Deep Run High School

Unit 3 Test

ID: **2744**

Name: _____ Score: / 100

Question 1 /1

A student hypothesizes that silicon (Si) will have similar chemical properties to germanium (Ge). The periodic table supports this hypothesis by indicating that –

- ☐ silicon and germanium have similar atomic masses
- ☐ silicon is a metal while germanium is a nonmetal
- ☐ silicon and germanium are both members of the halogen group
- ☐ silicon and germanium have the same numbers of valence electrons

Name: _____

Question 2 /1

Which of the following is the same for both an atom of radioactive iodine and an atom of stable iodine?

I. Mass number
II. Atomic number
III. Number of neutrons
IV. Chemical properties
V. Half life

- ☐ I and III only
- ☐ I, II, and III only
- ☐ II and IV only
- ☐ IV only
- ☐ V only

Name: _____

Question 3 /1

What process would cause thorium-230 to decay to radium-226?

- ☐ beta decay
- ☐ alpha decay
- ☐ positron decay
- ☐ gamma decay

Question 4 /1

According to the Bohr model of the atom, a single electron from a hydrogen atom

- ☐ can jump to higher energy orbitals and fall back down again
- ☐ orbits at a permanently fixed distance from the nucleus
- ☐ exists in many different orbitals at the same time
- ☐ is located in the positively charged nucleus.

Name: _____

Question 5 /1

True or **False**: According to Democritus, a single atom exhibits the same chemical and physical properties as the element from which it came.

- ☐ True
- ☐ False

Question 6 /1

Radioactive iodine-131, often used in cancer treatments, decays according to the following equation with a half-life of 8 days. If 1.00 µg of $^{131}_{53}I$ is injected into a cancer patient. Determine the amount remaining after 24 days.

- ☐ 0.125 µg remaining
- ☐ 0.333 µg remaining
- ☐ 0.250 µg remaining
- ☐ 0.500 µg remaining

Name: _____

Question 7 /1

The reaction times for an experiment are recorded below:

Trial #	Reaction Time
1	30.3 sec
2	34.7 sec
3	28.5 sec

The actual expected reaction time was 31.0 seconds. The results were

- ☐ both accurate and precise
- ☐ precise but not accurate
- ☐ accurate but not precise
- ☐ neither accurate nor precise

Name: _____

Question 8 /1

If $^{214}_{82}Pb$ undergoes beta decay, and then the product of this decay process undergoes another beta decay, what is the end result (in addition to a beta particle?

- ☐ $^{212}_{82}Bi$
- ☐ $^{214}_{84}Po$
- ☐ $^{214}_{82}Pb$
- ☐ $^{212}_{83}Bi$
- ☐ $^{206}_{82}Pb$

Question 9 /1

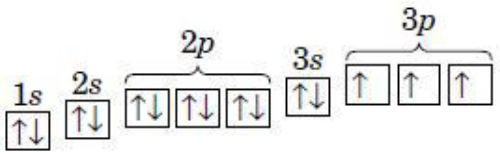
The half-life of thorium-227 is 18.72 days. How old is the sample, if 3 half lives have occured?

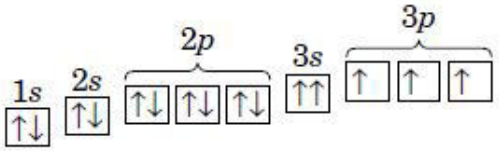
- ☐ 56.16 days
- ☐ 6.24 days
- ☐ 75.67 days
- ☐ 12.13 days

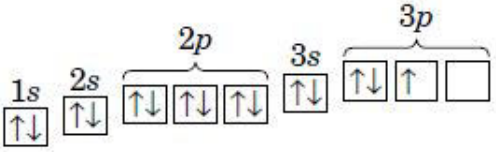
Name: _____

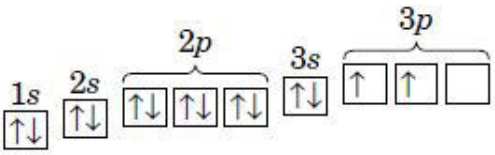
Question 10 /1

Which of the following orbital notations for phosphorus is correct?

☐ 

☐ 

☐ 

☐ 

Name: _____

Question 11 /1

The isotope shown below has

$$^{25}_{12}Mg^{+2}$$

- ☐ 12 protons, 13 neutrons, and 14 electrons
- ☐ 12 protons, 13 neutrons, and 10 electrons
- ☐ 25 protons, 12 neutrons, and 13 electrons
- ☐ 12 protons, 25 neutrons, and 14 electrons

Question 12 /1

Select the abbreviated electron configuration for Tin.

- ☐ [Xe] $5s^2\ 4d^{10}\ 5p^2$
- ☐ [Kr] $4s^2\ 3d^{10}\ 4p^2$
- ☐ [Ar] $4s^2\ 3d^{10}\ 4p^2$
- ☐ [Kr] $5s^2\ 4d^{10}\ 5p^2$

Name: _____

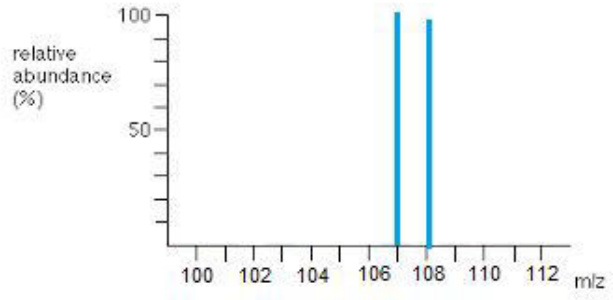
Question 13 /1

Which subatomic particle increases the stability of the nucleus?

- [ ] electron
- [ ] proton
- [ ] ion
- [ ] neutron

Question 14 /1

The mass spectrum of which element is shown below?



- [ ] Hs
- [ ] Ag
- [ ] Au
- [ ] Bh

Name: _____

Question 15 /1

Use the word bank below to fill-in-the-blanks for this sentence.

Ions **Atoms** **Electrons** **Isotopes** **Protons** **Neutrons**

_____ are different forms of the same element that contain equal numbers of _____ but different numbers of _____ in their nuclei.

Question 16 /1

In 1932, beryllium atoms were bombarded with alpha particles. An unknown radiation was produced. This radiation was composed of particles with a neutral electrical charge and the approximate mass of a proton. This particle became known as the _____.

- ☐ neutron
- ☐ proton
- ☐ electron
- ☐ isotope

Name: _____

Question 17 /1

What type of radiation occured in the nuclear reaction below?

$$^{9}_{4}\text{Be} \rightarrow {}^{9}_{4}\text{Be} + \_\_\_\_\_$$

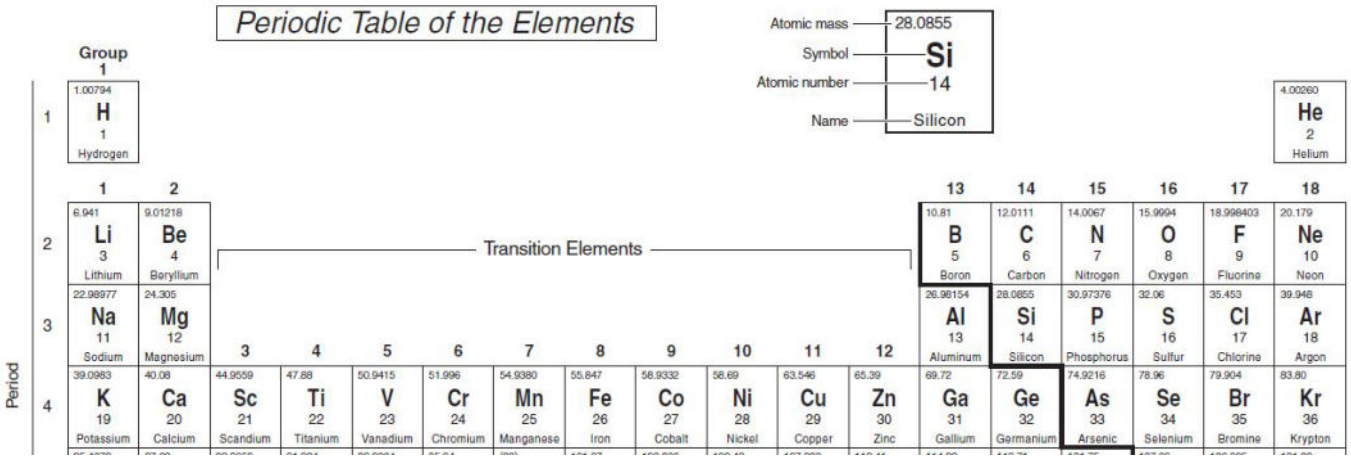
- ☐ beta decay
- ☐ alpha decay
- ☐ positron decay
- ☐ gamma decay

/1

Question 18

According to the periodic table an isotope of carbon always has _____ protons.

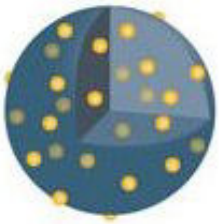
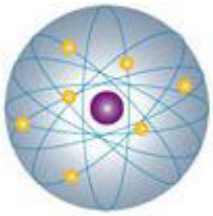
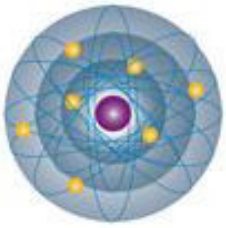
Periodic Table of the Elements
For Assessments Based on the 2010 Chemistry Standards of Learning



Name: _____

Question 19 /1

Which image of the atom supports the Plum Pudding Model?

- [ ] 
- [ ] 
- [ ] 
- [ ] 

Name: _____

Question 20 /1

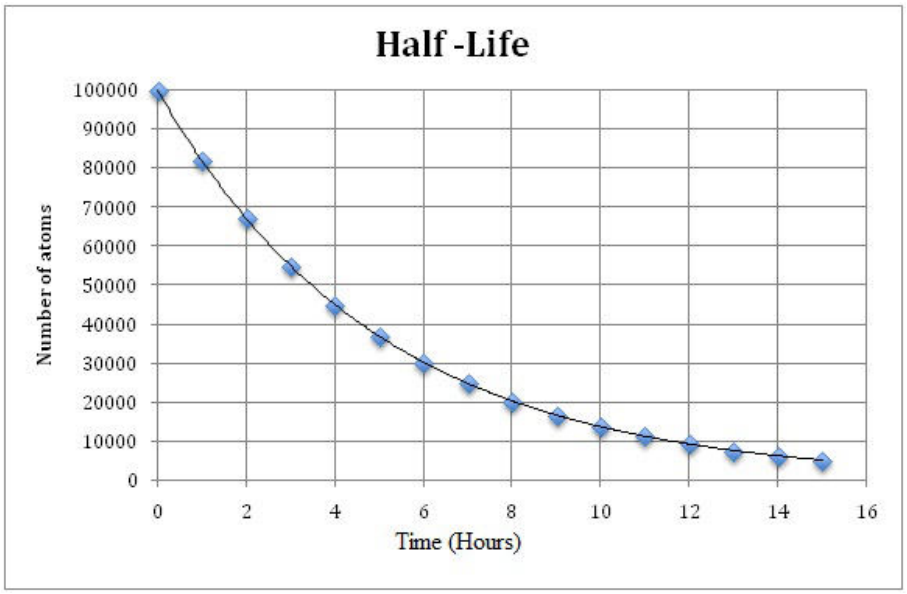
Oxygen can combine with carbon to form two compounds, carbon monoxide and carbon dioxide. The ratio of the masses of oxygen that can combine with a given mass of carbon is 1:1 and 1:2, respectively. This is an example of

- [ ] Neils Bohr's Planetary Model
- [ ] J. J. Thomson's Plum Pudding Model
- [ ] John Dalton's First Atomic Theory
- [ ] James Chadwick's Fussion Reaction

Name: _____

Question 21 /1

How much time has passed when two half-lives have occured?



- ☐ 3.5 hours
- ☐ 8.0 hours
- ☐ 5.5 hours
- ☐ 7.0 hours

Name: _____

Question 22 /1

A three-dimensional region around a nucleus where an electron may be found is called a(n)

- [ ] orbital
- [ ] spectra
- [ ] isotope
- [ ] nucleus

Question 23 /1

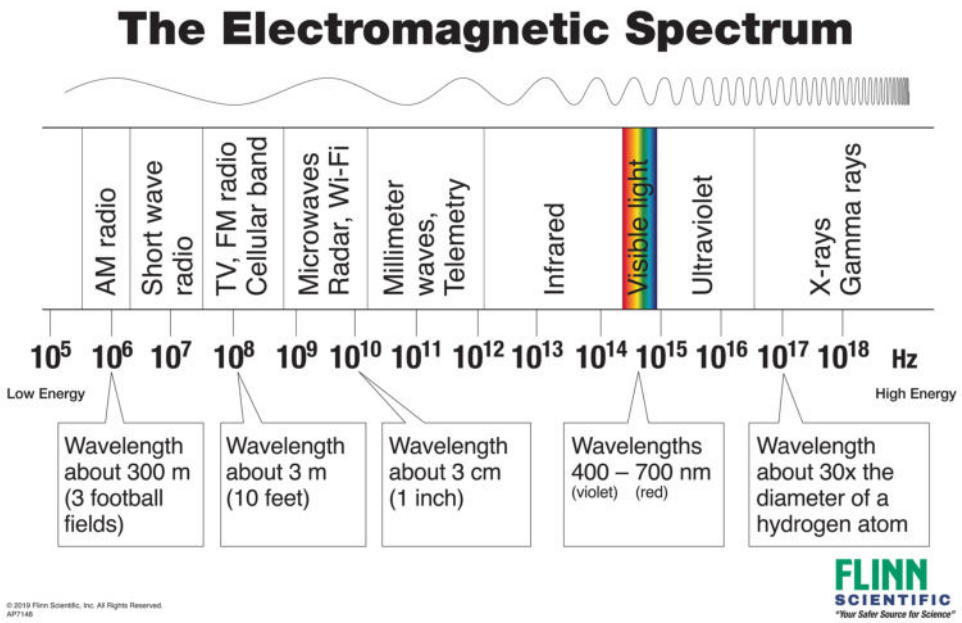
How many half lives have occured if 300 grams of a radioactive isotope decays until 9.375 grams is remaining?

- [ ] 4 half lives
- [ ] 3 half lives
- [ ] 5 half lives
- [ ] 6 half lives

Name: _____

Question 24 /1

According to the Electromagnetic Spectrum, which of the following has the longest wavelength?



- ☐ Yellow Light
- ☐ Red Light
- ☐ Blue Light
- ☐ Purple Light

Name: _____

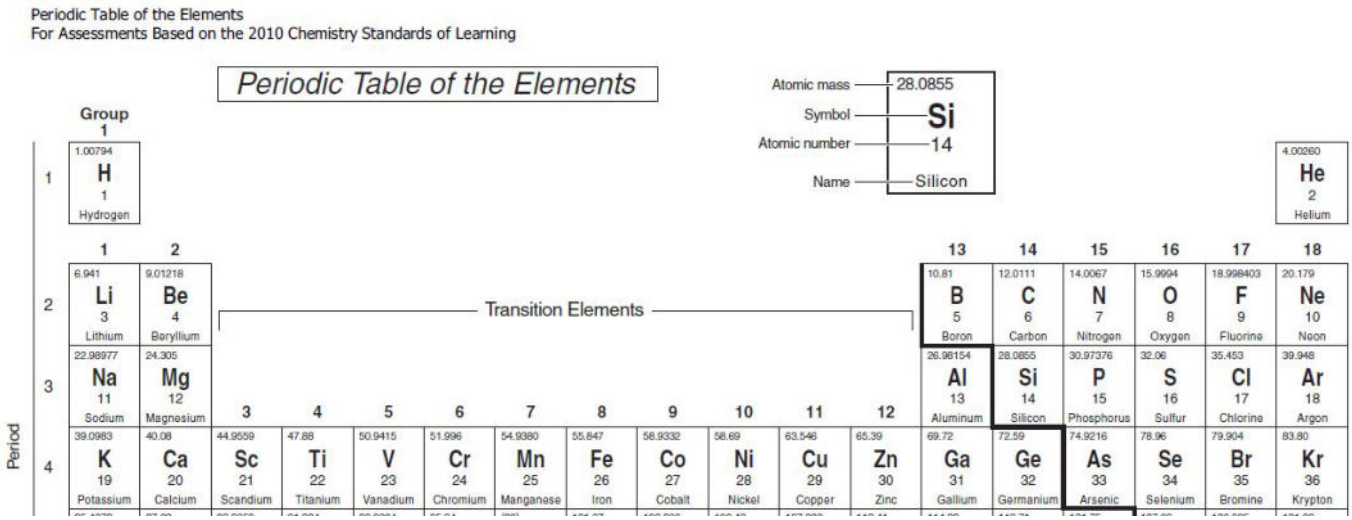
Question 25 /1

Choose the minimum thickness of material necessary to stop an alpha particle:

- ☐ three inches of lead
- ☐ three feet of concrete
- ☐ a sheet of paper
- ☐ a sheet of aluminum foil

Question 26 /1

According to the periodic table, a neutral atom of nitrogen will have _____ electrons.



Name: _____

Question 27 /1

An atom that has an atomic number of 19 and a mass number of 40 would be an isotope of which element?

- ☐ Potassium (K)
- ☐ Argon (Ar)
- ☐ Calcium (Ca)
- ☐ Zirconium (Zr)

Question 28 /1

A hypothetical element consists of three isotopes as shown below. What would the average atomic mass of the element be?

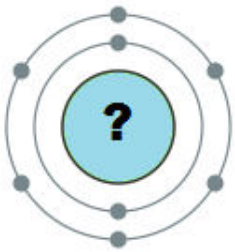
Isotope #1	30.00 %	30.00 amu
Isotope #2	50.00 %	32.00 amu
Isotope #3	20.00 %	35.00 amu

- ☐ 33.00 amu
- ☐ 32.00 amu
- ☐ 32.25 amu
- ☐ 31.50 amu
- ☐ 35.00 amu

Name: _____

Question 29 /1

Which element is represented by the Bohr Model below:



- ☐ neon
- ☐ carbon
- ☐ oxygen
- ☐ sulfur

Name: _____

Question 30 /1

Which one of the following statements is FALSE?

- ☐ The electrons occupy a very large volume compared to the nucleus
- ☐ The protons and neutrons in the nucleus are very tightly packed
- ☐ Almost all of the mass of the atom is concentrated in the nucleus
- ☐ The number of protons and neutrons is always the same in a neutral atom
- ☐ All four statements are true

Question 31 /1

Enter the proper number of significant figures into the first blank and the exponent into the second blank.

Higher frequencies allow faster transmission of data through WI FI, also known as bandwidth. Therefore, a frequency of 5 x10^{9} Hz is the most desired for data connections. Calculate the amount of energy required for this amount of bandwidth using Plank's constant.

E = hv (Plank's constant, h = 6.626 x 10^{-34} m^2 kg/s)

Energy of WiFi = _____ x 10 ____ Joules

Name: _____

Question 32 /1

The charge to mass ratio of a electron was discovered using the

- ☐ Oil Drop experiment by Millikan
- ☐ Cathode Ray Tube experiment by J.J. Thompson
- ☐ Gold Foil experiment by Rutherford
- ☐ Fussion Reaction by James Chadwick

Question 33 /1

Sugar dissolving in water is an example of

- ☐ a chemical property.
- ☐ a physical property.
- ☐ a physical change.
- ☐ a chemical change.

Name: _____

Question 34 /1

Which experiment proved that positively charged particles were located in the nucleus?

- [ ] Gold Foil Experiment
- [ ] Oil Drop Experiment
- [ ] Cathode Ray Experiment
- [ ] Fussion Reaction Experiment

Question 35 /1

Carbon dioxide sublimes at -78.4 °C. This is an example of

- [ ] a physical property
- [ ] a chemical property

Name: _____

Question 36 /1

A pH indicator changes color when dry ice is added to water, indicating the solution has become acidic. Is this a physical change or a chemical change?

- ☐ physical change
- ☐ chemical change

Question 37 /1

A 16 gram sample of Uranium-238 takes 13.4 billion years to decay to 2 grams remaining. What is the half life of this isotope?

- ☐ 6.7 billion years
- ☐ 40.2 billion years
- ☐ 4.46 billion years
- ☐ 17.8 billion years

Name: _____

Question 38 /1

Which of the following correctly lists the number of protons, electrons, and neutrons in a $^{59}_{28}Ni$ atom?

- ☐ 28, 28, 28
- ☐ 28, 28, 31
- ☐ 28, 28, 59
- ☐ 59, 59, 28
- ☐ 59, 59, 31

Question 39 /1

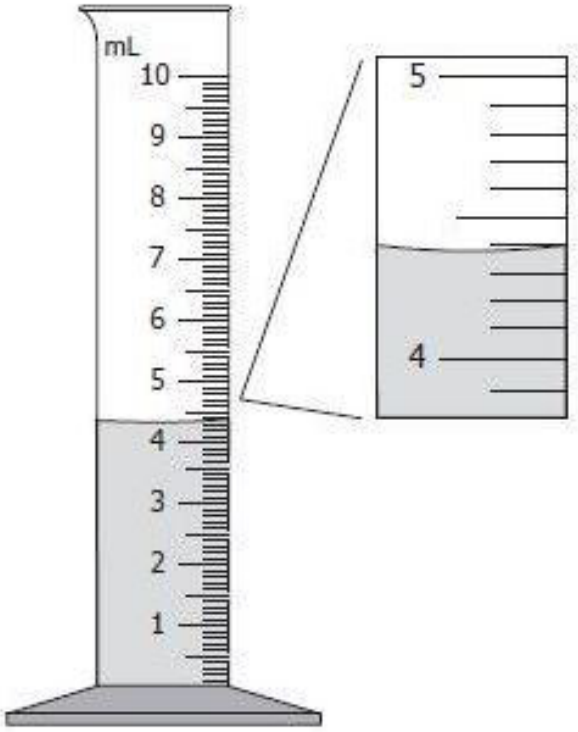
Gold is called a noble metal because it does not corrode like other metals.

- ☐ physical property
- ☐ chemical property

Name: _____

Question 40 /1

What is the volume of the water in this graduated cylinder?



- [ ] 4.40 ml
- [ ] 4.39 ml
- [ ] 4.04 ml
- [ ] 5.61 ml

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Instructions for grading: Grade each question and tally the score to obtain the total test points. If the factor does not equal 1, multiply the total points by the factor to obtain the student's final score.

Question 1

A student hypothesizes that silicon (Si) will have similar chemical properties to germanium (Ge). The periodic table supports this hypothesis by indicating that –

☑ silicon and germanium have the same numbers of valence electrons

1 possible pts.

Question 2

Which of the following is the same for both an atom of radioactive iodine and an atom of stable iodine?

I. Mass number
II. Atomic number
III. Number of neutrons
IV. Chemical properties
V. Half life

☑ II and IV only

1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 3

What process would cause thorium-230 to decay to radium-226?

☑ alpha decay

1 possible pts.

Question 4

According to the Bohr model of the atom, a single electron from a hydrogen atom

☑ can jump to higher energy orbitals and fall back down again

1 possible pts.

Question 5

True or **False**: According to Democritus, a single atom exhibits the same chemical and physical properties as the element from which it came.

☑ True

1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 6

Radioactive iodine-131, often used in cancer treatments, decays according to the following equation with a half-life of 8 days. If 1.00 µg of $^{131}_{53}I$ is injected into a cancer patient. Determine the amount remaining after 24 days.

☑ 0.125 µg remaining

1 possible pts.

Question 7

The reaction times for an experiment are recorded below:

Trial #	Reaction Time
1	30.3 sec
2	34.7 sec
3	28.5 sec

The actual expected reaction time was 31.0 seconds. The results were

☑ **accurate but not precise**

1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 8

If $^{214}_{82}Pb$ undergoes beta decay, and then the product of this decay process undergoes another beta decay, what is the end result (in addition to a beta particle)?

☑ $^{214}_{84}Po$

1 possible pts.

Question 9

The half-life of thorium-227 is 18.72 days. How old is the sample, if 3 half lives have occured?

☑ 56.16 days

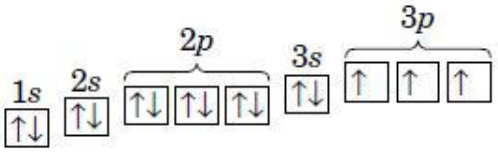
1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 10

Which of the following orbital notations for phosphorus is correct?

☑ 

1 possible pts.

Question 11

The isotope shown below has

$$^{25}_{12}Mg^{+2}$$

☑ 12 protons, 13 neutrons, and 10 electrons

1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 12

Select the abbreviated electron configuration for Tin.

☑ $[Kr]\ 5s^2\ 4d^{10}\ 5p^2$

1 possible pts.

Question 13

Which subatomic particle increases the stability of the nucleus?

☑ neutron

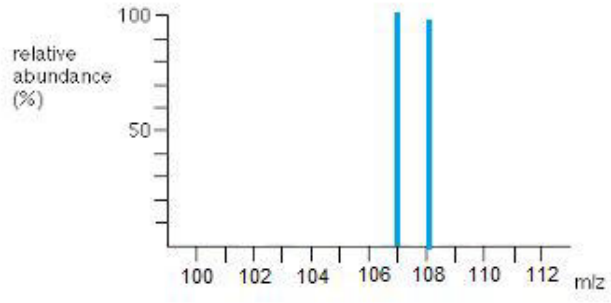
1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 14

The mass spectrum of which element is shown below?



☑ Ag

1 possible pts.

Question 15

Isotopes are different forms of the same element that contain equal numbers of _Protons_ but different numbers of _Neutrons_ in their nuclei.

1 possible pts. / partial credit

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 16

In 1932, beryllium atoms were bombarded with alpha particles. An unknown radiation was produced. This radiation was composed of particles with a neutral electrical charge and the approximate mass of a proton. This particle became known as the _____.

☑ neutron

1 possible pts.

Question 17

What type of radiation occured in the nuclear reaction below?

$$^{9}_{4}\text{Be} \rightarrow {}^{9}_{4}\text{Be} + \_\_\_\_\_$$

☑ gamma decay

1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 18

Which image of the atom supports the Plum Pudding Model?

☑ 

1 possible pts.

Question 19

According to the periodic table an isotope of carbon always has 6 **protons.**

1 possible pts.

Question 20

Oxygen can combine with carbon to form two compounds, carbon monoxide and carbon dioxide. The ratio of the masses of oxygen that can combine with a given mass of carbon is 1:1 and 1:2, respectively. This is an example of

☑ John Dalton's First Atomic Theory

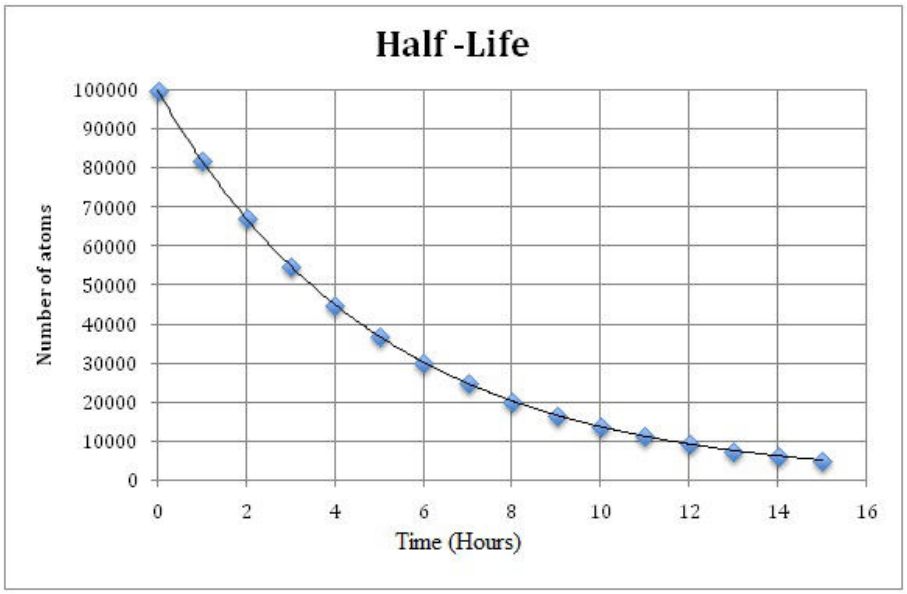
1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 21

How much time has passed when two half-lives have occured?



☑ 7.0 hours

1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 22

A three-dimensional region around a nucleus where an electron may be found is called a(n)

☑ orbital

1 possible pts.

Question 23

How many half lives have occured if 300 grams of a radioactive isotope decays until 9.375 grams is remaining?

☑ 5 half lives

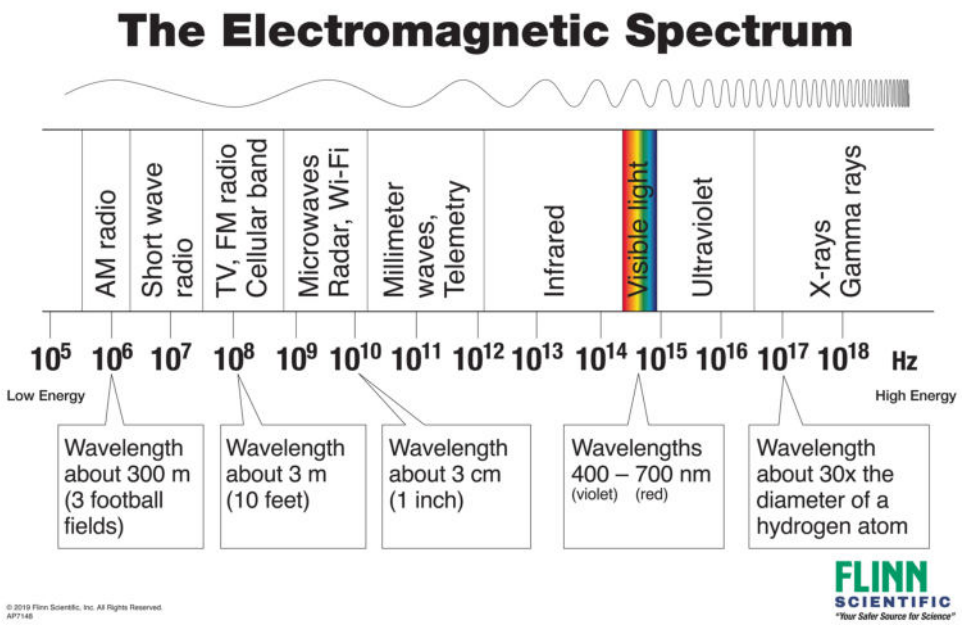
1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 24

According to the Electromagnetic Spectrum, which of the following has the longest wavelength?



☑ Red Light

1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 25

Choose the minimum thickness of material necessary to stop an alpha particle:

☑ a sheet of paper

1 possible pts.

Question 26

According to the periodic table, a neutral atom of nitrogen will have 7 **electrons.**

1 possible pts.

Question 27

An atom that has an atomic number of 19 and a mass number of 40 would be an isotope of which element?

☑ Potassium (K)

1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 28

A hypothetical element consists of three isotopes in the following relative abundance. What would the average atomic mass of the element be?

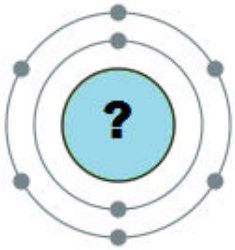
Isotope #1	30.00 %	30.00 amu
Isotope #2	50.00 %	32.00 amu
Isotope #3	20.00 %	35.00 amu

☑ 32.00 amu

1 possible pts.

Question 29

Which element is represented by the Bohr Model below:



☑ oxygen

1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 30

Which one of the following statements is FALSE?

☑ The number of protons and neutrons is always the same in a neutral atom

1 possible pts.

Question 31

Enter the proper number of significant figures into the first box. The second box is for the exponent.

Higher frequencies allow faster transmission of data through WI FI, also known as bandwidth. Therefore, a frequency of 5 x10^{9} Hz is the most desired for data connections. Calculate the amount of energy required for this amount of bandwidth using Plank's constant. E = hv (Plank's constant, h = 6.626 x 10^{-34} m^2 kg/s)

Energy of WiFi = 3 **x 10** -24 **Joules**

1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 32

The charge to mass ratio of a electron was discovered using the

☑ Oil Drop experiment by Millikan

1 possible pts.

Question 33

Sugar dissolving in water is an example of

☑ a physical change.

1 possible pts.

Question 34

Which experiment proved that positively charged particles were located in the nucleus?

☑ Gold Foil Experiment

1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 35

Carbon dioxide sublimes at -78.4 °C. This is an example of

☑ a physical property

1 possible pts.

Question 36

A pH indicator changes color when dry ice is added to water, indicating the solution has become acidic. Is this a physical change or a chemical change?

☑ chemical change

1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 37

A 16 gram sample of Uranium-238 takes 13.4 billion years to decay to 2 grams remaining. What is the half life of this isotope?

☑ 4.46 billion years

1 possible pts.

Question 38

Which of the following correctly lists the number of protons, electrons, and neutrons in a $^{59}_{28}Ni$ atom?

☑ 28, 28, 31

1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 39

Gold **is called a noble metal because it does not corrode like other metals.**

☑ chemical property

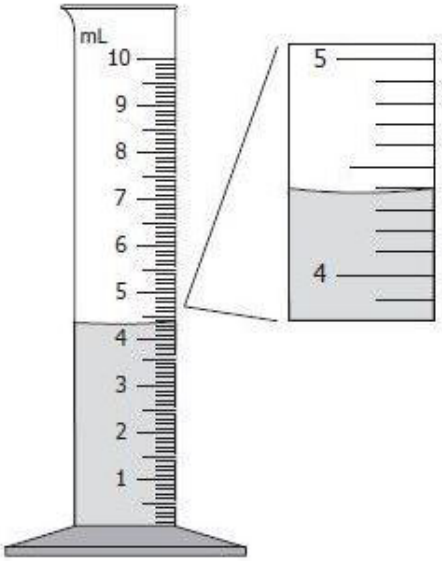
1 possible pts.

Answer Key

Possible Points: 40 Factor: x2.50 Test Value: 100

Question 40

What is the volume of the water in this graduated cylinder?



☑ 4.39 ml

1 possible pts.