MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) A concise verbal statement or mathematical equation that summarizes a broad variety of observations and experiences is called a(n) _________.
   A) hypothesis
   B) test
   C) experiment
   D) law
   E) theory

2) The SI unit for volume is ________.  
   A) liter
   B) milliliter
   C) troy ounce
   D) cc
   E) none of the above

3) The law of constant composition applies to _________.
   A) solutions
   B) homogeneous mixtures
   C) compounds
   D) solids
   E) heterogeneous mixtures

4) A common English set of units for expressing velocity is miles/hour. The SI unit for velocity is _________.
   A) km/s
   B) m/hr
   C) km/hr
   D) m/s
   E) cm/s

5) 1 nanometer = ________ picometers
   A) 10
   B) 0.1
   C) 0.01
   D) 1
   E) 1000

6) 3.337 g/cm³ = ________ kg/m³
   A) 3337
   B) 333.7
   C) 3.337 × 10⁻⁵
   D) 3.337 × 10⁻⁹
   E) 0.3337

7) There are ________ significant figures in the answer to the following computation:  
   \[
   \frac{(29.2 - 20.0) (1.79 \times 10⁵)}{1.39}
   \]
   A) 1
   B) 2
   C) 3
   D) 4
   E) 5
8) The correct result of the molecular mass calculation for \( \text{H}_2\text{SO}_4 \) is \___________.

\[
4 \times 15.9994 + 32.066 + 2 \times 1.0079 =
\]

A) 98.838  
B) 98.84  
C) 98.08  
D) 98.079  
E) 98.074

9) An element cannot \___________.

A) be part of a homogeneous mixture  
B) be separated into other substances by chemical means  
C) be a pure substance  
D) interact with other elements to form compounds  
E) be part of a heterogeneous mixture

10) Which one of the following is not an intensive property?

A) melting point  
B) mass  
C) temperature  
D) density  
E) boiling point

11) Which of the following are chemical processes?

1. rusting of a nail  
2. freezing of water  
3. decomposition of water into hydrogen and oxygen gases  
4. compression of oxygen gas

A) 1, 3, 4  
B) 1, 4  
C) 2, 3, 4  
D) 1, 3  
E) 1, 2

12) Precision refers to \___________.

A) how close a measured number is to the true value  
B) how close a measured number is to the calculated value  
C) how close a measured number is to infinity  
D) how close a measured number is to zero  
E) how close a measured number is to other measured numbers

13) Expressing a number in scientific notation \___________.

A) changes its value  
B) removes significant zeros  
C) removes ambiguity as to the significant figures  
D) allows to increase the number's precision  
E) all of the above

14) "Absolute zero" refers to \___________.

A) 273.15°C  
B) 0°C Celsius  
C) °C + 9/5(°F - 32)  
D) 0°F Fahrenheit  
E) 0 Kelvin
15) A cube of an unknown metal measures 1.61 mm on one side. The mass of the cube is 36 mg. Which of the following is most likely the unknown metal?

<table>
<thead>
<tr>
<th>Metal</th>
<th>Density (g/cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>rhodium</td>
<td>12.4</td>
</tr>
<tr>
<td>copper</td>
<td>8.96</td>
</tr>
<tr>
<td>niobium</td>
<td>8.57</td>
</tr>
<tr>
<td>vanadium</td>
<td>6.11</td>
</tr>
<tr>
<td>zirconium</td>
<td>6.51</td>
</tr>
</tbody>
</table>

A) rhodium B) zirconium C) vanadium D) niobium E) copper

16) A temperature of ________ K is the same as 63°F.
A) 29 B) 17 C) 276 D) 290 E) 336

17) Methane and ethane are both made up of carbon and hydrogen. In methane, there are 12.0 g of carbon for every 4.00 g of hydrogen, a ratio of 3:1 by mass. In ethane, there are 24.0 g of carbon for every 6.00 g of hydrogen, a ratio of 4:1 by mass. This is an illustration of the law of ________.
A) conservation of mass B) constant composition C) octaves D) multiple proportions E) conservation of matter

18) The atomic number indicates ________.
A) the number of atoms in 1 g of an element B) the number of different isotopes of an element C) the total number of neutrons and protons in a nucleus D) the number of neutrons in a nucleus E) the number of protons or electrons in a neutral atom

19) A molecule of water contains hydrogen and oxygen in a 1:8 ratio by mass. This is a statement of ________.
A) the law of multiple proportions B) the law of conservation of energy C) the law of constant composition D) the law of conservation of mass E) none of the above

20) Cathode rays are ________.
A) protons B) neutrons C) atoms D) x-rays E) electrons

21) Which isotope has 45 neutrons?
A) $^{103}_{45}$ Rh B) $^{78}_{34}$ Se C) $^{80}_{35}$ Br D) $^{34}_{17}$ Cl E) $^{80}_{36}$ Kr
22) In the symbol below, X = __________.

\[ \frac{13}{6} X \]

A) C  
B) N  
C) Al  
D) K  
E) not enough information to determine

23) Which one of the following is not one of the postulates of Dalton’s atomic theory?

A) All atoms of a given element are identical; the atoms of different elements are different and have different properties.
B) Each element is composed of extremely small particles called atoms.
C) Compounds are formed when atoms of more than one element combine; a given compound always has the same relative number and kind of atoms.
D) Atoms of an element are not changed into different types of atoms by chemical reactions: atoms are neither created nor destroyed in chemical reactions.
E) Atoms are composed of protons, neutrons, and electrons.

24) All atoms of a given element have the same __________.

A) mass 
B) density 
C) number of neutrons 
D) number of electrons and neutrons 
E) number of protons

25) Of the following, the smallest and lightest subatomic particle is the __________.

A) proton 
B) nucleus 
C) neutron 
D) alpha particle 
E) electron

26) There are __________ electrons, __________ protons, and __________ neutrons in an atom of \( ^{132}_{54} \text{Xe} \).

A) 54, 54, 132  
B) 78, 78, 54  
C) 54, 54, 78  
D) 132, 132, 54  
E) 78, 78, 132

27) In the symbol below, x = __________.

\[ \frac{x}{6} \text{C} \]

A) 6  
B) 13  
C) 19  
D) 7  
E) not enough information to determine
1) D
2) E
3) C
4) D
5) E
6) A
7) B
8) D
9) B
10) B
11) D
12) E
13) C
14) E
15) D
16) D
17) D
18) E
19) C
20) E
21) C
22) A
23) E
24) E
25) E
26) C
27) E