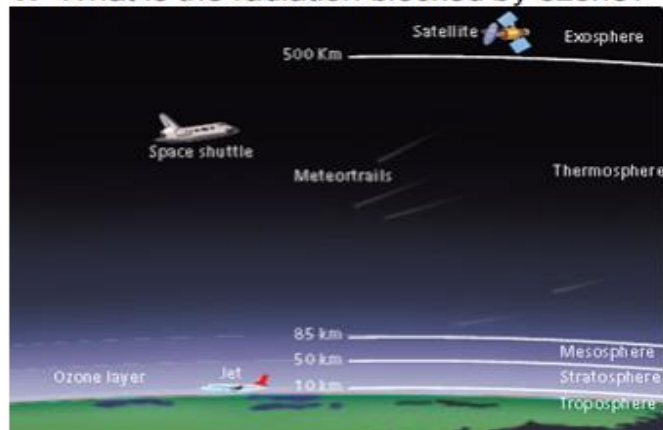


Science Grade 9 T1 Final Exam

Chapter 1

1. What is the radiation blocked by ozone?

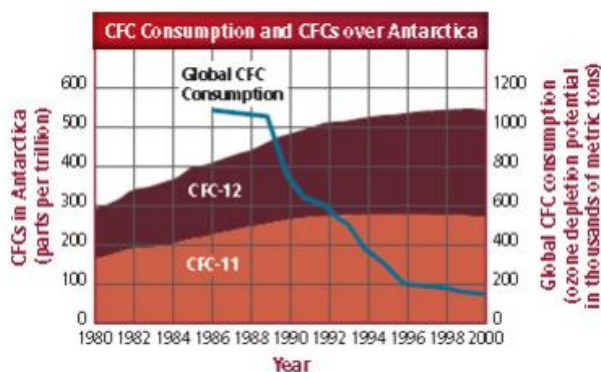


- A. ☐ infrared
- B. ☐ microwave
- C. ☒ ultraviolet
- D. ☐ alpha

2. What is the unit used to measure ozone in the atmosphere?

- A. ☒ dobson units
- B. ☐ pascals
- C. ☐ kilometers
- D. ☐ degrees Celsius

3. Look at the graph. In what year did global CFC consumption drop most dramatically?



- A. ☐ 1986
- B. ☒ 1989
- C. ☐ 1991
- D. ☐ 1996

4. What is the measurement of matter whose value depends on the force of gravity?

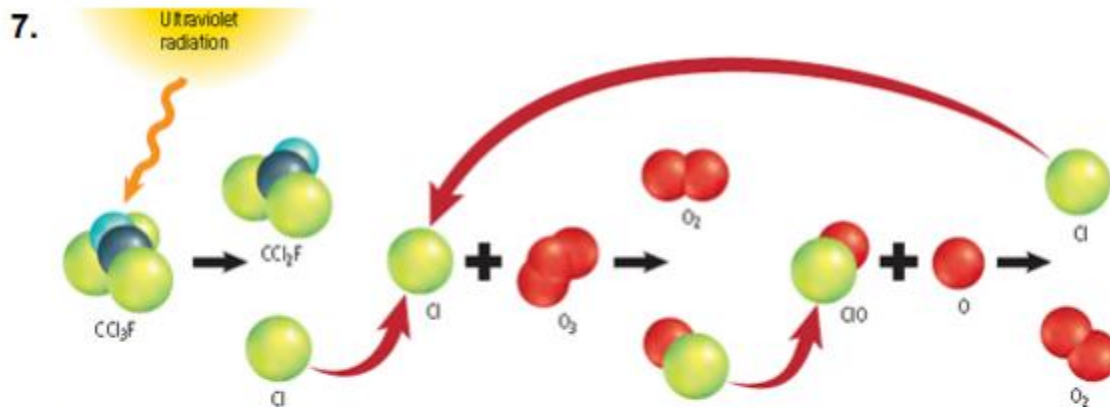
- A. ☐ mass
- B. ☐ volume
- C. ☐ energy
- D. ☒ weight

5. Chemists who study the chemistry of living organisms work in the field of _____.

- A. ☐ analytical chemistry
- B. ☐ physical chemistry
- C. ☐ organic chemistry
- D. ☒ biochemistry

6. A branch of chemistry that is concerned with how and why chemicals interact is _____.

- A. ☐ analytical chemistry
- B. ☐ biochemistry
- C. ☒ theoretical chemistry
- D. ☐ physical chemistry



In the model shown above, what event first releases chlorine?

- A. ☒ ultraviolet radiation strikes a CFC (CCl₃F)
- B. ☐ ultraviolet radiation strikes ozone (O₃)
- C. ☐ Oxygen (O) combines with chlorine monoxide (ClO)
- D. ☐ Chlorine (Cl) combines with ozone (O₃)

8. What is the name given to a set of controlled observations that test a proposed explanation?

- A. ☐ hypothesis
- B. ☒ experiment
- C. ☐ theory
- D. ☐ conclusion

9. A judgment based upon the results of an experiment is a _____.

- A. ☐ hypothesis
- B. ☐ theory
- C. ☐ variable
- D. ☒ conclusion

10. A _____ can be used to help visualize microscopic structures and events.

- A. ☐ variable
- B. ☐ hypothesis
- C. ☐ theory
- D. ☒ model

11. Suppose that you experimentally determine the mass of nylon formed as a result of each of several similar chemical processes. What are the measurements of mass called?

- A. ☐ qualitative data
- B. ☐ independent variables
- C. ☐ controls
- D. ☒ quantitative data

12. What is the name given to research that is undertaken to solve a specific problem?

- A. ☐ pure research
- B. ☐ theoretical research
- C. ☒ applied research
- D. ☐ technology

13. The study of Earth's atmospheric ozone and the effect of chlorofluorocarbons on ozone is an example of _____.

- A. ☐ technology
- B. ➡ applied research
- C. ☐ basic research
- D. ☐ theoretical research

14. In the laboratory, one should NEVER _____.

- A. ☐ ask questions
- B. ☐ know how to contact help
- C. ☐ wear safety goggles and a lab apron
- D. ➡ perform experiments without your teacher's permission.

15. Almost every situation you can imagine involves a chemist, because _____.

- A. ☐ chemists are nosy
- B. ➡ everything is made of matter
- C. ☐ chemists are well-paid
- D. ☐ ozone depletion is a problem

Chapter 2

1. In the SI system of measurement, there are seven _____ units

- A. ☐ metric
- B. ☐ English
- C. ☐ derived
- D. ☒ base

2. What is the temperature 51°C expressed in kelvins?

- A. ☐ 273.0 K
- B. ☐ 222 K
- C. ☐ 324°K
- D. ☒ 324 K

3. Use the conversion factor above to find the meters in 2.7×10^3 kilometers.

$$\frac{1 \text{ km}}{1000 \text{ m}}$$

- A. ☐ $2.7 \times 10^5 \text{ m}$
- B. ☐ $2.7 \times 10^{-3} \text{ m}$
- C. ☐ 2.7 m
- D. ☒ $2.7 \times 10^6 \text{ m}$

4. Which of the following conversion factors would be most useful in converting miles per gallon to kilometers per liter?

- A. ☐ 1 gallon/4 quarts
- B. ☐ 1 liter/1000 ml
- C. ☒ 1 mile/0.62 km
- D. ☐ 1 000 m/1 km

5. Which of the following numbers is equal to 2.70×10^{-4} ?

- A. ☒ 0.00027
- B. ☐ 0.675
- C. ☐ 27×10^{-3}
- D. ☐ 270

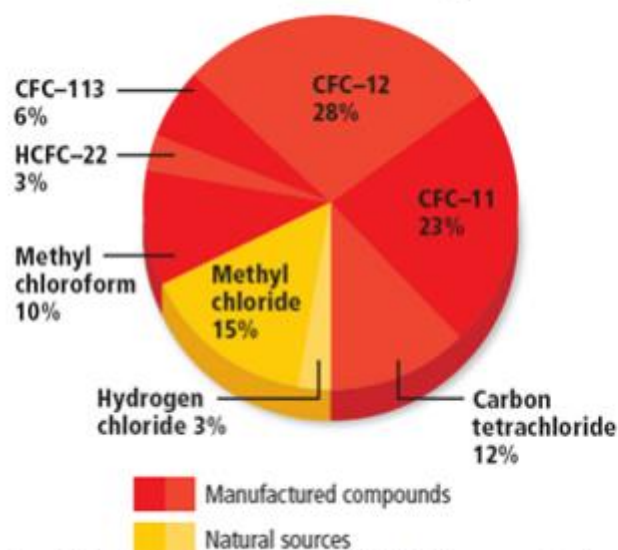
6. The closeness of an experimental value to an accepted value is its _____.

- A. ☒ accuracy
- B. ☐ precision
- C. ☐ percent error
- D. ☐ error

7. How many significant figures will there be when the density value is calculated from the following data? mass = 24.47g; volume = 13.2 mL

- A. ☐ 2
- B. ☒ 3
- C. ☐ 4
- D. ☐ 5

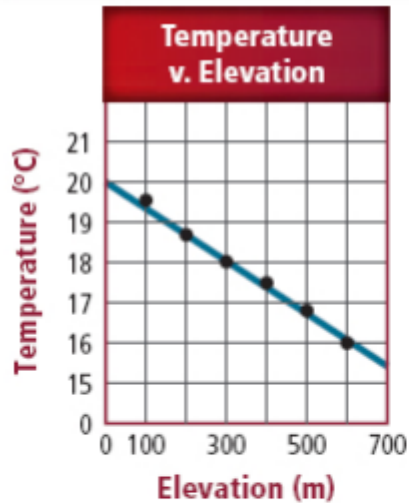
8. Chlorine in the Stratosphere



Look at the graph above. Which two substances are responsible for over half the chlorine in the stratosphere?

- A. ☐ CFC-12 and Methyl chloride
- B. ☐ HCFC-22 and CFC-11
- C. ☐ Carbon tetrachloride and Methyl chloroform
- D. ☒ CFC-12 and CFC-11

9.



Look at the graph above. What is the temperature at an elevation of 200 meters?

- A. ☐ 20 degrees Celsius
- B. ☐ 100 degrees Celsius
- C. ☒ 19 degrees Celsius
- D. ☐ 17 degrees Celsius

10. How is the slope of a linear graph calculated?

- A. ☐ slope = $(y_2 - y_1) \times 100$
- B. ☐ slope = $(x_2 - x_1) / 100$
- C. ☐ slope = $(x_2 - x_1) / (y_2 - y_1)$
- D. ☒ slope = $(y_2 - y_1) / (x_2 - x_1)$

1. Why were Democritus's ideas not science?



- A. ➡ They were not supported by experiment.
- B. ☐ They were partly incorrect.
- C. ☐ They went against the ideas of more influential philosophers.

2. Aristotle's ideas gained greater acceptance because _____.



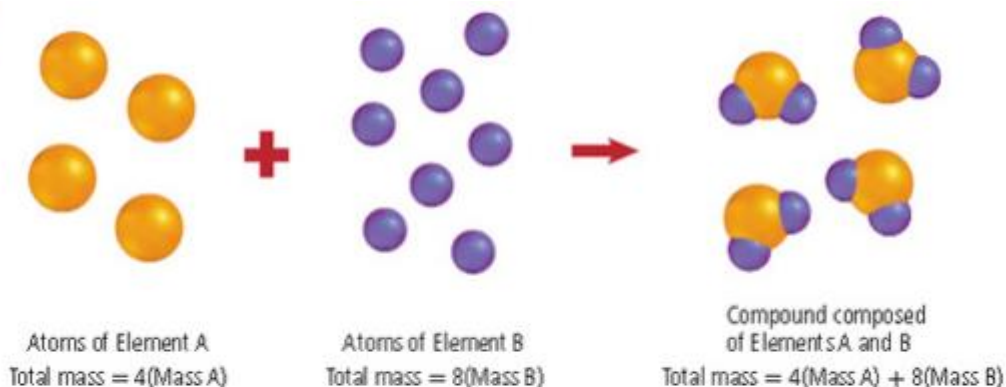
- A. ☐ he backed up his ideas with experimental evidence.
- B. ☐ he tested his ideas.
- C. ➡ he was one of the most influential philosophers of his time.
- D. ☐ empty space cannot exist.

3. Which of the following was not a feature of John Dalton's atomic research?



- A. ☐ careful observations and measurements
- B. ➡ discovery of the atom's internal structure
- C. ☐ mass ratios of elements involved in chemical reactions
- D. ☐ experiments that refined and supported his hypothesis

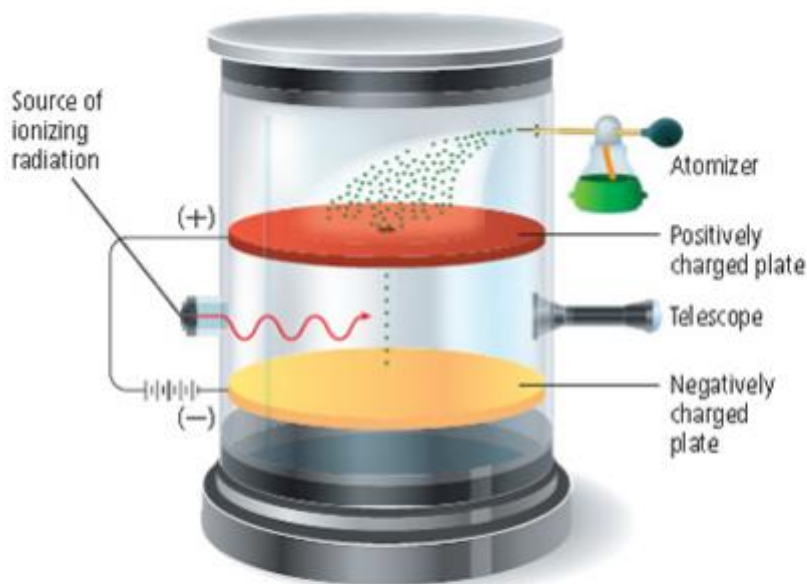
4.



In the figure above, if atoms of element A have a mass of 12 units and atoms of element B have a mass of 1 unit, what is the total mass of the compound composed of elements A and B?

- A. ☐ 13 units
- B. ☐ 14 units
- C. ☐ 20 units
- D. ☒ 56 units

5. In Millikan's Oil Drop Experiment (shown above), oil droplets are suspended in an electric field. What provides the downward force on the suspended droplets?



- A. ☐ the positive charge on the top plate
- B. ☐ the negative charge on the bottom plate
- C. ☒ gravity
- D. ☐ the strong nuclear force

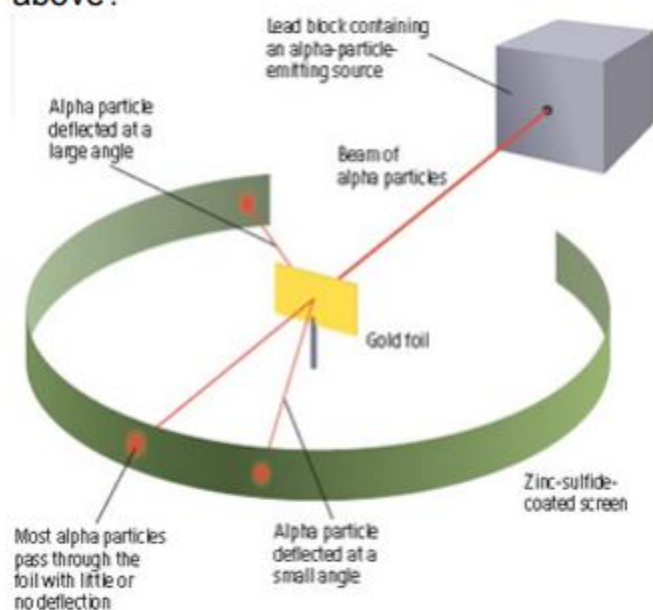
6. What is the negatively—charged particle in an atom?

- A. ☐ proton
- B. ☐ positron
- C. ☐ neutron
- D. ☒ electron

7. Which of the following statements is correct?

- A. ☐ An electron is about 2000 times more massive than a proton.
- B. ☒ A proton is about 2000 times more massive than an electron.
- C. ☐ A neutron will always be found orbiting the nucleus.
- D. ☐ The nucleus is negatively charged.

8. What can you infer about the alpha particle based on the diagram above?



- A. ☒ The alpha particle must have a positive electric charge.
- B. ☐ The alpha particle must have a negative electric charge.
- C. ☐ The alpha particle is about as massive as the gold nucleus.
- D. ☐ The alpha particle is repelled by electrons.

9. What is the name for atoms of an element that have different masses?
- ☒ isotopes
 - ☐ isomers
 - ☐ allotropes
 - ☐ alloforms
10. How many protons are present in an atom potassium-39?
- ☒ 19
 - ☐ 20
 - ☐ 39
 - ☐ 58
11. Which of the following is a correct statement about a neutral atom?
- ☐ Neutrons are present in the nucleus.
 - ☐ The atoms carry a positive or a negative charge.
 - ☒ The atom has the same number of proton and electrons.
 - ☐ The atom is radioactive.
12. Using information from the table, which type of radiation would be unaffected by an electric or magnetic field?

	Alpha	Beta	Gamma
Symbol	${}^4_2\text{He}$ or α	e^- or β	γ
Mass (amu)	4	$\frac{1}{1840}$	0
Mass (kg)	6.65×10^{-27}	9.11×10^{-31}	0
Charge	2+	1-	0

- ☐ alpha
- ☐ beta
- ☒ gamma
- ☐ all radiation is affected by electric and magnetic fields

13. What is the charge of a beta particle?

- A. ☐ 1^+
- B. ☐ 2^+
- C. ☒ 1^-
- D. ☐ 0

14. How do gamma rays differ from alpha particles and beta particles?

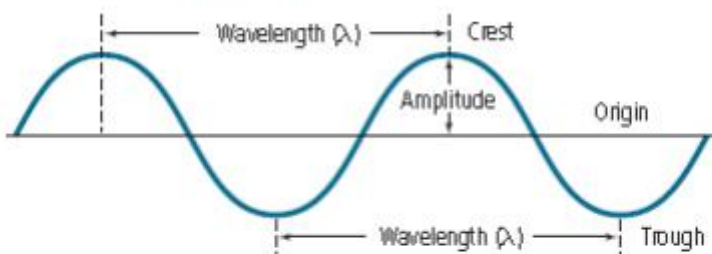
- A. ☒ Alpha particle and beta particle emissions result in the formation of new atoms, whereas gamma ray emissions do not.
- B. ☐ Gamma rays and beta particles result in the formation of new atoms, but alpha particles do not.
- C. ☐ Gamma rays and alpha particles result in the formation of new atoms, but beta particles do not.
- D. ☐ Gamma rays have mass, whereas alpha and beta particles do not.

15. Unlike chemical reactions, nuclear reactions produce _____.

- A. ☐ energy
- B. ☒ new elements
- C. ☐ molecules
- D. ☐ light

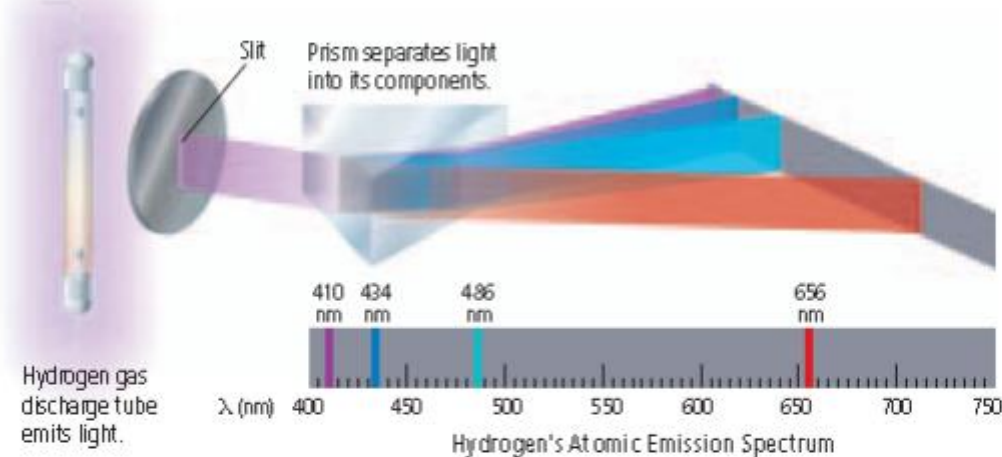
Chapter 5

1. The wavelength of a wave is measured from



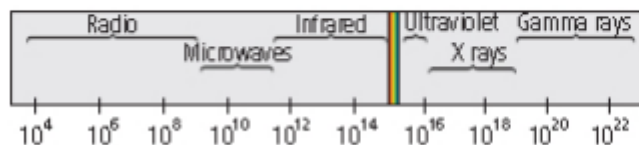
- A. ➡ crest to crest
- B. ○ crest to trough
- C. ○ origin to crest
- D. ○ origin to trough

2. What is the energy of a single photon of light from hydrogen's 656 nm emission? Use $h = 6.626 \times 10^{-34}$ Js and $c = 3.00 \times 10^8$ m/s.



- A. ○ 1.30×10^{-31} J
- B. ○ 1.45×10^{-48} J
- C. ○ 3.30×10^{18} J
- D. ➡ 3.03×10^{-19} J

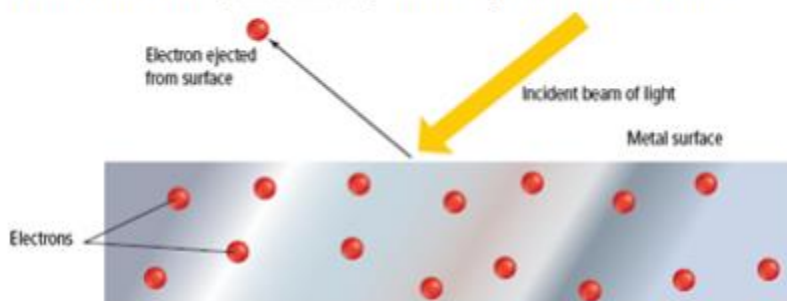
3. Which of the following electromagnetic waves has photons of the highest energy?



Frequency (ν) in hertz

- A. ☐ microwaves
- B. ☐ infrared
- C. ☒ x-rays
- D. ☐ ultraviolet

4. In the photoelectric effect, increasing the **frequency** of the light increases the _____ of the ejected electrons.



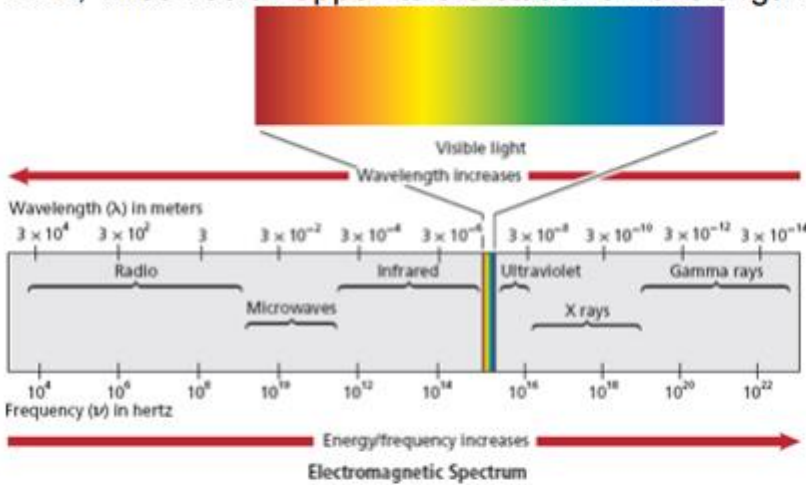
- A. ☐ number
- B. ☒ energy
- C. ☐ size
- D. ☐ wavelength

4. What is the maximum number of electrons that can be present in each principal energy level of hydrogen?

Principal Quantum Number (n)	Sublevels (Types of Orbitals) Present	Number of Orbitals Related to Sublevel	Total Number of Orbitals Related to Principal Energy Level (n^2)
1	s	1	1
2	s p	1 3	4
3	s p d	1 3 5	9
4	s p d f	1 3 5 7	16

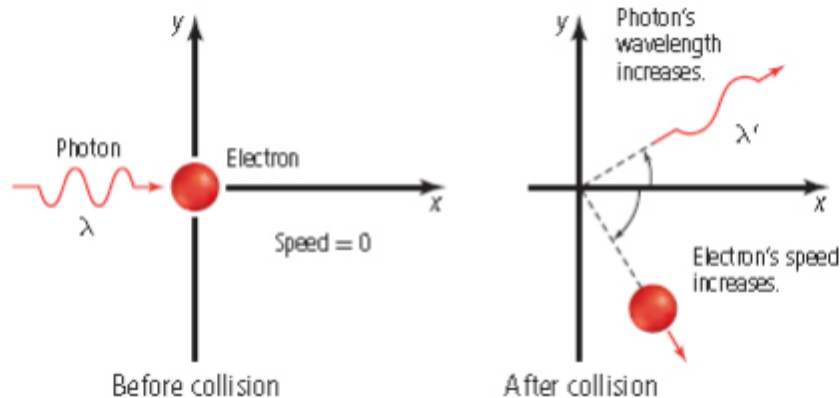
- A. ☐ n
- B. ☐ n^2
- C. ☐ $2n$
- D. ☒ $2n^2$

5. If a radio station were to increase its frequency from 94.5 MHz to 99.1 MHz, what would happen to the station's wavelength?



- A. ☐ The wavelength would not change.
- B. ☐ The wavelength would go up.
- C. ☒ The wavelength would go down.
- D. ☐ The wavelength would double.

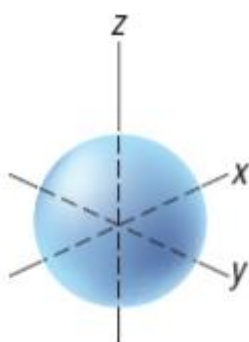
6.



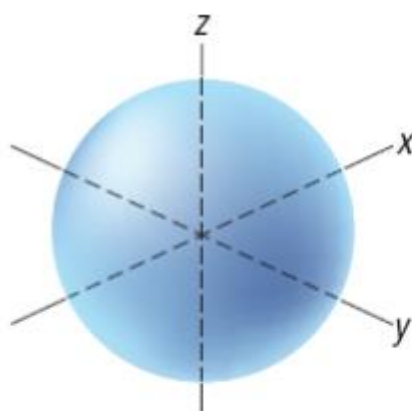
In the figure above, why must the photon's wavelength increase after the collision?

- A. ☐ The photon changes direction.
- B. ☐ The photon changes speed.
- C. ☒ The photon gives up some energy to the electron.
- D. ☐ The photon starts spinning.

7. The ground state of hydrogen corresponds to the _____.
- A. ☐ zeroeth energy level
 - B. ☒ first energy level
 - C. ☐ second energy level
 - D. ☐ highest energy level
8. Which of the following statements is true?
- A. ☐ Each set of d orbitals contains seven orbitals.
 - B. ☐ Each set of d orbitals can hold a maximum of 14 electrons.
 - C. ☐ The first energy level contains only s and p orbitals.
 - D. ☒ All s orbitals are spherically shaped.
9. What is the primary difference between the 1s and the 2s orbitals?



1s orbital



2s orbital

- A. ☐ shape
- B. ☒ size
- C. ☐ number of electrons
- D. ☐ number of neutrons

10. In the Bohr model of the hydrogen atom, which of the following transitions results in light you can see?



- A. ☐ $n = 6$ to $n = 1$
- B. ☒ $n = 6$ to $n = 2$
- C. ☐ $n = 6$ to $n = 3$
- D. ☐ $n = 6$ to $n = 4$

11. The principle that states each electron occupies the lowest energy orbital available is the _____.

- A. ☒ aufbau principle
- B. ☐ uncertainty principle
- C. ☐ exclusion principle
- D. ☐ photoelectric principle

12. The valence orbitals in an atom are the _____.

- A. ☐ innermost orbitals
- B. ☐ second energy level
- C. ☐ d orbitals
- D. ☒ outermost orbitals

13. How many valence electrons does a group 1A metal atom have?

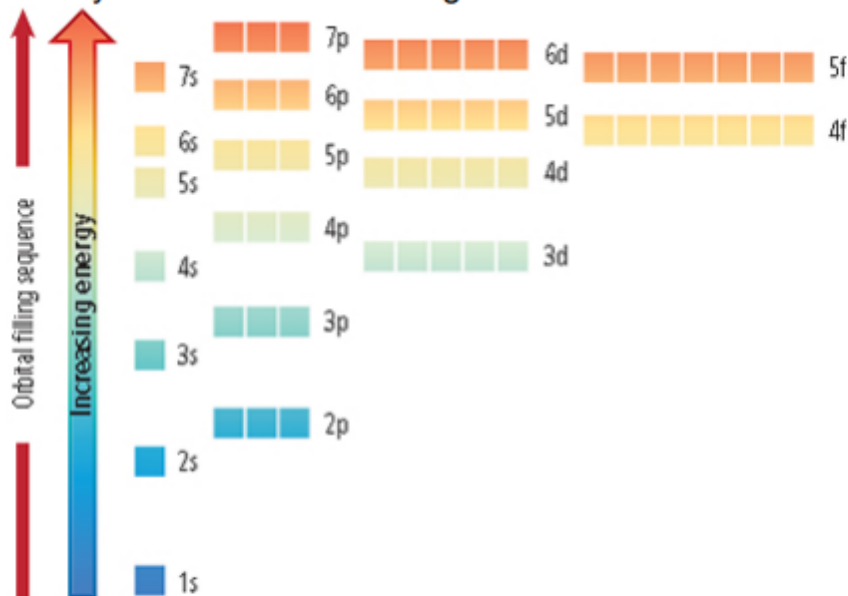
- A. ☒ 1
- B. ☐ 2
- C. ☐ 3
- D. ☐ 4

14. What would be the proper noble gas notation for oxygen?

Element	Atomic Number	Orbital Diagram 1s 2s 2p _x 2p _y 2p _z	Electron Configuration Notation
Hydrogen	1	$\boxed{\uparrow}$	$1s^1$
Helium	2	$\boxed{\uparrow\downarrow}$	$1s^2$
Lithium	3	$\boxed{\uparrow\downarrow} \quad \boxed{\uparrow}$	$1s^2 2s^1$
Beryllium	4	$\boxed{\uparrow\downarrow} \quad \boxed{\uparrow\downarrow}$	$1s^2 2s^2$
Boron	5	$\boxed{\uparrow\downarrow} \quad \boxed{\uparrow\downarrow} \quad \boxed{\uparrow}$	$1s^2 2s^2 2p^1$
Carbon	6	$\boxed{\uparrow\downarrow} \quad \boxed{\uparrow\downarrow} \quad \boxed{\uparrow} \quad \boxed{\uparrow}$	$1s^2 2s^2 2p^2$
Nitrogen	7	$\boxed{\uparrow\downarrow} \quad \boxed{\uparrow\downarrow} \quad \boxed{\uparrow} \quad \boxed{\uparrow} \quad \boxed{\uparrow}$	$1s^2 2s^2 2p^3$
Oxygen	8	$\boxed{\uparrow\downarrow} \quad \boxed{\uparrow\downarrow} \quad \boxed{\uparrow\downarrow} \quad \boxed{\uparrow} \quad \boxed{\uparrow}$	$1s^2 2s^2 2p^4$
Fluorine	9	$\boxed{\uparrow\downarrow} \quad \boxed{\uparrow\downarrow} \quad \boxed{\uparrow\downarrow} \quad \boxed{\uparrow\downarrow} \quad \boxed{\uparrow}$	$1s^2 2s^2 2p^5$
Neon	10	$\boxed{\uparrow\downarrow} \quad \boxed{\uparrow\downarrow} \quad \boxed{\uparrow\downarrow} \quad \boxed{\uparrow\downarrow} \quad \boxed{\uparrow\downarrow}$	$1s^2 2s^2 2p^6$

- A. ☐ $[\text{Ne}]2s^2 2p^4$
 B. ☐ $[\text{Ne}]2s^2 2p^1$
 C. ☒ $[\text{He}]2s^2 2p^4$
 D. ☐ $[\text{He}]2s^2 2p^1$

9. Why does the 4s orbital begin to fill before the 3d orbital?



- A. ☒ The 4s orbital is lower than the 3d orbital in the aufbau diagram.
 B. ☐ s orbitals always fill before d orbitals.
 C. ☐ The 4s orbital is to the left of the 3d orbital in the diagram.
 D. ☐ The 4s orbital has higher energy than the 3d orbital.

10. Which of the following statements expresses Hund's rule?

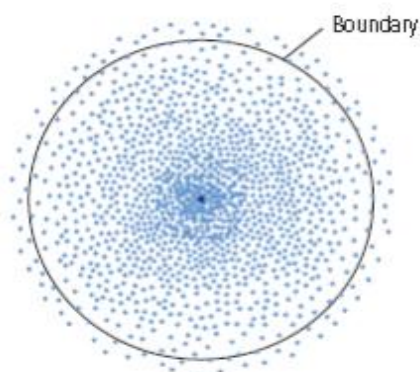
1. $\uparrow \square \square$ 2. $\uparrow \uparrow \square$ 3. $\uparrow \uparrow \uparrow$
 4. $\uparrow \downarrow \uparrow \uparrow$ 5. $\uparrow \downarrow \uparrow \downarrow$ 6. $\uparrow \downarrow \uparrow \downarrow$

- A. ☐ Electrons in orbitals must possess opposite spins.
 B. ☒ Single electrons with the same spin must occupy each equal-energy orbital before additional electrons with opposite spins can occupy the same orbitals.
 C. ☐ Electrons with the same spin fill all orbitals.
 D. ☐ P orbitals may contain up to six electrons.

8. What is an electron dot structure?

- A. ☒ An element symbol surrounded by dots representing its valence electrons.
 B. ☐ An element symbol surrounded by its innermost electrons.
 C. ☐ An element symbol with a positive charge.
 D. ☐ A filled noble gas in brackets plus the remaining electron configuration expressed by filled orbitals.

7.



In the figure above, why are there dots beyond the "boundary" of the atomic orbital?

- A. ☒ the boundary encloses the volume in which the electron is found 90% of the time
 B. ☐ the boundary is three-dimensional, while the picture shows only two dimensions
 C. ☐ experimental error
 D. ☐ the boundary encloses the volume in which the electron is found 50% of the time

