

The Material World:

Name: _____

SOLUTIONS

1) Atom & Elements: Review Exercises

1) What is the primary difference between Aristotle's and Democritus' theory of the structure of matter?

Aristotle: Matter can be cut forever

Democritus: Limit to how much matter can be cut, we would eventually reach the atom (cannot cut anymore)

2) Three conducting spheres M, N and P are used for an experiment in static electricity. The following observations are made: (refer to Static-Electric series)

- Sphere M is repelled by a glass rod which was rubbed with silk.
- Spheres M and N attract each other.
- Spheres N and P attract each other

What electrical charges are there on the three spheres?

M: (+) N: (-) P: (+)

3) Who discovered the nucleus? Rutherford

4) What is an electron? negatively charged subatomic particle

5) Are protons found inside or outside the nucleus? inside

6) What is the primary difference between Dalton and Thomson's atomic model? _____

Thomson's model took into consideration the existence of charge

7) What is the positive terminal of a cathode ray tube called? Anode

8) What is a neutral atom? same amounts of Protons & electrons

9) Is it possible to move protons from one piece of matter to another? No

10) What is the charge of an atom which loses 2 electrons? +2

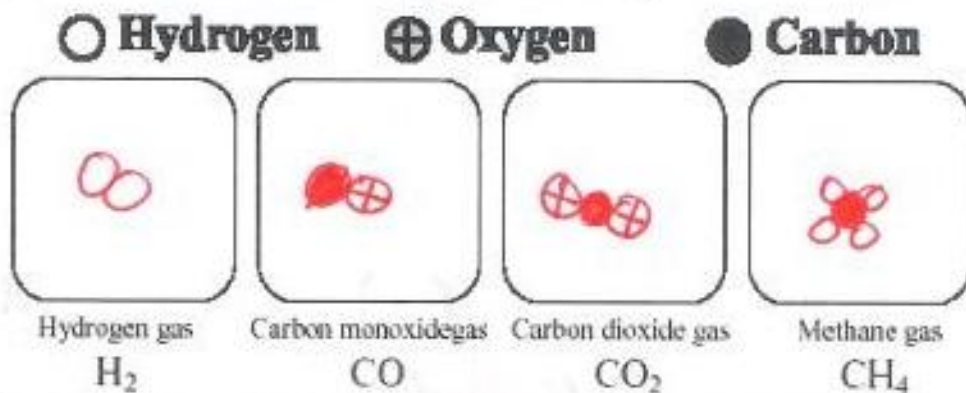
11) According to Bohr, the specific spectral lines emitted by different elements tells us what about electrons? Electrons occupy specific locations around the nucleus

12) Briefly define the following:

Element: Unique type of atom (like on Periodic table)

Molecule: is made up of 2 or more atoms that are joined

13) Using the symbols of the elements below, draw the following molecules.



14) When any two of the substances from the following list are rubbed together, the one that is higher on the list becomes negatively charged.

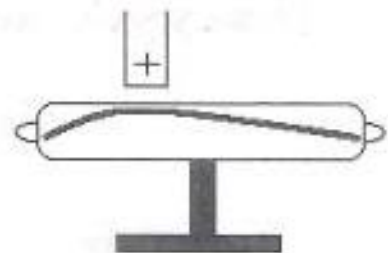
Rubber	Wood	- Rubber	Glass	Silk
(-)	(+)	- Silk	(+)	(-)
		- Wool		
		- Glass		

If you rub a rubber ball with a woolen sweater, how will the ball behave towards a glass ball that has been rubbed with a silk shirt?

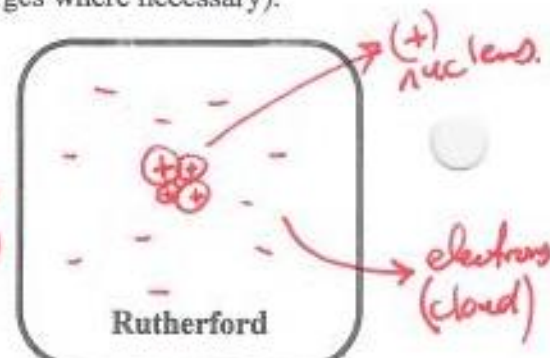
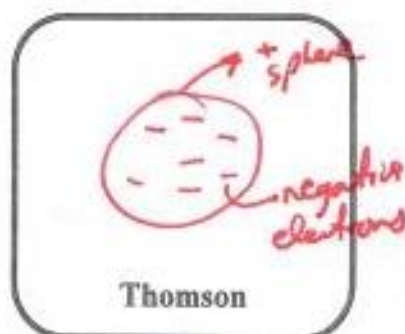
Rubber Glass → Attraction
(-) (+)

15) Describe what is happening in the following diagram where a positively charged plate is placed next to an active cathode ray tube:

Negative cathode rays are being attracted to positive plate.



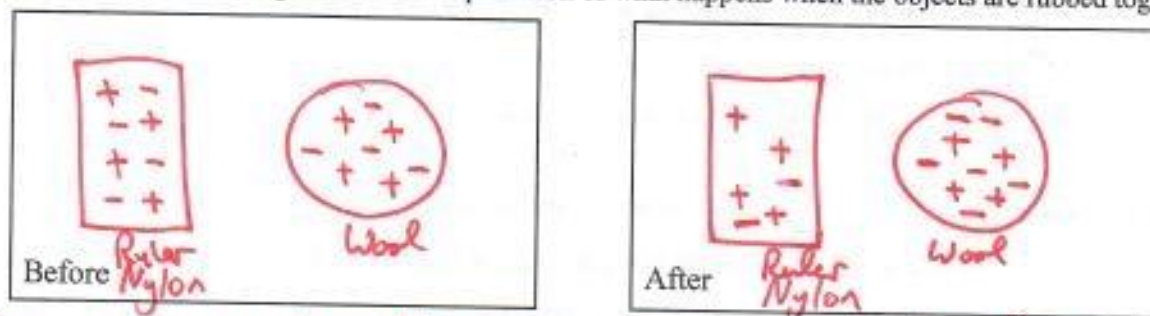
16) Draw the atom as proposed by the following scientists (include charges where necessary).



17) State 3 properties that atoms have as using Dalton's atomic theory of the structure of matter :

- ① Atoms of same element are all the same
- ② Atoms of different elements are different (different masses)
- ③ Different atoms can combine to form compounds.

18) Explain why a nylon ruler and a piece of wool become oppositely charged when they are rubbed together. Your answer should include a diagram of the situation before the objects are rubbed together, a diagram of the situation after they have been rubbed together and an explanation of what happens when the objects are rubbed together.



When rubbed together the nylon gives its electrons to the wool, giving the wool a more Negative charge, leaving the nylon with a more Positive charge.

19) For each of the questions below, choose one of the following possible charges (POSITIVE, NEGATIVE, OR NEUTRAL) for the object mentioned:

- a. After rubbing her feet on the carpet, Daniel's body acquired a charge: (-)
- b. A piece of plastic was repelled by a positive piece of plastic. (+)
- c. When rubber is rubbed with silk, rubber gains electrons from silk. That leaves silk with this charge: (+)
- d. This object has less protons than electrons: (-)
- e. Object A repels a positive charge. Object B attracts A. Object C repels B. C = (-)
- f. If little pieces of an object are attracted to a negatively charged comb, then the object can be either (+) or Neutral

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If an atom contains 33 protons and 42 neutrons:

What is the Atomic Mass?

75

What is the Atomic Number?

33

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Several models have been developed to represent matter. The following information relates to two of these models.

Model 1: Matter is continuous. Everything is made from four elements; water, fire, air and earth.

Model 2: Matter is composed of atoms. An atom consists of a nucleus in which protons and neutrons are found. Electrons spin in shells (energy levels) around the nucleus.

With whom is each of these models associated?

- a) The first with Democritus and the second with Dalton.
- b) The first with Democritus and the second with Rutherford and Bohr.
- c) The first with Aristotle and the second with Rutherford and Bohr.
- d) The first with Aristotle and the second with Dalton.

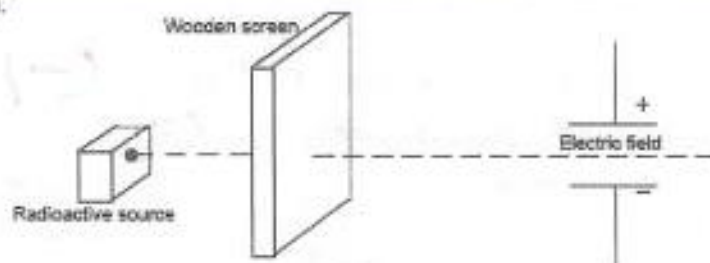
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Which of the following best describes Dalton's atomic theory?

- a) Matter consists of atoms containing positive and negative charges.
- b) Matter consists of atoms that contain a positive nucleus and electrons that move freely about the nucleus.
- c) Matter consists of atoms that contain a positive nucleus and electrons that move within different energy levels.
- d) Matter consists of atoms and all atoms of the same element are identical.

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The apparatus illustrated below is used to study the behaviour of alpha, beta and gamma radiation.



The radiation that passed through the wooden screen was not deflected as it passed through the electric field.

Which of the following types of radiation passed through the wooden screen?

- a) Alpha radiation
- b) Beta radiation
- c) Gamma radiation
- d) Alpha, beta and gamma radiation

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Which of the following are characteristics of Thomson's atomic model?

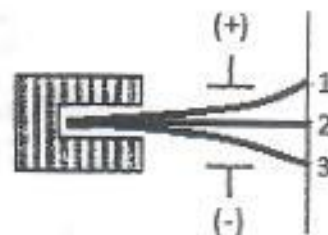
1. Electrons revolve around the nucleus.
2. The mass of an atom is concentrated in the nucleus.
3. Atoms can lose or gain electrons.
4. An atom is almost completely empty.
5. An atom is a positively charged sphere containing negative particles.
6. Electrons move within energy levels.

- a) 1 and 3
- b) 2 and 4
- c) 3 and 5
- d) 4 and 6

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The illustration below shows radiation from a radioactive point source passing through an electric field. Which of the following correctly describes the rays formed after the radiation has passed through the electric field?

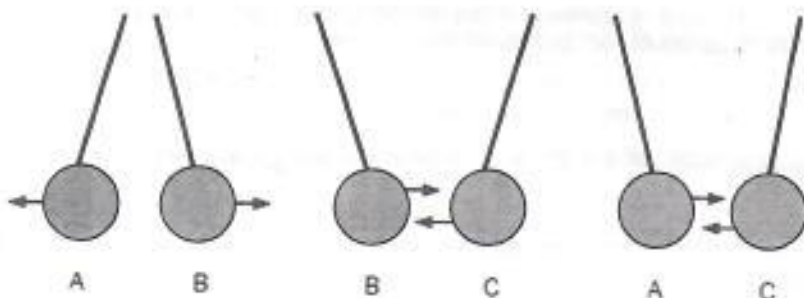
- a) Ray 1: negatively charged gamma rays
Ray 2: neutral alpha particles
Ray 3: positively charged beta particles
- b) Ray 1: negatively charged beta particles
Ray 2: neutral gamma rays
Ray 3: positively charged alpha particles
- c) Ray 1: positively charged beta particles
Ray 2: neutral gamma rays
Ray 3: negatively charged alpha particles
- d) Ray 1: negatively charged alpha particles
Ray 2: neutral beta particles
Ray 3: positively charged gamma rays



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Two charged spheres, A and B, are suspended.

When they are near one another, they repel each other. A third charged sphere, C, is brought close to B and an attraction is observed.



*A+B = Same charge
(since they repel)*

*C = opposite charge
of A+B
(since it attracts)*

From this experiment, what can be concluded about the charges of spheres A, B, and C?

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Which of the following is a characteristic common to both the Thomson and the Rutherford models of the atom?

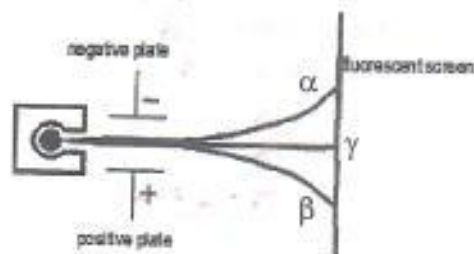
- a) The atom is made up of positive and negative charges.
- b) The negative charges are evenly distributed throughout the atom.
- c) The electrons revolve around the nucleus.
- d) The nucleus of atoms is made up of protons and neutrons.

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The results of an experiment dealing with radioactivity are illustrated below.

What can you conclude from this experiment?

- a) The atom consists of a nucleus and electrons.
- b) The alpha and beta radiation is electrically charged.
- c) The alpha and beta particles and the gamma rays have different masses.
- d) The alpha, beta, and gamma radiation can penetrate matter.



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The following statements refer to atomic models.

- There is a nucleus at the center of the atom.
- The nucleus is very small compared with the size of the entire atom.
- The electrons are located in energy levels around the atom.

Which of the statements above apply to Rutherford's atomic model?

- a) 1 and 2
- b) 1, 2, and 3
- c) 1 and 3
- d) 2 and 3

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Thomson's atomic model could account for only some of the facts about the behaviour of matter.

Which of the following statements describe the behaviour of matter according to Thomson's model?

1. Matter is electrically neutral.
2. Matter emits radiation.
3. Each element that makes up matter emits a unique spectrum of light.
4. There are different isotopes of each element.
5. An atom contains positive and negative charges.
6. Static electricity is found in nature.

- a) 1, 2, and 4 c) 2, 3, and 4
 b) 1, 5, and 6 d) 3, 5, and 6

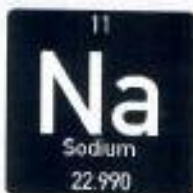
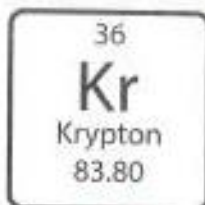
31

Several scientists have proposed a model to describe the structure of the atom. Which of the following is the description of Rutherford's model?

- a) An atom is composed of evenly distributed negative and positive charges.
- b) An atom is composed of positive particles concentrated in a nucleus and negative particles moving within different energy levels.
- c) An atom is composed of very dense positive particles concentrated in a nucleus and negative charges moving freely around that nucleus.
- d) An atom is indivisible and the atoms of the same element are all identical.

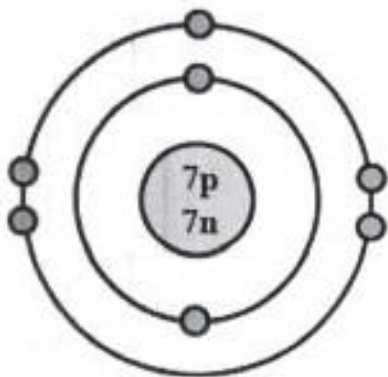
32

State the number of protons, electrons, and neutrons for each

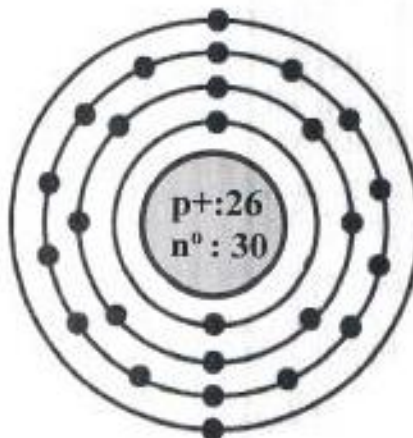
p⁺ 11e⁻ 11n⁰ 12p⁺ 36e⁻ 36n⁰ 48p⁺ 53e⁻ 53n⁰ 74

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Identify the following elements



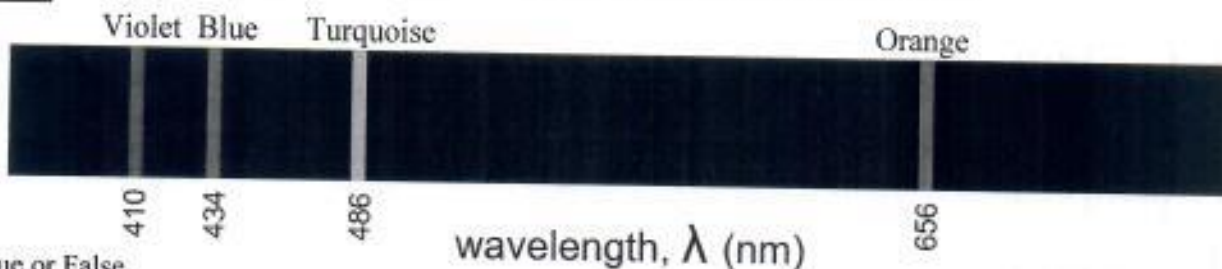
Nitrogen



Iron

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The following represents the spectral lines of Hydrogen as proposed by Bohr:



True or False

- T or F a) The spectral line colours of Hydrogen depends on the size of the electrons
 T or F b) Elements release light when their electrons become excited.
 T or F c) The number of spectral lines that an element has is equal to the number of electrons for a given element.
 T or F d) Each element has its own unique spectral lines. These lines are a characteristic property of the element.

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Fill in the information for the following Elements and then draw the atomic diagram (nucleus & electron configuration) for each.

a) Argon ATOM

Atomic Symbol: Ar

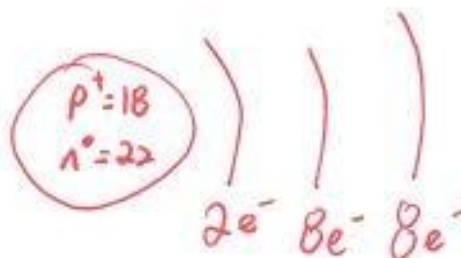
Atomic Number: 18

Atomic Mass: 40

of p^+ : 18

of e^- : 18

of n^0 : $40 - 18 = 22$



b) HELIUM ATOM

Atomic Symbol: He

Atomic Number: 2

Atomic Mass: 4

of p^+ : 2

of e^- : 2

of n^0 : $4 - 2 = 2$



c) Magnesium ATOM

Atomic Symbol: Mg

Atomic Number: 12

Atomic Mass: 24

of p^+ : 12

of e^- : 12

of n^0 : $24 - 12 = 12$

