Deep Run High School

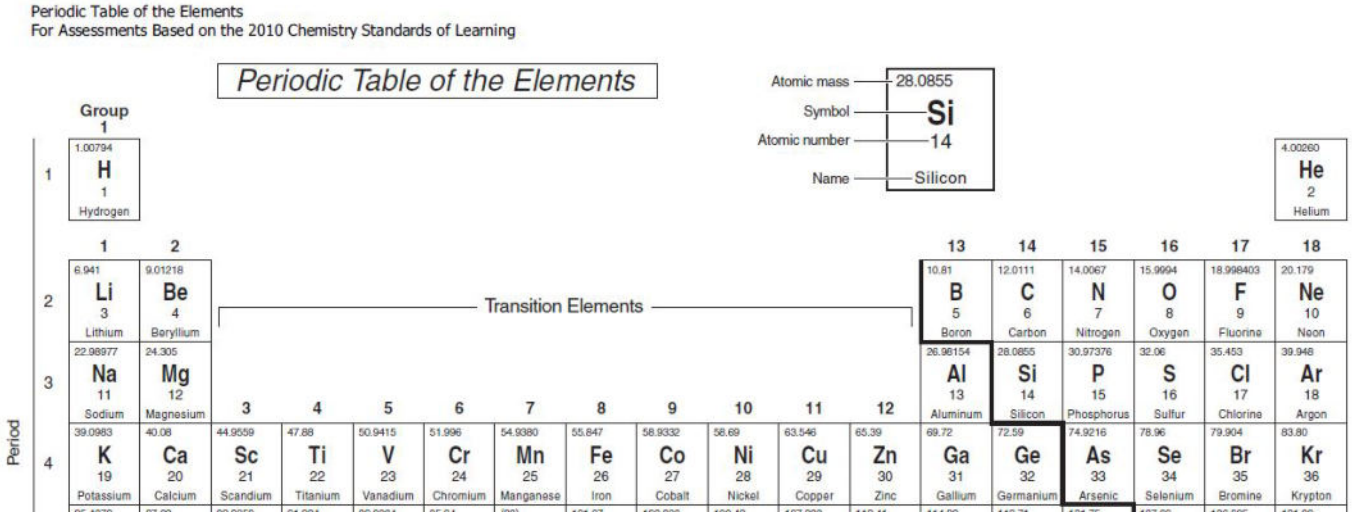
Unit 3 Test

ID: **9900**

Name: _____ Score: / 100

Question 1 /1

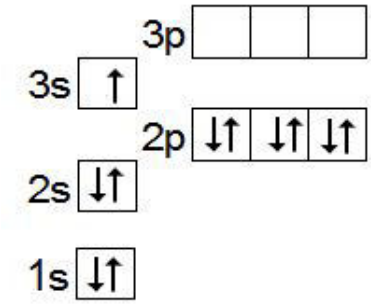
According to the periodic table an isotope of carbon always has _____ protons.



Name: _____

Question 2 /1

Which element has the following Aufbau electron configuration?



- ☐ lithium
- ☐ boron
- ☐ scandium
- ☐ sodium

Name: _____

Question 3 /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

Question 4 /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

Name: _____

Question 5 /1

Chlorine **has two stable isotopes - ^{35}Cl and ^{37}Cl. The average atomic mass listed on the periodic table is 35.453 amu. Based on this information, which of the following statements is most accurate?**

- ☐ The percent abundance of ^{35}Cl is less than the percent abundance of ^{37}Cl.
- ☐ The percent abundance of ^{35}Cl is equal to the percent abundance of ^{37}Cl.
- ☐ The percent abundance of ^{35}Cl is greater than the percent abundance of ^{37}Cl.
- ☐ The percent abundance of ^{35}Cl is inversely proportional to the percent abundance of ^{37}Cl.

Question 6 /1

What is the correct electron configuration for a silicon atom?

- ☐ $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$
- ☐ $1s^2\ 2s^2\ 3s^2\ 2p^6\ 3p^2$
- ☐ $1s^2\ 2s^2\ 2p^6\ 3s^4$
- ☐ $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 4p^2$

Name: _____

Question 7 /1

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

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

Question 8 /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 9 /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

Question 10 /1

Which subatomic particle increases the stability of the nucleus?

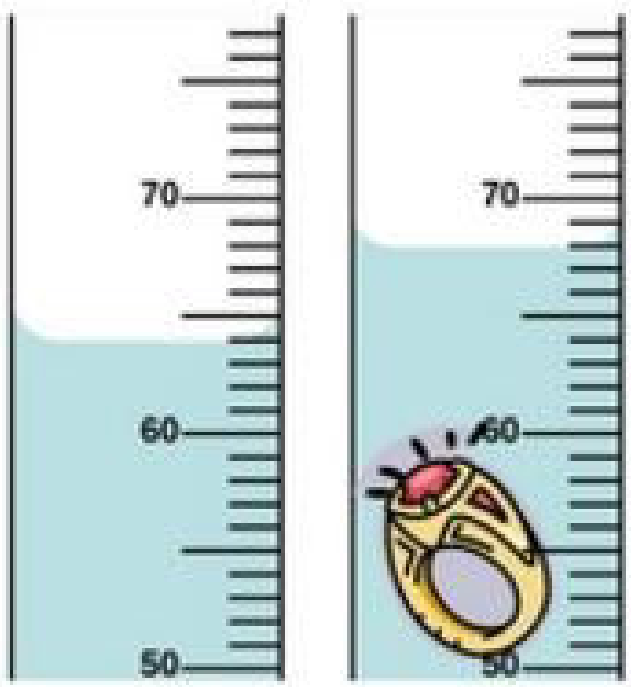
- ☐ electron
- ☐ proton
- ☐ ion
- ☐ neutron

Name: _____

Question 11 /1

Record the volume of the ring to the correct number of significant figures.

_____



Name: _____

Question 12 /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)?

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

Question 13 /1

Write the proper sig figs in the first blank and the exponent in 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 14 /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 15 /1

Use the word bank below to complete this sentence.

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

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

Name: _____

Question 16 /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

Question 17 /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 18 /1

The isotope shown below has

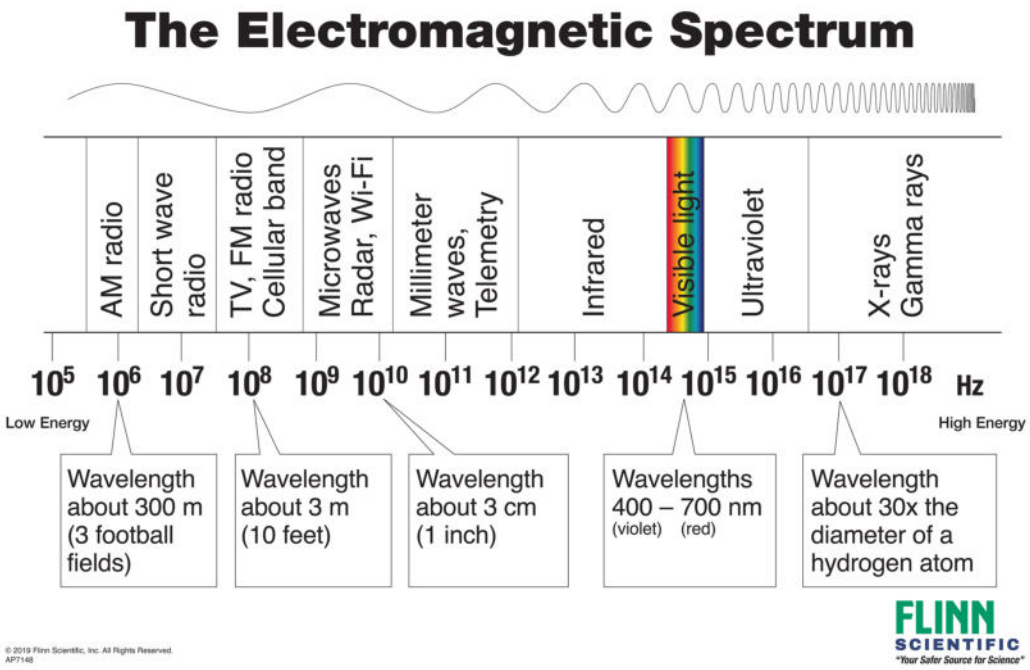
$$^{25}_{12}Mg^{+2}$$

- ☐ 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

Name: _____

Question 19 /1

According to the Electromagnetic Spectrum, which of the following exhibits the most energy?



- [ ] Microwaves
- [ ] AM Radio waves
- [ ] Infrared light waves
- [ ] X-rays

Name: _____

Question 20 /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 21 /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 22 /1

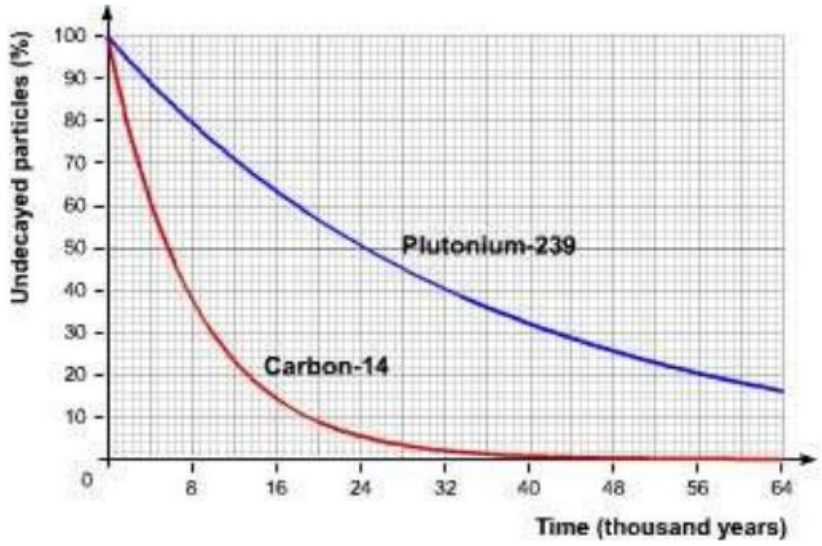
Which of the following elements is a halogen?

- ☐ Hydrogen (H)
- ☐ Fluorine (F)
- ☐ Nitrogen (N)
- ☐ Xenon (Xe)

Name: _____

Question 23 /1

Which isotope has the longest half life?



- ☐ plutonium-239
- ☐ carbon-14
- ☐ both isotopes are the same
- ☐ cannot be determined

Name: _____

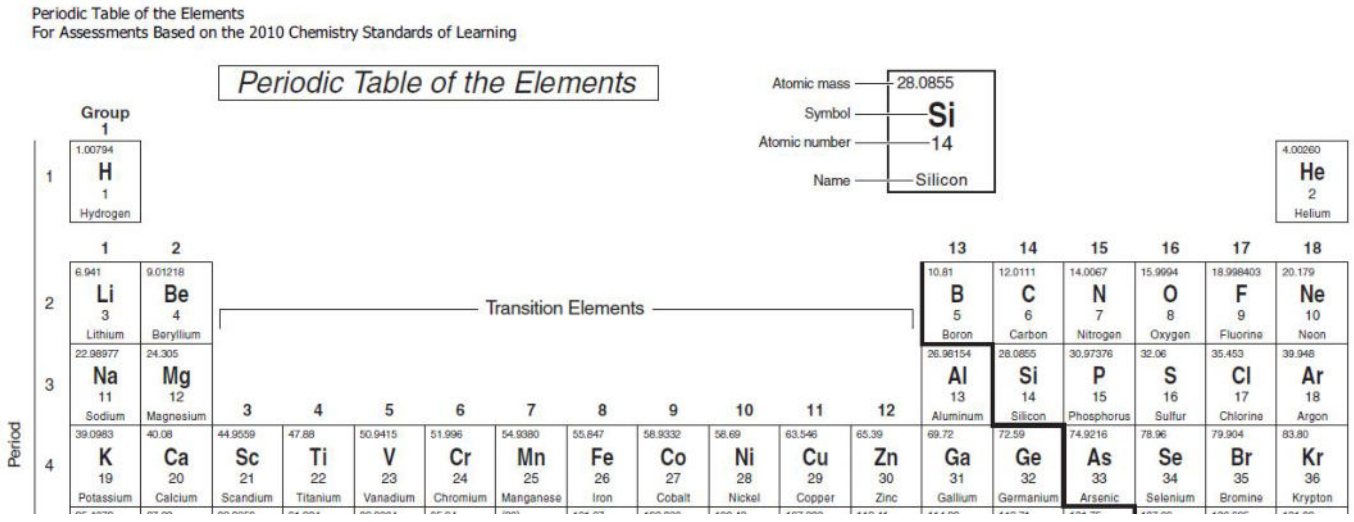
Question 24 /1

Sugar dissolving in water is an example of

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

Question 25 /1

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



Name: _____

Question 26 /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

Question 27 /1

Choose the atom below that is most likely to be stable:

- ☐ $^{8}_{3}Li$
- ☐ $^{10}_{5}B$
- ☐ $^{29}_{15}P$
- ☐ $^{18}_{18}Ar$

Name: _____

Question 28 /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

/1

Question 29

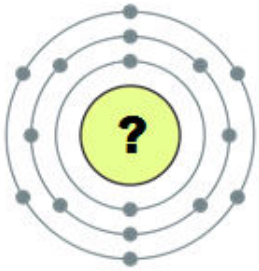
What process would cause thorium-230 to decay to radium-226?

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

Name: _____

Question 30 /1

Which element is represented by the Bohr Model below:

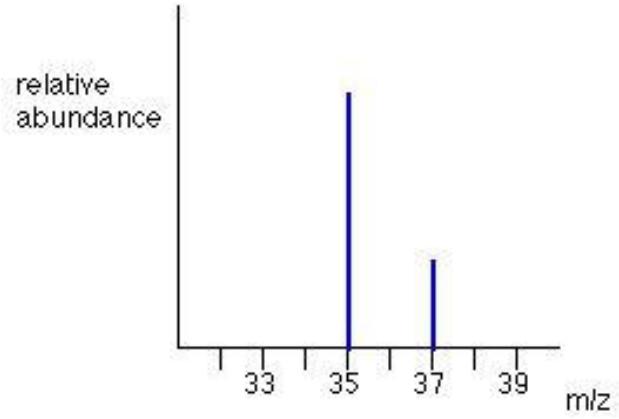


- ☐ selenium
- ☐ sulfur
- ☐ phosphorus
- ☐ carbon

Name: _____

Question 31 /1

The mass spectrum below belongs to



- [ ] bromine isotopes
- [ ] chlorine isotopes
- [ ] rubidium isotopes
- [ ] krypton isotopes

Name: _____

Question 32 /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

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

Question 33 /1

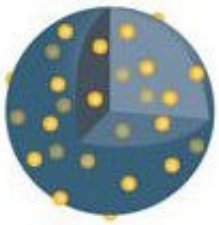
A pH indicator changes color when dry ice is added to water, indicating the solution has become acidic. Is this a physical change or a chemical change?

- ☐ physical change
- ☐ chemical change

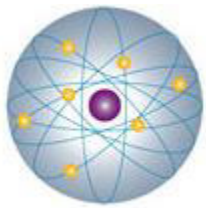
Name: _____

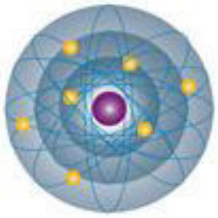
Question 34 /1

Which image of the atom supports the Plum Pudding Model?

☐ 

☐ 

☐ 

☐ 

Name: _____

Question 35 /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 xed distance from the nucleus
- ☐ exists in many different orbitals at the same time
- ☐ is located in the positively charged nucleus.

Question 36 /1

In order for an atom to be neutral,

- ☐ the number of protons must equal the number of neutrons.
- ☐ the number of protons must equal the number of electrons.
- ☐ the number of neutrons must be greater than the number of electrons.
- ☐ the number of neutrons must be greater than the number of protons.

Name: _____

Question 37 /1

Which part of Dalton's First Atomic Theory of Matter was revised due to the discovery of neutrons?

- ☐ All atoms of the same element are identical
- ☐ Atoms are tiny indivisible particles
- ☐ Compounds are made of two or more atoms
- ☐ Chemical reactions involve rearranging chemical bonds

Question 38 /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

Name: _____

Question 39 /1

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

- ☐ a physical property
- ☐ a chemical property

Question 40 /1

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

- ☐ physical property
- ☐ chemical property

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.

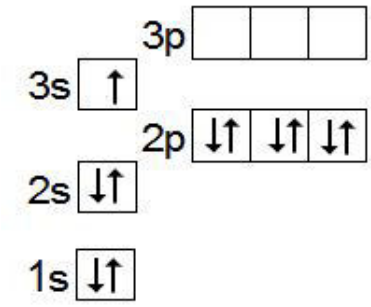
Question 1

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

1 possible pts.

Question 2

Which element has the following Aufbau electron configuration?



☑ sodium

1 possible pts.

Answer Key

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

Question 3

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 4

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

☑ a sheet of paper

1 possible pts.

Answer Key

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

Question 5

Chlorine has two stable isotopes - ^{35}Cl and ^{37}Cl. The average atomic mass listed on the periodic table is 35.453 amu. Based on this information, which of the following statements is most accurate?

☑ The percent abundance of ^{35}Cl is greater than the percent abundance of ^{37}Cl.

1 possible pts.

Question 6

What is the correct electron configuration for a silicon atom?

☑ $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$

1 possible pts.

Answer Key

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

Question 7

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

☑ orbital

1 possible pts.

Question 8

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 9

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 10

Which subatomic particle increases the stability of the nucleus?

☑ neutron

1 possible pts.

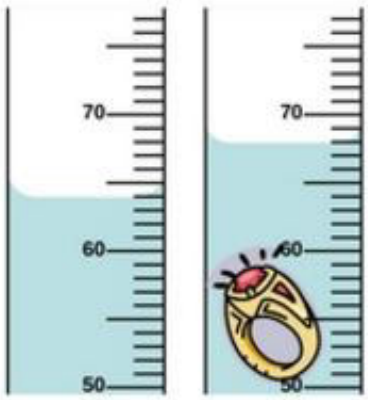
Answer Key

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

Question 11

Record the volume of the ring to the correct number of significant figures.

4.0ml, 4.0 ml



1 possible pts.

Answer Key

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

Question 12

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 13

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 14

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.

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

What type of radiation occured in the nuclear reaction below?

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

☑ gamma decay

1 possible pts.

Question 17

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.

Answer Key

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

Question 18

The isotope shown below has

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

☑ 12 protons, 13 neutrons, and 10 electrons

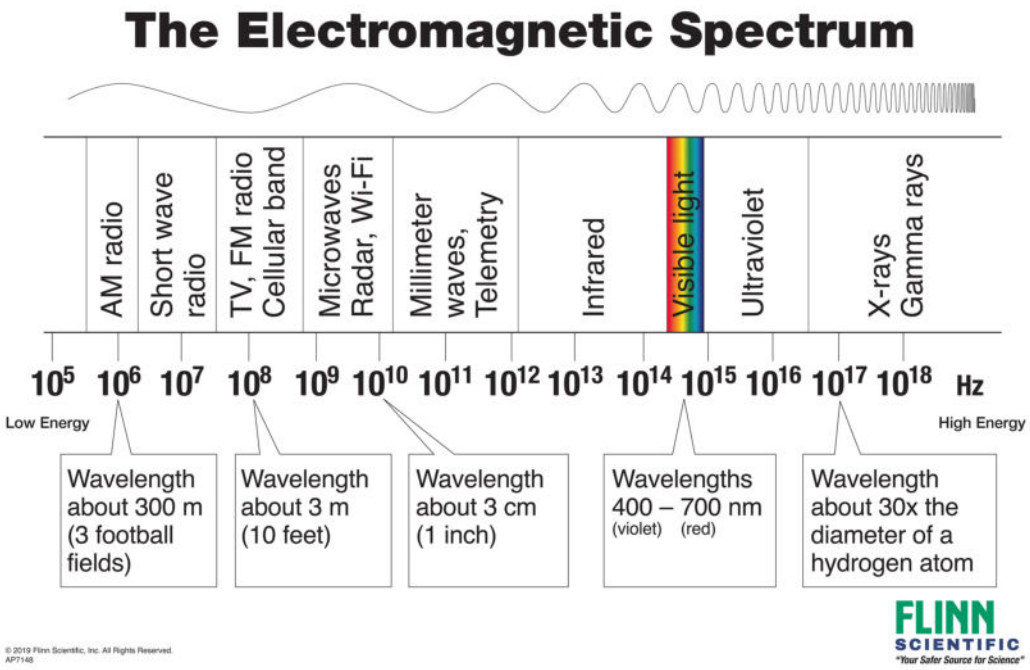
1 possible pts.

Answer Key

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

Question 19

According to the Electromagnetic Spectrum, which of the following exhibits the most energy?



☑ X-rays

1 possible pts.

Answer Key

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

Question 20

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

☑ Gold Foil Experiment

1 possible pts.

Question 21

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.

Question 22

Which of the following elements is a halogen?

☑ Fluorine (F)

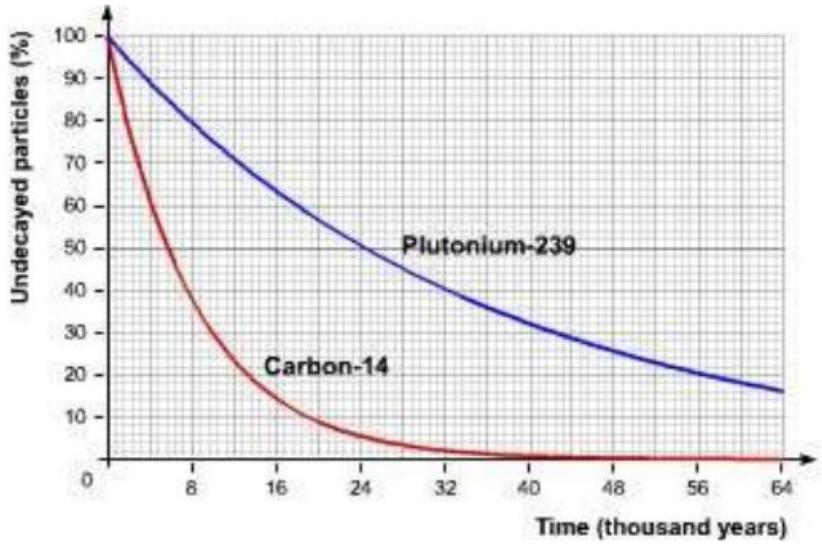
1 possible pts.

Answer Key

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

Question 23

Which isotope has the longest half life?



☑ plutonium-239

1 possible pts.

Question 24

Sugar dissolving in water is an example of

☑ a physical change.

1 possible pts.

Answer Key

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

Question 25

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

1 possible pts.

Question 26

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 27

Choose the atom below that is most likely to be stable:

☑ $^{10}_{5}B$

1 possible pts.

Question 28

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.

Question 29

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

☑ alpha decay

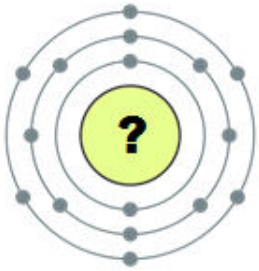
1 possible pts.

Answer Key

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

Question 30

Which element is represented by the Bohr Model below:



☑ sulfur

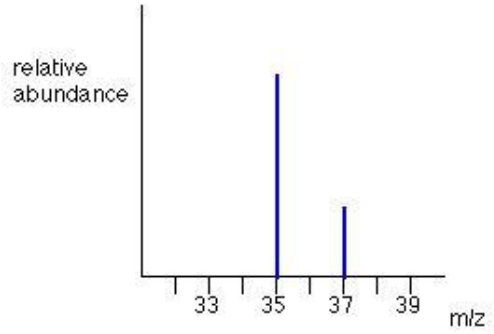
1 possible pts.

Answer Key

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

Question 31

The mass spectrum below belongs to



☑ chlorine isotopes

1 possible pts.

Answer Key

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

Question 32

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.

Question 33

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 34

Which image of the atom supports the Plum Pudding Model?

☑ 

1 possible pts.

Question 35

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 36

In order for an atom to be neutral,

☑ the number of protons must equal the number of electrons.

1 possible pts.

Answer Key

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

Question 37

Which part of Dalton's First Atomic Theory of Matter was revised due to the discovery of neutrons?

☑ All atoms of the same element are identical

1 possible pts.

Question 38

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

☑ Oil Drop experiment by Millikan

1 possible pts.

Question 39

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

☑ a physical property

1 possible pts.

Answer Key

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

Question 40

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

☑ chemical property

1 possible pts.