. has the formula NO

3. All samples of a pure substance
   a. contain no chemicals  b. have the same composition
   c. have a variable composition  d. are heterogeneous

4. The number of significant figures in 0.001040 is:
   a. 7  b. 6
   c. 4  d. 3

5. How many significant figures should be in the answer obtained by adding 0.04, 31.2, and 100.0?
   a. 3  b. 2
   c. 5  d. 4

6. Which molecule has the largest mass?
   a. CO₂  b. H₂O
   c. NH₃  d. SO₂

7. A student weighed a graduated cylinder and found its mass was 105.68 g. The graduated cylinder was filled with an unknown liquid up to the 8.81 mL mark. The mass of graduated cylinder and liquid was then found to be 131.76 g. What was the liquid?
   a. CCl₄, d = 1.59 g/mL  b. CBr₄, d = 2.96 g/mL
   c. Cl₂, d = 4.23 g/mL  d. CHCl₃, d = 1.48 g/mL
   e. CHBr₃, d = 2.89 g/mL

8. Broom Hilda is preparing a special love potion for Valentine’s day. What is the volume occupied by a cauldron of witch’s brew if she measures out 21.2 g of chicken’s blood, 14 g of eye of newt, 600 g of bladder of wart-hog, 0.561 g of nightshade root, and 0.0010 x 10³ g of spider eyeball. It is known that this particular brew has a density of 10.00 g/mL.
   a. 61.5561 mL  b. 0.0162453 mL
   c. 0.02 mL  d. 60 mL
   e. 62 mL  f. 1.624 x 10⁻³ mL
   g. 6000 mL  h. 61.6 mL

9. The distance between atoms is sometimes given in picometers, where 1 pm is equivalent to 1 x 10⁻¹² m. If the distance between the layers of carbon atoms in graphite is 3.35 x 10⁻⁸ cm, what is this distance in picometers?
   a. 0.355  b. 3.35
   c. 335  d. 3,350
10. A substance which always fills a container is a
   a. gas          b. liquid
   c. solid        d. free goo

11. Which of the following represents an element?
   a. CO          b. NI
   c. N₂          d. OS

12. Which of the following is NOT a mixture?
   a. air          b. salt water
   c. milk         d. sugar

13. How many atoms of oxygen are represented by the formula Fe(NO₃)₃?
   a. 3       b. 6
   c. 9       d. 12

14. Which pair of the following represents a pair of isotopes?

<table>
<thead>
<tr>
<th>Atomic Number</th>
<th>Mass Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I 7</td>
<td>16</td>
</tr>
<tr>
<td>II 8</td>
<td>16</td>
</tr>
<tr>
<td>b. I 17</td>
<td>35</td>
</tr>
<tr>
<td>II 17</td>
<td>37</td>
</tr>
<tr>
<td>c. I 7</td>
<td>14</td>
</tr>
<tr>
<td>II 8</td>
<td>16</td>
</tr>
<tr>
<td>d. I 17</td>
<td>34</td>
</tr>
<tr>
<td>II 18</td>
<td>36</td>
</tr>
</tbody>
</table>

15. There are only two naturally occurring isotopes of copper, $^{63}\text{Cu}$ and $^{65}\text{Cu}$. The natural abundance of the copper-65 must be about
   a. 15%          b. 30%
   c. 40%          d. 85%

16. How many neutrons are there in 15 molecules of $^{17}\text{Cl}_2$?
   a. 20          b. 40
   c. 300         d. 600

**Section 2: Short Answer**

17. Three different samples of the same substance were subjected to analysis with each sample analyzed by a different technique. The results were:
   Technique 1:  34.2% C and 65.8% D
   Technique 2:  34.21% C and 65.83% D
   Technique 3:  34.2133% C and 65.8349% D

   Is the substance that was analyzed likely an element, a compound, or a mixture? Then, EXPLAIN in detail, in complete sentences, why you chose your answer and why you rejected the other two.
18. Calculate the atomic mass of sulfur on the basis of the following percent composition and isotopic mass data for the naturally occurring isotopes.

- sulfur-32 = 95.0% (31.9679 amu)
- sulfur-33 = 0.76% (32.9715 amu)
- sulfur-34 = 4.22% (33.9679 amu)
- sulfur-36 = 0.014% (35.9671 amu)

Answer:

19. In 1.00 g of fluorine atoms there are \(3.17 \times 10^{22}\) fluorine atoms. If you lined these atoms up side by side, how many miles long would the line of fluorine atoms be? The diameter of a fluorine atom is \(1.44 \times 10^{-8}\) cm.

Answer:

20. Complete the following table. (15 pts)

<table>
<thead>
<tr>
<th>Nuclear Symbol</th>
<th>Atomic Number</th>
<th>Mass Number</th>
<th>Number of Protons</th>
<th>Number of Neutrons</th>
<th>Number of Electrons</th>
<th>Net Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>15(^7)N(^{-3})</td>
<td>7</td>
<td>15</td>
<td>8</td>
<td></td>
<td>10</td>
<td>-3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25</td>
<td>12</td>
<td></td>
<td></td>
<td>+2</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>16</td>
<td></td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

21. Some doctors think heroin is more effective for the relief of severe pain than other medicines. However, heroin is highly addictive and often renders the user unable to function in society. Do a risk-benefit analysis for the use of heroin in treating the pain of (a) a young athlete's broken leg and (b) a terminally ill cancer patient.

22. Tell what type of change-chemical (c) or physical (p)- is probably occurring when
   a. a solid is placed in a liquid and bubbles appear
   b. a liquid is heated and the liquid disappears
   c. a solution is allowed to cool and a solid appears in the liquid
   d. an electrical current is sent through saltwater and a gas appears

23. Identify the following as a chemical (c) or physical (p) property:
   a. color
   b. flammability
   c. gas at room temperature
   d. boiling point

24. For each of the following identify whether a chemical (c) or physical (p) change has occurred:
a. A sample of metal is heated in air. A white powder is formed that weighs more than the original metal sample.
b. A substance is heated. The resulting white powder weighs less.
c. Ice cubes become smaller in the freezer.

25. What is the difference between a *group* and a *period* in the periodic table.

25. Tell whether each of the following elements is an alkali metal (am), alkaline earth metal (aem), halogen (h), or noble gas (g):
   a. potassium
   b. argon
   c. silver
   d. bromine
   e. calcium

26. Calculate the area of a circle in cm² with a radius of 2.0 in. Area of circle = \( \pi r^2 \).

27. Use the blank outline of the periodic table below to answer the questions that follow. Place the letter of the question in the space on the table that best answers that question.

   a. The halogen group.
   b. The group whose ions all have a charge of +2
   c. The group whose ions all have a charge of -2
   d. The element sulfur
   e. The element whose symbol is Be

27. How many electrons can be held in shell \( n = 4 \)?
28. What is the highest energy subshell in the third energy level (\( n = 3 \))?  
29. How many electrons could be placed in a 2p subshell?
30. How many electrons could be placed in a 2p orbital?
31. Give an example of something that is *quantized*. 