Important Instructions:

1) Use a soft (#2) graphite pencil only in filling out the answer sheet. **Make dark marks** in the correct circles on your answer sheet.

2) Print your name in the boxes on the upper left of Side 1 and blacken the respective circle under each letter of your name. Fill in **your last name first**.

3) Enter the first letter of the test color in the last box of the name grid and blacken the corresponding circle under the letter. **This is a White exam**.

4) You must enter a 10-digit identification code on your answer sheet as follows. The **left most digits** will be 117, followed by the **7-digits of your NDSU NAID number** (the numbers before the dash). Next, blacken the respective circle under each digit of this identification code.

5) **Sign your name (do not print)** in the upper left hand corner of the answer sheet.

6) Answer each question by blackening the circle of the letter corresponding to the best or most correct answer to that question. **There is only one correct answer to each question**. If you blacken more than one circle for a question it will be scored as incorrect.

7) There should be **25 answers filled** in when you are finished.

8) Be prepared to **show a picture I. D.** when you turn in your quiz.

1. Which one of the following does **not** involve a chemical change?
   a. a fish that is left for some time in an un-refrigerated place decomposes
   b. apple juice which is left in an open bottle ferments
   c. a loaf of bread rises and the gas produced expands the loaf when baked.
   d. when a lake starts to freeze in winter, ice is formed on the surface
   e. when sugar is fermented under certain conditions, alcohol is produced

2. The SI base units of temperature and mass, respectively, are
   a. degree and gram
   b. kelvin and kilogram
   c. celsius and milligram
   d. °K and kilogram
   e. kelvin and gram

3. Iridium has a density of 22.65 g cm\(^{-3}\). The vice president for research and development has an iridium figurine on his desk which weighs 11.50 pounds. What is its volume, in cubic inches? 1 pound = 0.4536 kg, 1 inch = 2.54 cm exactly.
   a. 5.533 cubic inches
   b. 9.410 cubic inches
   c. 14.05 cubic inches
   d. 35.70 cubic inches
   e. 90.67 cubic inches
4. The two major types of pure substances are

a. compounds and elements  
b. compounds and solutions  
c. elements and mixtures  
d. mixtures and solutions  
e. solutions and elements

5. The symbol "Si" is used to represent the element:

a. silver  
b. silicon  
c. sodium  
d. sulfur  
e. silicium

6. Which element below occurs in nature as a gas composed of diatomic molecules at ordinary temperatures and pressures?

a. boron  
b. silver  
c. neon  
d. nitrogen  
e. sulfur

7. The naturally occurring, fictitious element, engrium, En, has the following composition.

<table>
<thead>
<tr>
<th>En</th>
<th>Mass</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>147 En</td>
<td>146.9672 a.m.u.</td>
<td>64.792%</td>
</tr>
<tr>
<td>149 En</td>
<td>148.9638 a.m.u.</td>
<td>26.117%</td>
</tr>
<tr>
<td>150 En</td>
<td>149.9592 a.m.u.</td>
<td>9.0910%</td>
</tr>
</tbody>
</table>

What is the average atomic weight of naturally occurring engrium?

a. 49.254  
b. 147.76  
c. 148.63  
d. 148.67  
e. 147.80

8. Which answer below best describes all atoms of a given isotope of a particular element?

a. They possess the same mass, only.  
b. They possess the same chemical properties and the same mass, but nothing else in common.  
c. They possess the same atomic number and the same mass, but have nothing else in common.  
d. They possess the same number of electrons, the same atomic number, the same mass, but nothing else in common.  
e. They possess the same number of electrons, the same atomic number, the same mass, and the same chemical properties.

9. The fluoride anion, F\(^{-}\), contains _______ electrons arranged around the nucleus.

a. 8  
b. 9  
c. 10  
d. 16  
e. 18
10. The element set below that correctly features one alkali, one alkaline earth, one halogen, one lanthanide, and one actinide (in that order) is

a. cesium, magnesium, bromine, erbium, plutonium
b. titanium, beryllium, iodine, terbium, berkelium
c. lithium, manganese, fluorine, lanthanum, vanadium
d. potassium, radium, iodine, lutetium, plutonium
e. rubidium, strontium, chlorine, thorium, plutonium

11. Which of the sets below includes the largest number of elements?

a. alkali metals
b. alkaline earth elements
c. halogens
d. lanthanides
e. noble gases

12. The atomic weight of boron is 10.811. What is the mass of a boron sample which contains 0.585 moles of B atoms?

a. 0.00541 g  b. 1.80 g  c. 3.52 g  d. 6.32 g  e. 18.5 g

13. Which one of the following is a physical change?

a. when ignited with a match in open air, paper burns
b. in cold weather, water condenses on the inside surface of single pane windows
c. when treated with bleach, some dyed fabrics change color
d. when heated strongly, sugar turns dark brown
e. grape juice left in an open unrefrigerated container turns sour

14. The boiling point of chlorine is -34.6 °C. This temperature expressed in kelvins is

a. -30.3 K  b. 177.4 K  c. 238.6 K  d. 243.0 K  e. 307.6 K

15. Bromine is a red liquid at 25°C. Its density is 3.12 g/cm³. What is the volume of 28.1 g of liquid bromine?

a. 87.7 cm³  b. 0.111 cm³  c. 9.01 cm³  d. 28.1 cm³  e. None of the above

16. The elements in a column of the periodic table are known as

a. metalloids.
b. a period.
c. noble gases.
d. a group.
e. nonmetals.
In questions 17 – 21, correctly match the scientist with the discovery credited to them.

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>17. Thomsen</td>
<td>(a) Law of definite proportions</td>
<td></td>
</tr>
<tr>
<td>18. Proust</td>
<td>(b) Law of conservation of mass</td>
<td></td>
</tr>
<tr>
<td>19. Mendeleev</td>
<td>(c) Atomic Theory</td>
<td></td>
</tr>
<tr>
<td>20. Lavoisier</td>
<td>(d) Organized elements in chart</td>
<td></td>
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<tr>
<td>21. Dalton</td>
<td>(e) Discovery of the electron</td>
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22. Many companies are selling throat lozenges and cough drops containing zinc gluconate or other zinc-containing compounds, claiming that they are a homeopathic remedy for the common cold and the flu?

What would be one of the first steps that you as a consumer would undertake to validate this claim, before shelling out a lot of money and taking a risk ingesting a metallic compound?

a. hypothesize as to why zinc lozenges affect colds and flus
b. formulate a theory based upon discussions with your friends
c. go to the laboratory to study the effects of zinc on disease-causing bugs
d. gather facts from sound scientific research articles as to zinc’s homeopathic ability

23. The scientific revolution of the 1500s was marked by a move away from ______ and towards ______ as a method for explaining the natural world.

a. law, theory
b. alchemy, research
c. reason, observation
d. scientific theory, experimentation
e. Both a and c are correct.

24. A substance composed of two or more different elements in fixed proportions is known as a(n) ________.

a. atom  b. element  c. molecule  d. ion  e. compound

25. Solve the following equation for z.

\[ 2(z + 6) - 10 = 42 \]

a. 6  b. 10  c. 12  d. 20  e. 40