Day 1: Matter and Atoms

1. Which material would be classified as homogeneous?

a. stainless steel bolt b. granite rock c. soda pop d. apple

2. Which of the elements listed is a metalloid?

a. carbon b. antimony c. sulfur d. helium

3. What classification would best describe a material with the following characteristics?

-white liquid -not separated by filtration -scatters light

a. element b. solution c. colloid d. suspension

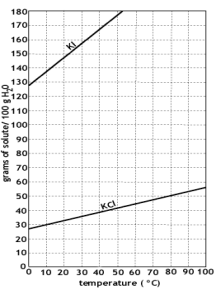
4. At one atmosphere pressure water boils at 100**°**C, but evaporation occurs at all temperatures.

(a) Explain the process of evaporation of water.

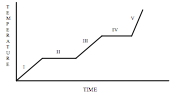
(b) Why does water evaporate but oil does not?

5. The following table shows the solubility in 100 g of water of two compounds containing potassium ions.

Compare the solubility of the two compounds at 20 **°** C. What explanation would account for the difference in solubility?



The graph below shows a heating curve for a pure substance at normal atmospheric pressure. Use the graph to answer the questions that follow.



6. What happens to the molecules during segment II?

a. Energy of the molecules forms chemical bonds.

b. Energy of the molecules breaks chemical bonds.

c. Energy of the molecules overcomes intermolecular attractions.

d. Energy of the molecules strengthens intermolecular attractions.

7. What phase change occurs during segment IV of the graph?

a. solid to liquid c. liquid to gas

b. solid to gas d. liquid to solid

8. What process occurs during segment III?

a. increase in temperature of the solid c. melting of the solid

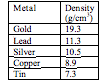
b. increase in temperature of the liquid d. boiling of the liquid

9. Which is a characteristic property of aluminum?

a. reacts with oxygen to form rust c. dissolves in alcohol

b. reacts with water d. forms into a wire

10. One characteristic that can be used to identify pure metals is density. The table below provides the density of some common metals. A ring is determined to have a density of 15.3 g/cm3. What would be the best conclusion concerning the composition of the ring?



a. The ring does not contain any of the metals listed.

b. The ring contains a mixture of metals.

c. The ring must be made of pure gold.

d. The ring must be made of pure lead.

Day 2: Periodic Table and Chemical Bonding

1. Which element is represented by the diagram below?



a. magnesium b. sodium c. titanium d. vanadium

2. Which element could have the dot diagram shown below?

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a. carbon b. helium c. magnesium d. potassium

3. A recently discovered element would be placed in Group I, Period 8 of the periodic table. Which statement would best describe this element?

a. This element has a -1 oxidation number. c. This element has two valence electrons.

b. This element will form an ion with +1 charge. d. This element is a gas.

4. How many valence electrons does a phosphorus atom contain?

a. 5 b. 7 c. 9 d. 15

5. Which of the following metals is more reactive than magnesium?

a. aluminum b. calcium c. copper d. zinc

6. Identity the type of chemical bond found in each compound:

(a) NaCl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (c) KI \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b) CO \_­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (d) SiF4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. Which combinations of elements will form an ionic bond?

a. carbon and hydrogen c. chlorine and fluorine

b. chlorine and magnesium d. hydrogen and oxygen

8. Two properties of metals are ductility and malleability. Explain how these properties are related to metallic bonding.

9. Give the chemical formula and name for the following combinations. Explain your reasoning.

(a) sodium and sulfur (b) carbon and oxygen

10. What is the correct chemical formula for magnesium phosphate?

a. Mg3P b. MgPO4 c. Mg3 PO4 d. Mg3 (PO4)2

Day 3: Motion, Forces, Work, and Power

1. If Bob walks 2 blocks east, 4 blocks south, and 2 blocks west, what is his displacement?

a. 2 blocks south c. 2 blocks south, 2 blocks east

b. 4 blocks south d. 4 blocks south, 2 blocks east

2. If Bob walks 2 blocks east, 4 blocks south, and 2 blocks west, what distance has he traveled?

a. 2 blocks b. 4 blocks c. 6 blocks d. 8 blocks

3. How is a velocity of zero different from an acceleration of zero?

4. What is the motion that is represented in the graphs below?

a. The object is changing velocity during the entire time.

b. The object is moving at constant velocity during the entire time.

c. The object is changing velocity initially then moving at a constant velocity.

d. The object is not moving during any time interval.

5. Which statement is true about an object in freefall? Assume negligible air resistance.

a. The object has a constant velocity.

b. The object has a constant acceleration.

c. The acceleration of the object increases as it falls.

d. The velocity decreases as the acceleration decreases as it falls.

6. How much does a 125.0 kg object weigh on Earth?

a. 784.0 N b. 12.76 N c. 1113 N d. 1225 N

7. Brakes on a car are designed to use friction to slow or stop a vehicle. Brake shoes and pads are lined with a heat-resistant material that presses against rotating disks or drums. Which type of frictional force causes a car to slow when the brakes are applied?

a. fluid b. rolling c. sliding d. static

8. When a driver applies brakes quickly which of the following best explains why a book on the seat keeps moving forward?

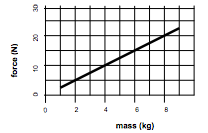
a. Gravity pushes the book forward.

b. There is no frictional force acting on the book.

c. The brakes apply a force to the car, but not to the book.

d. The book accelerates in the direction of the applied force.

9. The graph below shows data for various amounts of force and mass.



Which statement is true about the relationship shown?

a. There is an inverse relationship between force and mass.

b. The acceleration is equal to the slope of the line.

c. Acceleration increases as the mass increases.

d. The mass of the object is not related to force.

10. If you push a book across a table, which of the following describes the reaction force?

a. The book pushes on the table. c. The table pushes on the book.

b. The book pushes on you. d. You push on the table.

11. A hockey stick applies a force to a puck that results in an acceleration of 3.0 m/s2. What would be the effect on the acceleration of the hockey puck if the force is tripled?

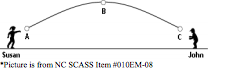
a. The acceleration would remain the same.

b. The acceleration would be reduced to 1.0 m/s2.

c. The acceleration would be increased to 6.0 m/s2.

d. The acceleration would be increased to 9.0 m/s2

Use the diagram below to answer the questions that follow. Two students play catch with a baseball. It moves along the path A to B to C.



12. Which statement best describes the energy of the ball as it moves from position A to position B?

a. The total mechanical energy of the object increases.

b. The total energy of the object is constant neglecting air resistance.

c. The kinetic energy of the object is at a maximum at point B.

d. The potential energy of the object is constant.

13. What happens to the mechanical energy that the ball possesses after John catches the ball?

a. It remains mechanical energy but is transferred from the ball to John.

b. Kinetic energy of the ball is transformed into heat.

c. Potential energy of the ball is transformed into chemical energy.

d. The energy no longer exists.

14. A force of 50 newtons is applied to a rock for one hour. How much work is done on the rock if it does not move?

a. 3000 joules b. 400 joules c. 50 joules d. 0 joules

15. How much work is done when 25 joules of energy is used to move a table 2.5 meters across a frictionless surface?

a. 0 J b. 20 J c. 25 J d. 30 J

16. How much power is required to lift a 2.00-kg object 5.00 meters in 4.50 seconds?

a. 0.45 watts b. 2.22 watts c. 21.8 watts d. 45.0 watts

Day 4: Heat, Machines, Waves, and Electricity

1. Which of the following occurs as a pot of soup on a hot burner begins to boil?

a. Thermal energy is not transferred.

b. Thermal energy is transferred from the burner to the air to the soup.

c. Thermal energy is transferred from the burner to the pot to the soup.

d. Thermal energy is transferred from the soup to the burner.

2. Why does a metal spoon feel colder to the touch than a wooden spoon at the same temperature?

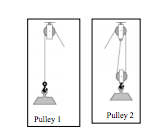
a. Metals have a lower boiling point than wood.

b. Metals transfer more thermal energy.

c. Wood is a better reflector of radiant energy.

d. Wood has less mass than metal.

3. Compare the mechanical advantage of the two pulley systems shown below



4. A string is tied around a balance beam and hung so the balance beam is perfectly balanced. One cup is placed at the right end of the beam. Another cup is placed on the left side of the beam closer to the middle than the right cup. Two cubes are placed in the cup on the right.

How many cubes should be placed in the left cup in order to balance the beam?

a. 2 cubes b. 4 cubes c. 6 cubes d. 8 cubes

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5. What is the effect on frequency of a wave when the wavelength is doubled?

a. Frequency is also doubled. c. Frequency is reduced to one-fourth.

b. Frequency remains the same. d. Frequency is reduced to one-half.

6. A sound wave with a frequency of 240 hertz travels through a material at a speed of 340 meters per second. Which statement is true about a sound wave with a frequency of 300 hertz traveling in the same material?

a. It would travel at the same speed. c. It would have the same period.

b. It would have the same wavelength. d. It would have the same frequency

7. Which statement is true for all types of waves?

a. Wave speed is determined by the frequency.

b. Wave speed increases as the wavelength of the wave increases.

c. Wave motion transports particles of matter.

d. Wave motion transfers energy from one place to another.

8. Which type of wave can travel in a vacuum?

a. sound b. mechanical c. surface d. electromagnetic.

9. Which type of wave would be classified as compressional?

a. visible light b. ultrasound c. x-rays d. radio waves

10. Which wave interaction best explains glare on the windshield of a car?

a. diffraction b. interference c. reflection d. refraction

11. What wave interaction best explains the production of an image on a glass window as you walk by a store front?

a. diffraction b. interference c. reflection d. refraction

12. The bending and change in speed of water waves as they approach a shoreline is explained by what process?

a. diffraction b. interference c. reflection d. refractio

13. A student noticed that a woolen sweater was clinging to a silk scarf. Why would these pieces of clothing be clinging together?

a. The static charge of both pieces of clothing is the same.

b. The static charge of both pieces is positive.

c. The static charge of both pieces is negative.

d. The static charge of one piece of clothing is positive and the other is negative.

14. The leaves of a neutral electroscope move apart when a negatively charged object is brought near. Which statement explains why this occurs?

a. Electrons moved downward to the leaves of the electroscope.

b. Electrons moved to the top of the electroscope.

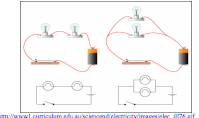
c. Protons moved toward the top of the electroscope.

d. Protons moved downward to the leaves of the electroscope.

15. What is the current in a circuit that has a potential difference of 120 volts and a resistance of 2 ohms?

a. 240 amps b. 60 amps c. 40 amps d. 0 amps

16. Given that the voltages and individual resistances in the diagrams below are equal, which statement would be true?



a. The current is greater in the circuit on the left.

b. The current is greater in the circuit on the right.

c. The total resistance is greater in the circuit on the right.

d. The total resistance is the same in both circuits.

17. A section of copper wire has a set resistance. Which of the following changes would provide less resistance?

a. a longer copper wire of the same thickness

b. a thinner copper wire of the same length

c. a thicker copper wire of the same length

d. increase in temperature of the wire

18. How can the strength of an electromagnet in a generator be increased?

19. What is the purpose of a transformer?

a. change the voltage of alternating current

b. change the resistance of direct current

c. convert potential to kinetic energy

d. convert mechanical energy to electrical energy

20. Which statement best describes the magnetic orientation of the two magnets shown in the diagram below?

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a. B and C are both north-seeking poles.

b. B and C are both south-seeking poles.

c. A and C are both north-seeking poles.

d. A and C are both south-seeking poles.

Day 5: Chemical Reactions, Acids and Bases, Nuclear

1. What is the coefficient of iron (Fe) when the following chemical equation is balanced?

Fe + Cl2  FeCl3

a. 1 b. 2 c. 3 d. 4

2. Which is a synthesis reaction?

a. 2H20  2H2 + O2 c. 2Cu + O2  2CuO

b. Mg + 2HCl MgCl2 + H2 d. HCl + NaOH  NaCl +H2O

3. Explain the laboratory observations that could be used to determine if a substance is an acid or base.

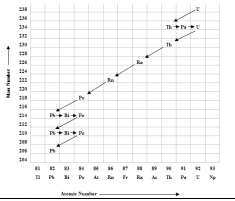
4. Which pH would indicate the most acidic substance?

a. 2 b. 4 c. 10 d. 14

5. Describe what happens when a solution of hydrochloric acid is mixed with a solution of sodium hydroxide

6. Compare nuclear fission and fusion reactions.

Use the chart below to answer the questions that follow



7. Which type of naturally occurring radioactivity results in an increase in atomic number of an atom?

a. fusion b. alpha decay c. beta decay d. gamma rays

8. What particles are the products of the natural radioactive decay of an atom of uranium-238?

a. thorium-234 and an alpha particle c. uranium-234 and a beta particle

b. radium-226 and an alpha particle d. polonium-218 and a beta particle

9. A radioactive isotope of iodine has a half-life of 8 days. What amount of an 80-gram sample would remain unchanged after 24 days?

a. 10 grams b. 20 grams c. 30 grams d. 40 grams