

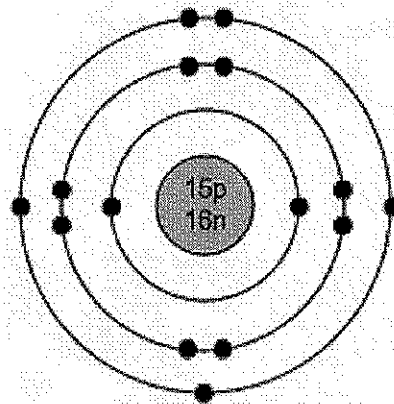
IV. Practice Questions

Section 4.1

Atomic theory explains the formation of compounds: Atomic Theory and Bonding

Circle the letter of the best answer. You can use the Periodic Table of the Elements on page 2 of your Data Pages to help you.

- Which subatomic particles are found in the nucleus of atoms?
 - only protons
 - only electrons
 - protons and neutrons
 - protons and electrons
- When forming ions, elements on the left side of the periodic table tend to behave in which of the following ways?
 - lose protons
 - gain protons
 - lose electrons
 - gain electrons
- What is the name of the reactive family of elements that form $1-$ ions?
 - halogens
 - noble gases
 - alkali metals
 - alkaline earth metals
- What is the atomic number of an atom with 19 protons, 19 electrons, and 21 neutrons?
 - 19
 - 21
 - 38
 - 39
- Which of the following describes an ion of chlorine?
 - 20 neutrons and 17 electrons
 - 20 neutrons and 18 electrons
 - 37 neutrons and 17 electrons
 - 37 neutrons and 18 electrons

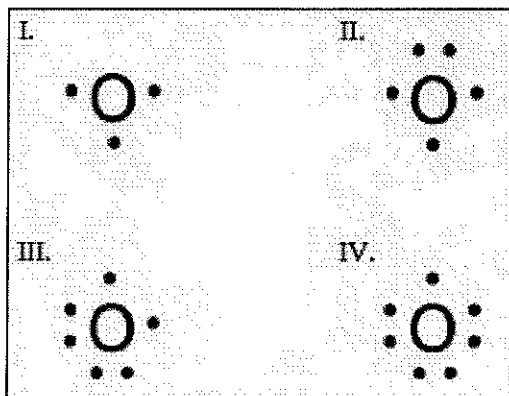


- Identify the atom shown in the Bohr diagram above.
 - gallium
 - sulfur
 - oxygen
 - phosphorus
- How many lone pairs and bonding pairs of electrons appear in the Lewis diagram shown below of water?

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  ..
  |
H - O
  |
  H
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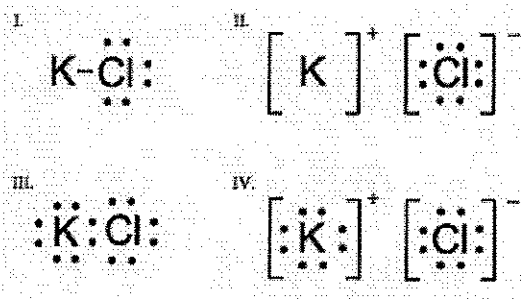
 - two lone pairs and no bonding pairs
 - two lone pairs and two bonding pairs
 - no lone pairs and two bonding pairs
 - four lone pairs and four bonding pairs

8. Which of the following Lewis diagrams represents an oxygen atom?



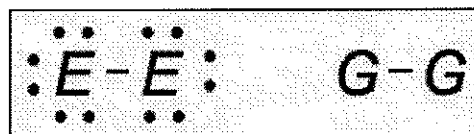
- A. I
B. II
C. III
D. IV

9. Which of the following Lewis diagrams represents KCl?



- A. I
B. II
C. III
D. IV

10. E and G represent unknown elements from the periodic table. What product could be formed from the two molecules shown below?



- A. water
B. krypton gas
C. hydrogen chloride
D. sodium chloride

IV. Practice Questions

Section 4.2

Atomic theory explains the formation of compounds: Names and Formulas of Compounds

Circle the letter of the best answer. You can use the Periodic Table of the Elements on page 2 of your Data Pages to help you.

- What is the formula for aluminum sulfide?
 - AlS
 - AlS₃
 - Al₃S₂
 - Al₂S₃
- What is the ionic charge of lead in PbO₂?
 - +1
 - +2
 - +3
 - +4
- Which of the following is the correct name for Fe₂(SO₄)₃?
 - iron(II) sulfate
 - iron(II) sulfide
 - iron(III) sulfate
 - iron(III) sulfide
- Which statement best describes the compound N₂O₃?
 - It is the ionic compound nitrogen oxide.
 - It is the covalent compound nitrogen oxide.
 - It is the ionic compound dinitrogen trioxide.
 - It is the covalent compound dinitrogen trioxide.
- Which of the following is the correct bond type and name for (NH₄)₂S?
 - ionic, ammonium sulfide
 - ionic, nitrogen hydrogen sulfide
 - covalent, ammonium sulfide
 - covalent, dinitrogen monohydrogen sulfide
- What is the formula for diphosphorus pentachloride?
 - PCl
 - PCl₅
 - P₂Cl₅
 - P₅Cl₂
- Which of the following is the correct name for SrCl₂?
 - strontium chloride
 - strontium dichloride
 - strontium(II) chloride
 - monostrontium dichloride
- What is the name for AuBr₃?
 - gold bromide
 - gold tribromide
 - gold(III) bromide
 - gold(III) bromine
- How many atoms of each of the following elements are present in nickel(III) sulfate?
 - nickel = 2, sulfur = 3
 - nickel = 1, sulfur = 1, oxygen = 4
 - nickel = 3, sulfur = 1, oxygen = 4
 - nickel = 2, sulfur = 3, oxygen = 12
- What is the formula for manganese(II) chloride?
 - MnCl
 - MnCl₂
 - Mn₂Cl
 - MgCl₂

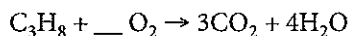
IV. Practice Questions

Section 4.3

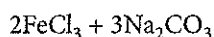
Atomic theory explains the formation of compounds: Chemical Equations

Circle the letter of the best answer. You can use the Periodic Table of the Elements on page 2 of your Data Pages to help you.

1. What coefficient is needed in front of O_2 in order to balance the following equation?



- A. 2
B. 5
C. 6
D. 10
2. In a chemical reaction, 40.3 g of magnesium oxide is broken down to yield 24.3 g of magnesium and 16.0 g of oxygen. What is this an example of?
- A. Dalton's atomic theory
B. the law of constant proportions
C. the law of conservation of mass
D. the law of conservation of energy
3. List the total number of each type of atom found in the following reactants:



	Fe	Cl	Na	C	O
I	2	6	6	3	3
II	2	3	6	1	3
III	2	6	6	3	9
IV	1	3	2	1	3

- A. I
B. II
C. III
D. IV

4. Which of the following is the correctly balanced equation for the following skeleton equation?



- A. $Al + CuCl_2 \rightarrow AlCl_3 + Cu$
B. $Al + 3CuCl_2 \rightarrow 2AlCl_3 + Cu$
C. $2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$
D. $6Al + 3CuCl_2 \rightarrow 2AlCl_3 + 6Cu$
5. Which of the following equations is correctly balanced?
- A. $Al + Br_2 \rightarrow AlBr_3$
B. $Al + 3Br_2 \rightarrow AlBr_3$
C. $Al + 3Br_2 \rightarrow 2AlBr_3$
D. $2Al + 3Br_2 \rightarrow 2AlBr_3$
6. Rewrite the following word equation as a balanced equation.

Potassium sulfate and lead(II) nitrate react to make potassium nitrate and lead(II) sulfate.

- A. $K_2S + Pb(NO_3)_2 \rightarrow 2KNO_3 + PbS$
B. $K_2SO_4 + Pb(NO_3)_2 \rightarrow 2KNO_3 + PbSO_4$
C. $3K_2SO_4 + Pb_3N_2 \rightarrow 2K_3N + 3PbSO_4$
D. $3PSO_4 + Pb_3N_2 \rightarrow P_3N + 3PbSO_4$
7. Write the skeleton equation for the following reaction.
- Iron(III) bromide reacts with sodium hydroxide to yield iron(III) hydroxide and sodium bromide.
- A. $FeBr_3 + NaOH \rightarrow Fe(OH)_3 + NaBr$
B. $FeBr_3 + SOH \rightarrow Fe(OH)_3 + SBr$
C. $FeBr + NaOH \rightarrow FeOH + NaBr$
D. $IBr + NaOH \rightarrow IOH + NaBr$

8. Which of the following equations is correctly balanced?
- A. $C_5H_{12} + 8O_2 \rightarrow 5CO_2 + 6H_2O$
 - B. $C_5H_{12} + 11O_2 \rightarrow 5CO_2 + 6H_2O$
 - C. $C_5H_{12} + 11O_2 \rightarrow 5CO_2 + 12H_2O$
 - D. $2C_5H_{12} + 22O_2 \rightarrow 10CO_2 + 24H_2O$
9. In a tightly closed container, a piece of zinc reacts in hydrochloric acid to produce hydrogen gas and a salt solution of zinc chloride. What will happen to the mass of the container?
- A. It will increase.
 - B. It will decrease.
 - C. It will stay the same.
 - D. It will first increase, then decrease.
10. Tom has an open cup of vinegar (acetic acid) and adds some sodium carbonate. The mixture bubbles and fizzes. After the fizzing stops, Tom finds the container is lighter (less mass) than it was originally. He thinks it has broken the law of conservation of mass. His lab partner knows the correct answer and states:
- A. "You must have made a mistake. Try it again."
 - B. "Yes, you found a reaction that breaks the law of conservation of mass!"
 - C. "There is not enough information here. We must do the experiment again."
 - D. "No, the law of conservation of mass is obeyed. Gas was produced, and it escaped into the surrounding air."

IV. Practice Questions

Section 5.1

Compounds are classified in different ways: Acids and Bases

Circle the letter of the best answer. Use the charts on page 3 of your Data Pages to help you answer the questions.

1. What is the pH of an acidic substance?
 - A. between 4 and 8
 - B. greater than 7
 - C. less than 7
 - D. equal to 7
2. A sample of grapes is crushed, and the pH is tested using three different indicators. Which set of colours is correct for the grapes?

	Methyl Orange	Bromothymol Blue	Indigo Carmine
I.	yellow	yellow	yellow
II.	red	yellow	blue
III.	red	blue	blue
IV.	yellow	blue	yellow

- A. I
 - B. II
 - C. III
 - D. IV
3. You have a sample to test in a lab. The sample looks like milk. Choose the two best indicators for testing if the sample is in the same pH range as milk.
 - A. litmus and phenolphthalein
 - B. methyl orange and methyl red
 - C. methyl red and bromothymol blue
 - D. phenolphthalein and indigo carmine
 4. A property of acids is that they react with metals. If you placed a cut lemon and a raw egg on two spots on bare metal, which of the following would you observe?
 - A. Only the egg would react.
 - B. Only the lemon would react.
 - C. Both the lemon and the egg would react.
 - D. Neither the lemon nor the egg would react.
 5. What kind of substance feels slippery, turns red litmus blue, and has a pH > 7?
 - A. a base, such as NaOH
 - B. an acid, such as HCl
 - C. a salt, such as $MgCl_2$
 - D. a neutral substance, such as HNO_3
 6. A solution has a pH of 11. Acid is added until pH = 5. Which indicator would be a good choice to know when the solution has reached pH = 5?
 - A. methyl red
 - B. methyl orange
 - C. phenolphthalein
 - D. indigo carmine
 7. A substance used in producing plastic is HCl. It is a(n) ____ and is named ____.
 - A. salt, hydrogen chlorite
 - B. acid, hydrogen chlorate
 - C. base, hydrogen chloride
 - D. acid, hydrogen chloride

8. Which of the following is the correct formula for sulfuric acid?

- A. H_2S
- B. HSO_4
- C. H_2SO_3
- D. H_2SO_4

9. Perchloric acid is used in manufacturing explosives and speeding up chemical reactions. What is the formula for perchloric acid?

- A. HF
- B. HBr
- C. HClO_4
- D. H_2Pe_3

10. A sample of bleach was tested with bromothymol blue to determine its pH.

What colour will it be, **and** what does the colour tell you about the pH of bleach?

- A. blue, $\text{pH} > 7$
- B. blue, $\text{pH} = 12$
- C. yellow, $\text{pH} < 7$
- D. yellow, $\text{pH} = 12$

IV. Practice Questions

Section 5.2

Compounds are classified in different ways: Salts

Circle the letter of the best answer.

- Which of the following correctly lists, in order, an acid, a base, and a salt?
 - HCl, NaOH, BaCl₂
 - HNO₃, CaCl₂, NaOH
 - NaCl, MgBr₂, NH₄OH
 - Ba(OH)₂, HNO₃, H₃PO₄
- Which reaction is an acid-base neutralization?
 - HCl + Ca → CaCl₂ + H₂
 - CaO + H₂O → Ca(OH)₂
 - HCl + BaCO₃ → BaCl₂ + H₂O + CO₂
 - HNO₂ + Ca(OH)₂ → Ca(NO₃)₂ + H₂O
- Which of the following are produced when Ca + HCl react?
 - CaHCl
 - CaH + Cl₂
 - CaCl₂ + H
 - CaCl₂ + H₂
- Which of the following completes the reaction below?
$$\text{SO}_3(\text{g}) + \text{H}_2\text{O}(\ell) \rightarrow \underline{\hspace{2cm}}$$
 - H₂SO₄(aq)
 - H₂SO₃(aq)
 - HSO₄(aq)
 - HSO₃(aq)
- Consider the following reaction.
$$\text{BaO} + \text{H}_2\text{O} \rightarrow \underline{\hspace{2cm}}$$

Determine the formula of the product(s), and indicate if the product is an acid, a base, or a neutral compound.

 - Ba(OH)₂, a base
 - Ba(OH)₂, an acid
 - BaO + H₂, neutral compounds
 - Ba + H₂O₂, neutral compounds
- Which basic compound could be added to lakes to help deal with acid precipitation?
 - NaCl
 - NaOH
 - CaCO₃
 - HCl
- Which of the following groups contains only salts?
 - NaCl, HBr
 - NH₄OH, LiOH
 - NaCl, Ca(NO₃)₂
 - NaCl, Ca(NO₃)₂, NH₄OH, LiOH, HBr
- Which of the following is a balanced equation for the reaction between an acid and a carbonate?
 - 2CH₃COOH + 2NaOH → 2NaCH₃COO + H₂O
 - 2HCl + CaCO₃ → CaCl₂ + H₂O + CO₂
 - 2HCl + Mg → MgCl₂ + H₂
 - CO₂ + H₂O → H₂CO₃
- Identify the products that complete the following reaction.
$$\text{H}_3\text{PO}_4 + \text{Ba}(\text{OH})_2 \rightarrow \underline{\hspace{2cm}}$$
 - BaPO₄ + H₂O
 - Ba₃P₂ + H₂O
 - BaH₂PO₄ + H₂O
 - Ba₃(PO₄)₂ + H₂O
- Which of the following reactions are written correctly?

I.	HNO ₃ + Ba(OH) ₂ → Ba(NO ₃) ₂ + H ₂ O
II.	CO ₂ + H ₂ O → H ₂ CO ₂
III.	Li ₂ O + H ₂ O → 2LiOH

 - I and II
 - I and III
 - II and III
 - I, II, and III

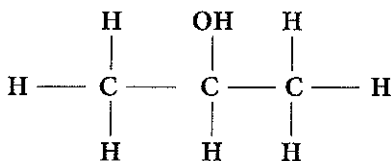
IV. Practice Questions

Section 5.3

Compounds are classified in different ways: Organic Compounds

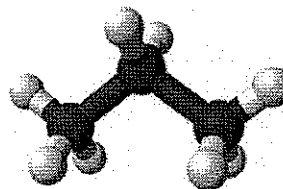
Circle the letter of the best answer.

- Which of the following is **not** an organic compound?
 - CH_4
 - CO_2
 - $\text{C}_6\text{H}_5\text{COOH}$
 - $\text{K}_2\text{HC}_6\text{H}_5\text{O}_7$
- Which of the following best describes organic compounds?
 - almost all compounds that contain carbon
 - compounds made exclusively by living things
 - compounds made of mostly carbon and oxygen, such as oxides and carbonates
 - any compound that does not include carbon, except compounds such as CO_2 , CO , and compounds like Li_2CO_3
- What is a hydrocarbon?
 - another name for the acid H_2CO_3
 - another name for an organic alcohol
 - one of the products of an acid-base neutralization
 - an organic compound that is made of only carbon and hydrogen
- Which of the following is an inorganic compound?
 - $\text{C}_6\text{H}_{12}\text{O}_6$
 - NO_2
 - $\text{CH}_3\text{CH}_2\text{COOH}$
 - C_4H_{10}
- Consider the following representation of 2-propanol, a kind of rubbing alcohol. What kind of representation is used in the diagram?



- chemical name
- molecular formula
- structural formula
- space-filling model

- Which of the following is an organic compound?
 - CaH_3
 - H_2CO_3
 - $\text{C}_3\text{H}_8\text{O}$
 - Ca_2CO_3
- $\text{CH}_3(\text{CH}_2)_5\text{CH}_3$ is an example of what type of compound?
 - an acid
 - a salt
 - a base
 - an organic compound
- In the following diagram of propane, light-coloured spheres represent hydrogen atoms and dark-coloured spheres represent carbon atoms. What is the chemical formula of propane?



- C_8H_3
 - $8\text{C}_3\text{H}$
 - C_3H_8
 - $3\text{C}_8\text{H}$
- Ethanol ($\text{CH}_3\text{CH}_2\text{OH}$) is used in alcoholic beverages and also as a fuel. What kind of compound is ethanol?
 - inorganic
 - organic
 - ionic
 - multivalent
 - Which of the following is **not** an inorganic compound?
 - methane
 - carbon dioxide
 - barium carbonate
 - ammonium chloride

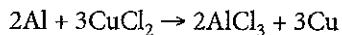
IV. Practice Questions

Section 6.1

Chemical reactions occur in predictable ways: Types of Chemical Reactions

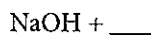
Circle the letter of the best answer.

1. What type of reaction is the following?



- A. synthesis
 - B. neutralization
 - C. single replacement
 - D. double replacement
2. Which equation shows a double replacement reaction?
- A. $2\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$
 - B. $2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$
 - C. $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
 - D. $\text{Na}_2\text{CO}_3 + \text{CaCl}_2 \rightarrow \text{CaCO}_3 + 2\text{NaCl}$
3. KCl reacts with $\text{Pb}(\text{NO}_3)_2$. What type of reaction is this?
- A. combustion
 - B. neutralization
 - C. single replacement
 - D. double replacement
4. Solid magnesium reacts with nitric acid to produce hydrogen gas and another product. What is the other product that would be formed in this reaction?
- $$\text{Mg} + 2\text{HNO}_3 \rightarrow \underline{\hspace{2cm}} + \text{H}_2$$
- A. $\text{Mg}(\text{NO}_3)_2$
 - B. Mg_3N_2
 - C. MgO
 - D. O_2
5. Which of the following balanced equations represents a synthesis reaction?
- A. $2\text{LiF} \rightarrow 2\text{Li} + \text{F}_2$
 - B. $\text{Ca} + \text{Br}_2 \rightarrow \text{CaBr}_2$
 - C. $\text{Ba} + \text{CuSO}_4 \rightarrow \text{BaSO}_4 + \text{Cu}$
 - D. $\text{KOH} + \text{HNO}_3 \rightarrow \text{KNO}_3 + \text{H}_2\text{O}$

6. For a neutralization reaction to occur, which of the following should be added to react with NaOH?



- A. F_2
 - B. Ca
 - C. HCl
 - D. $\text{Mg}(\text{NO}_3)_2$
7. What is the missing reactant in this synthesis reaction, and what are the coefficients needed to balance this equation?



- A. $\text{Na} + \text{F} \rightarrow \text{NaF}$
 - B. $\text{Na} + \text{F}_2 \rightarrow \text{NaF}_2$
 - C. $\text{Na} + \text{F}_2 \rightarrow 2\text{NaF}$
 - D. $2\text{Na} + \text{F}_2 \rightarrow 2\text{NaF}$
8. If Na_2O undergoes decomposition, what will the products be?
- A. $\text{Na} + \text{O}$
 - B. $\text{Na} + \text{O}_2$
 - C. $\text{Na}_2 + \text{O}$
 - D. $\text{Na}_2 + \text{O}_2$
9. If aluminum bromide decomposes, which of the following is the correct balanced formula equation for the reaction?
- A. $\text{AlBr}_3 \rightarrow \text{Al} + \text{Br}$
 - B. $\text{AlBr}_3 \rightarrow \text{Al} + 3\text{Br}_2$
 - C. $2\text{AlBr}_3 \rightarrow 2\text{Al} + \text{Br}_2$
 - D. $2\text{AlBr}_3 \rightarrow 2\text{Al} + 3\text{Br}_2$
10. Which of the following balanced equations correctly represents the combustion of butene, C_4H_8 ?
- A. $\text{C}_4\text{H}_8 + 6\text{O}_2 \rightarrow 4\text{CO}_2 + 4\text{H}_2\text{O}$
 - B. $\text{C}_4\text{H}_8 + \text{O}_2 \rightarrow 8\text{CO}_2 + 8\text{H}_2\text{O}$
 - C. $\text{C}_4\text{H}_8 + \text{O}_2 \rightarrow 4\text{CO}_2 + \text{H}_2\text{O}$
 - D. $\text{C}_4\text{H}_8 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$

IV. Practice Questions

Section 6.2

Chemical reactions occur in predictable ways: Factors Affecting the Rate of Chemical Reactions

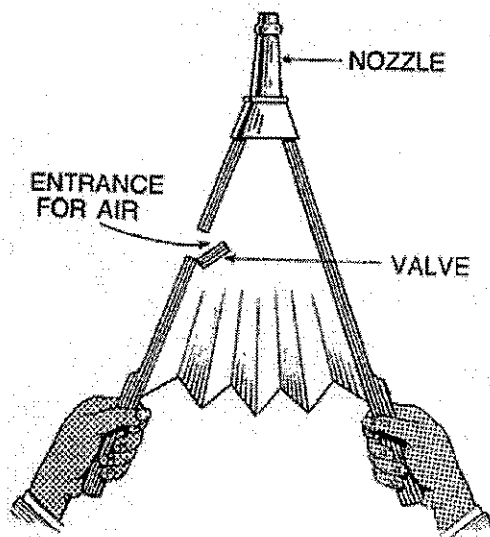
Circle the letter of the best answer.

- When zinc metal is added to hydrochloric acid, it reacts to produce hydrogen gas. Which of the following pairs would react at the greatest rate?
 - a chunk of zinc and dilute HCl
 - a chunk of zinc and concentrated HCl
 - powdered zinc and dilute HCl
 - powdered zinc and concentrated HCl
- Cement is used in many construction projects. When used in building projects, water is sprayed on the surface of the drying cement. This allows the cement to dry evenly both on the surface and in the middle. A strange fact about cement is that, as cement "cures" (what we think of as drying), it undergoes an exothermic reaction. In other words, cement is actually giving off heat energy as it dries, which can speed up drying even more. Which factor affecting the rate of chemical reactions is involved when builders spray water onto drying cement?
 - addition of a catalyst
 - change in temperature
 - change in surface area
 - change in concentration
- Which of the following is an example of decreasing reaction rate?
 - scrambling an egg
 - adding food colouring
 - putting food in a refrigerator
 - cleaning a clogged drain with concentrated vinegar and baking soda
- In order to start a campfire, wood is chopped into many small pieces, called kindling. Which factor makes it easier to light a fire using kindling instead of large pieces of wood?
 - temperature
 - concentration
 - surface area
 - catalyst
- If you have had your gall bladder removed, you may have trouble digesting fats. It is possible in some cases to take an enzyme called lipase, which helps to digest fats.

With respect to rates of reactions, which factor is best illustrated by taking lipase?

 - introducing a catalyst
 - increasing temperature
 - increasing surface area
 - increasing concentration
- Food is digested in your body with the aid of a number of factors that affect the reaction rates. Which of the following affects the rate of food digestion by changing surface area?
 - chewing food
 - a body temperature of 37°C
 - enzymes such as lipase and sucrase
 - the concentration of HCl in the stomach

7. Thinking of factors that affect reaction rate, what first aid treatment should you use when you burn your hand on a hot stove or with hot water?
- Do nothing, as you have already stopped touching the hot object.
 - Cover the burn with moisturizing cream.
 - Cover your burn in butter or margarine.
 - Run your hand under cold water.
8. Blacksmithing is considered to be a fading art. Blacksmiths use heated coal and other materials to work with molten metal to turn the metal into everything from horseshoes to swords and ploughs. Blacksmiths use a tool called a bellows to make the fire hotter. This tool is also often used in homes with fireplaces.



Thinking of factors that affect reaction rate, how do you think the use of bellows affects the temperature of the fire?

- adds a catalyst
- removes carbon dioxide
- increases the surface area of the fire
- increases the concentration of oxygen

9. Why does putting food in a refrigerator slow the spoilage of the food?
- The decreased temperature speeds up the molecules, making the reactions slower.
 - The decreased temperature slows down the molecules making the reactions faster.
 - The decreased temperature slows down the molecules making the reactions slower.
 - Keeping the food in the refrigerator decreases the concentration of oxygen.
10. Which of the following is **not** a factor that affects the rate of reaction?
- changing the temperature
 - changing the colour of the reactants
 - changing the surface area of the reactants
 - changing the concentration of the reactants

IV. Practice Questions

Section 7.1

The atomic theory explains radioactivity: Atomic Theory, Isotopes, and Radioactive Decay

Circle the letter of the best answer.

- Which of the following shows alpha radioactive decay?
 - ${}^{13}_5\text{B} \rightarrow {}^{13}_6\text{C} + {}^0_{-1}e$
 - ${}^{23}_{11}\text{NaCl} \rightarrow {}^{23}_{11}\text{Na} + {}^{35,5}_{17}\text{Cl}_2$
 - ${}^{60}_{28}\text{Ni}^* \rightarrow {}^{60}_{28}\text{Ni} + {}^0_0\gamma$
 - ${}^{238}_{92}\text{U} \rightarrow {}^{234}_{90}\text{Th} + {}^4_2\text{He}$
- Which of the following shows beta radioactive decay?
 - ${}^{211}_{87}\text{Fr} \rightarrow {}^{207}_{85}\text{At} + {}^4_2\text{He}$
 - ${}^{137}_{55}\text{Cs} \rightarrow {}^{137}_{56}\text{Ba} + {}^0_{-1}e + {}^0_0\gamma$
 - ${}^{60}_{28}\text{Ni}^* \rightarrow {}^{60}_{28}\text{Ni} + {}^0_0\gamma$
 - ${}^1_1\text{H}_2\text{O}_2 \rightarrow {}^1_1\text{H}_2\text{O} + {}^{60}_{28}\text{O}_2$
- Which of the following is an example of gamma radioactive decay?
 - ${}^{42}_{19}\text{K}^* \rightarrow {}^{42}_{19}\text{K} + {}^0_0\gamma$
 - ${}^{90}_{38}\text{Sr} \rightarrow {}^{90}_{39}\text{Y} + {}^0_{-1}e$
 - ${}^{196}_{79}\text{Au} \rightarrow {}^{192}_{77}\text{Ir} + {}^4_2\alpha$
 - ${}^{222}_{86}\text{Rn} \rightarrow {}^{218}_{84}\text{Po} + {}^4_2\text{He}$
- What type of decay occurs in the following reaction?
$${}^{24}_{11}\text{Na} \rightarrow {}^{24}_{12}\text{Mg} + {}^0_{-1}e$$
 - alpha
 - beta
 - gamma
 - decomposition
- Which is the correct parent nucleus to give the following products?
$$\text{_____} \rightarrow {}^{227}_{89}\text{Ac} + {}^4_2\text{He}$$
 - ${}^{225}_{85}\text{At}$
 - ${}^{229}_{93}\text{Np}$
 - ${}^{223}_{87}\text{Fr}$
 - ${}^{231}_{91}\text{Pa}$
- How does each of the isotopes of an atom differ?
 - in the number of protons
 - in the number of electrons
 - in the number of neutrons
 - in the number of protons, electrons, and neutrons
- How many protons and neutrons are in the following isotope?
$${}^{37}_{17}\text{Cl}$$
 - 17 protons, 17 neutrons
 - 17 protons, 20 neutrons
 - 17 protons, 37 neutrons
 - 37 protons, 17 neutrons
- If an isotope has 55 protons and 82 neutrons, which of the following correctly represents the isotope?
 - ${}^{55}_{82}\text{Pb}$
 - ${}^{82}_{55}\text{Cs}$
 - ${}^{137}_{55}\text{Cs}$
 - ${}^{137}_{82}\text{Pb}$
- Which of the following correctly completes the following radioactive decay?
$${}^{201}_{80}\text{Hg} \rightarrow {}^{201}_{82}\text{Tl} + \text{_____}$$
 - ${}^0_{-1}e$
 - ${}^0_0\gamma$
 - ${}^1_1\text{H}$
 - ${}^4_2\text{He}$
- Which of the following correctly completes the following radioactive decay?
$${}^{233}_{91}\text{Pa} \rightarrow {}^{229}_{89}\text{Ac} + \text{_____}$$
 - ${}^0_{-1}e$
 - ${}^0_0\gamma$
 - ${}^1_1\text{H}$
 - ${}^4_2\text{He}$

IV. Practice Questions

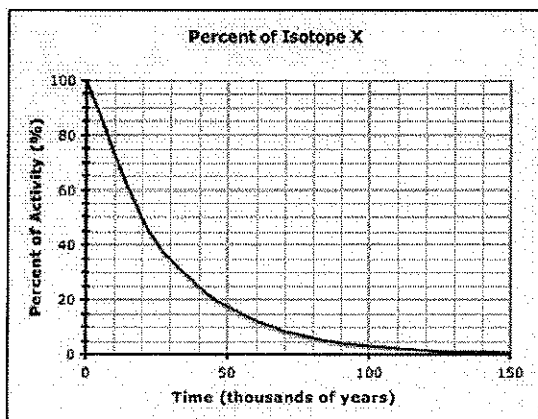
Section 7.2

The atomic theory explains radioactivity: Half-Life

Circle the letter of the best answer. You can use the Common Isotope Pairs chart on page 4 of your Data Pages to help you.

- What is a half-life?
 - the time required for nuclei to undergo nuclear fusion
 - the time required for nuclei to undergo nuclear fission
 - the time required for half the nuclei in a sample to decay
 - the time it takes for an isotope to react with any other substance to produce a new compound
- The carbon-14 isotope has a half-life of 5730 y. What percent of carbon-14 isotope will be present after 17 190 y?
 - 12.5 percent
 - 25 percent
 - 50 percent
 - 100 percent
- A 10 g sample of potassium-40 undergoes radioactive decay until 2.5 g of potassium-40 is present. How many half-lives have occurred?
 - 0
 - 1
 - 2
 - 3
- Suppose a meteorite is analyzed and found to contain equal amounts of uranium-238 and lead-206. How long ago did the meteorite form?
 - 710 million years
 - 1420 million years
 - 4.5 billion years
 - 9 billion years
- What is carbon dating?
 - the exact age of a sample of carbon
 - the process of determining the time required to complete the carbon cycle
 - the process of determining the age of an object by measuring the amount of carbon-14 remaining in that object
 - the process of looking for fossils from specific time periods and determining the age of the carbon sample relative to the fossil
- If a 10 g rock sample of isotope ${}^{40}_{19}\text{K}$ undergoes two half-lives to make daughter isotope ${}^{40}_{18}\text{Ar}$, what is the mass of the total sample at the completion of the second half-life?
 - 10 g
 - 5.0 g
 - 2.5 g
 - 1.25 g
- If you start with 100 g of isotope ${}^{238}_{92}\text{U}$, what mass of this parent material will be left after four half-lives?
 - 50 g
 - 25 g
 - 12.5 g
 - 6.25 g
- After three half-lives have passed for carbon-14, a 4.0 g sample remains of the parent isotope. What mass of the parent isotope was originally present?
 - 0.5 g
 - 8.0 g
 - 16 g
 - 32 g

Use the following decay curve to answer question 9.



9. Scientists have discovered a new isotope (X). Using the data they collected, a graph was produced to show the percentage of the isotope remaining over time. Using this information, what is the half-life of this isotope?
- A. 10 000 y
 - B. 20 000 y
 - C. 50 000 y
 - D. 100 000 y
10. A 10 g sample of isotope $^{14}_6\text{C}$ decays for 17 190 years. Use the Common Isotope Pairs chart on page 4 of your Data Pages to find the half life of this radioactive sample. Determine the total mass of daughter isotope $^{14}_7\text{N}$ that would be produced.
- A. 8.75 g
 - B. 7.5 g
 - C. 2.5 g
 - D. 1.25 g

IV. Practice Questions

Section 7.3

The atomic theory explains radioactivity: Nuclear Reactions

Circle the letter of the best answer.

- What is nuclear fission?
 - the process in which two low mass nuclei join together to make a more massive nucleus
 - the process of cell division that results in two new cells that are identical to their parent cell
 - the splitting of a massive nucleus into two less massive nuclei, subatomic particles, and energy
 - the process in which a parent cell splits into two daughter cells of approximately equal size, often occurring in single celled organisms
- What is nuclear fusion?
 - the process in which two low mass nuclei join together to make a more massive nucleus
 - the process of cell division that results in two new cells that are identical to their parent cell
 - the splitting of a massive nucleus into two less massive nuclei, subatomic particles, and energy
 - the process in which a parent cell splits into two daughter cells of approximately equal size, often occurring in single celled organisms
- Which equation represents nuclear fission?
 - ${}_{19}^{40}\text{K} \rightarrow {}_{20}^{40}\text{Ca} + {}_{-1}^0e + \text{energy}$
 - $2\text{C}_3\text{H}_7\text{OH} + 9\text{O}_2 \rightarrow 6\text{CO}_2 + 8\text{H}_2\text{O}$
 - ${}^2_1\text{H} + {}^2_1\text{H} \rightarrow {}^4_2\text{He} + {}^1_0n + \text{energy}$
 - ${}^1_0n + {}^{235}_{92}\text{U} \rightarrow {}^{92}_{36}\text{Kr} + {}^{141}_{56}\text{Ba} + 3 {}^1_0n + \text{energy}$
- Which equation represents nuclear fusion?
 - ${}^{131}_{53}\text{I} \rightarrow {}^{131}_{54}\text{Xe} + {}^1_0\beta$
 - ${}^{238}_{92}\text{U} \rightarrow {}^{234}_{90}\text{Th} + {}^4_2\text{He} + 2\gamma$
 - ${}^2_1\text{H} + {}^3_1\text{H} \rightarrow {}^4_2\text{He} + {}^1_0n + \text{energy}$
 - ${}^1_0n + {}^{235}_{92}\text{U} \rightarrow {}^{114}_{42}\text{Mo} + {}^{119}_{50}\text{Sn} + 3 {}^1_0n + \text{energy}$
- What is the daughter nucleus to complete the following nuclear fission reaction?
$${}^1_0n + {}^{235}_{92}\text{U} \rightarrow {}^{118}_{43}\text{Tc} + \underline{\hspace{2cm}} + 3 {}^1_0n + \text{energy}$$
 - ${}^{114}_{43}\text{In}$
 - ${}^{115}_{49}\text{In}$
 - ${}^{117}_{49}\text{In}$
 - ${}^{118}_{49}\text{In}$
- Which of the following is used to control the rate of the chain reaction that occurs in a nuclear reactor?
 - Add uranium-235 to the reactor.
 - Use fossil fuels (like gas or coal).
 - Insert cadmium rods into the nuclear reactor.
 - Remove cadmium rods from the nuclear reactor.
- Which statement about nuclear fusion is **not** true?
 - Two lightweight nuclei join together to form a heavier nucleus.
 - A typical reaction showing nuclear fusion is:
$${}^2_1\text{H} + {}^3_1\text{H} \rightarrow {}^4_2\text{He} + {}^1_0n + \text{energy}$$
 - Lightweight nuclei will not release excess energy if the nucleus generated by fusion is heavier than iron.
 - There are many commercial fusion reactors in the world. Canada has a series of them called CANDU reactors.

8. Which of the following statements applies to nuclear fission?
- A. Nuclear fission produces clean energy with very little waste.
 - B. Unstable nuclei release a huge amount of energy when they split.
 - C. Heavy, unstable nuclei join together into one new, larger nucleus.
 - D. A typical reaction for nuclear fission is:
$${}^2_1\text{H} + {}^3_1\text{H} \rightarrow {}^4_2\text{He} + {}^1_0n + \text{energy}$$

9. Which of the following statements applies to nuclear fusion?
- A. All fusion reactions release massive amounts of energy.
 - B. Unstable nuclei release a huge amount of energy when they split.
 - C. A typical reaction for nuclear fusion is:
$${}^1_0n + {}^{235}_{92}\text{U} \rightarrow {}^{92}_{36}\text{Kr} + {}^{131}_{56}\text{Ba} + 3 {}^1_0n + \text{energy}$$
 - D. A fusion reaction is used in modern nuclear weapons to generate most of the energy released in the blast.

10. How can a nuclear reaction be induced?
- A. by bombarding a nucleus with alpha particles, beta particles, or gamma rays
 - B. by heating the reaction with your lab Bunsen burner
 - C. by inserting cadmium rods into the nuclear reactor
 - D. by burning the nucleus using oxygen

IV. Practice Questions

Section 8.1

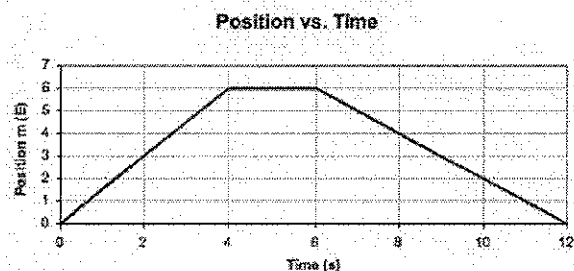
Average velocity is the rate of change in position: The Language of Motion

Circle the letter of the best answer.

1. What term describes quantities that have a magnitude but no directional component?

A. amplitude
B. velocity
C. vectors
D. scalars

Use the graph below to answer the following two questions 2 and 3.



2. What is the total displacement of this object?
- A. 0 m
B. 6.0 m [E]
C. 6.0 m [W]
D. 12 m
3. What does the horizontal section of the graph between time 4 s and 6 s indicate about the object?
- A. The object is at rest.
B. The object has turned south.
C. The object has slowed down.
D. The object is moving over a plateau on a hilltop.
4. If a rolling cart moves with uniform motion at a rate of 2 m/s in the forward direction, what will its displacement be after 5 s?
- A. 0.4 m
B. 2.0 m
C. 10 m
D. 100 m

5. A golf ball is hit from the right side of a hole (+) at a constant speed and travels toward the hole. If you were to make a position vs. time graph representing the ball's journey, would the slope of the graph be positive, negative, or zero?

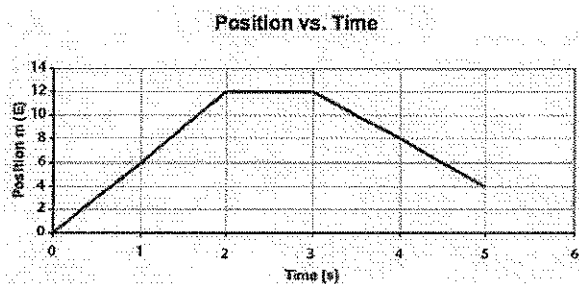
A. both negative and positive slope
B. negative slope
C. positive slope
D. zero slope

Use the following data to answer question 6.

Time (s)	Position (m)
0	0
1	5
2	10
3	15

6. A cyclist coasts forward on a flat, obstacle-free road. What was the total displacement of the cyclist?
- A. 0 m
B. 5.0 m
C. 10 m
D. 15 m
7. If you were to create a position-time graph for someone who is standing still, what kind of slope would the graph have?
- A. zero slope
B. positive slope
C. negative slope
D. both negative and positive slope

Use the graph below to answer question 8.



8. What is the total displacement of the object based on the graph above?
- A. 4.0 m
 - B. 12.0 m
 - C. 20 m
 - D. -4.0 m
9. What is the definition of “displacement”?
- A. a quantity that has only a magnitude
 - B. a scalar quantity that describes the length of a path between two points
 - C. a vector quantity that describes the straight-line distance between two points
 - D. the distance an object travels during a given time interval divided by the time interval
10. What symbol is used to represent change in a quantity?
- A. \vec{d}
 - B. Δ
 - C. γ
 - D. d

IV. Practice Questions

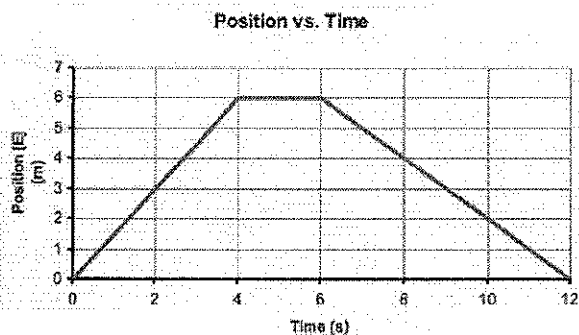
Section 8.2

Average velocity is the rate of change in position: Average Velocity

Circle the letter of the best answer.

- What units are used to measure speed?
 - s
 - km
 - m/s
 - m/s^2
- What is the average velocity of a baseball that travels 10 m [E] in 0.75 s?
 - 7.5 m/s
 - 10.0 m/s
 - 11.3 m/s
 - 13.3 m/s
- A major league baseball pitcher throws a baseball with an average velocity of 28 m/s. How long would it take for the ball to travel the 18.5 m distance from the pitcher's mound to home plate?
 - 0.33 s
 - 0.66 s
 - 1.3 s
 - 1.5 s

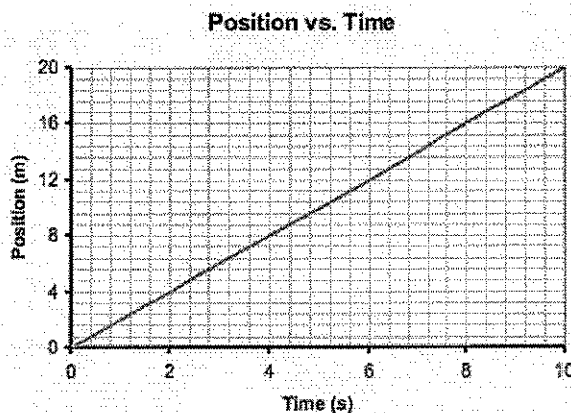
Use the following graph to answer questions 4 and 5.



- Using the graph above showing the motion of an object, determine the average speed of the object.
 - 1.0 m/s^2
 - 1.5 m/s^2
 - 1.0 m/s
 - 1.5 m/s

- What is the average velocity of the object described by the graph above?
 - 1.0 m/s
 - 0 m/s
 - 1.0 m/s
 - 1.5 m/s

Use the following graph to answer question 6.



- What is the average velocity represented by the graph above?
 - 0.5 m/s
 - 1.0 m/s
 - 2.0 m/s
 - 10 m/s
- On August 16, 2008, the 100 m sprint record was broken by Jamaican Usain Bolt running the distance in 9.69 s. What was Usain's average velocity?
 - 9.3 m/s
 - 9.72 m/s
 - 10.3 m/s
 - 10.5 m/s

8. A Formula One race car can move at an average velocity of 350 km/h. How far would the race car travel in 10 s?
- A. 972 m
 - B. 102 m
 - C. 97.2 m
 - D. 1.2 km
9. What does the slope of a line in a position vs. time graph represent?
- A. time
 - B. distance
 - C. displacement
 - D. average velocity
10. A Boeing 747 jet has an average cruising velocity of 780 km/h. How long would it take to fly the 675 km distance from Vancouver to Calgary?
- A. 69 min
 - B. 52 min
 - C. 42 min
 - D. 35 min

IV. Practice Questions

Section 9.1

Acceleration is the rate of change in velocity: Describing Acceleration

Circle the letter of the best answer.

- How is acceleration defined?
 - the rate at which an object changes its velocity
 - the difference between the initial time and the final time
 - the rate at which an object travels over a given distance
 - the displacement of an object during a time interval divided by the time interval
- How is deceleration defined?
 - the displacement of an object during a time interval divided by the time interval
 - the difference between the initial time and the final time
 - the rate at which an object travels over a given distance
 - acceleration that is opposite the direction of motion
- While a car is backing up, its velocity changes from -2.0 m/s to -7.0 m/s. What would be the total change in velocity?
 - -9.0 m/s
 - -5.0 m/s
 - 5.0 m/s
 - 9.0 m/s
- A drag racer uses a parachute to slow down after reaching top speed at the racetrack. What kind of acceleration does the parachute create on the car?
 - zero acceleration
 - positive acceleration
 - negative acceleration
 - both negative and positive acceleration
- What happens to the speed of an object if its acceleration is in the same direction as its velocity?
 - The object will speed up.
 - The object will slow down.
 - The object's speed will not change.
 - The object will begin to travel in the opposite direction.
- A ball being dropped from a height accelerates at 9.8 m/s². Which of the following statements best describes the motion of the ball?
 - The velocity increases and the acceleration increases.
 - The velocity is constant and the acceleration increases.
 - The velocity is constant and the acceleration is constant.
 - The velocity increases and the acceleration is constant.
- A Ferrari P4/5 race car goes from 0 km/h to 100 km/h in 3.55 s. What statement best describes the motion of the car?
 - uniform motion
 - zero acceleration
 - positive acceleration
 - negative acceleration
- A horse that is running forward at 25 m/s stops and then backs up at 2.0 m/s. What is the horse's change in velocity?
 - -27 m/s
 - -23 m/s
 - 23 m/s
 - 27 m/s

9. A ball is thrown straight up into the air. On its way up, the ball's acceleration is in the downward direction. Which of the following statements is true?
- A. This ball has no acceleration.
 - B. The ball is being slowed by gravity.
 - C. The ball has acceleration in an upward direction.
 - D. The ball is being accelerated by the thrower and gains velocity.
10. The Drop of Doom is a ride that accelerates you upward from 0 km/h to 80 km/h before plummeting you back to the ground, where you come to a rest at 0 km/h. What is the total change in velocity?
- A. 0 km/h
 - B. 80 km/h
 - C. It depends on acceleration and cannot be calculated from the information given.
 - D. It depends on the height of the ride and cannot be calculated from the information given.

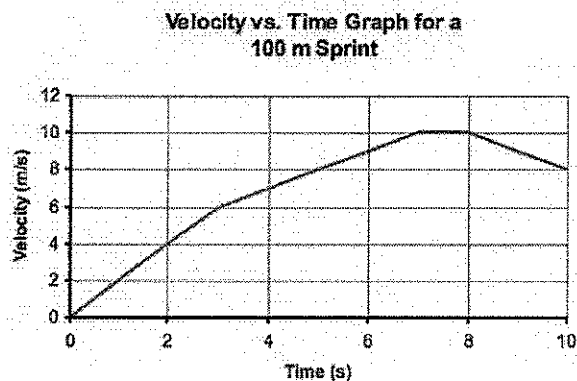
IV. Practice Questions

Section 9.2

Acceleration is the rate of change in velocity: Calculating Acceleration

Circle the letter of the best answer.

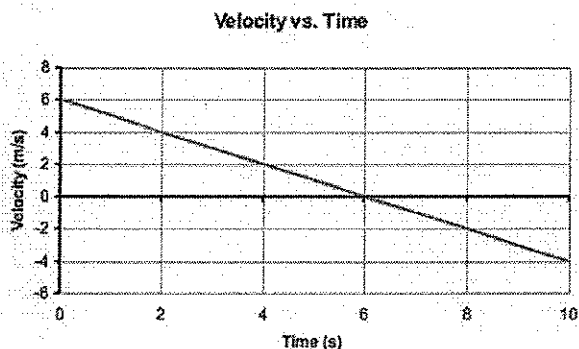
Use the graph below to answer questions 1 and 2.



- The graph above shows the motion of a sprinter during a 100 m sprint. Where does the sprinter have the greatest acceleration?
 - 0 to 3.0 s
 - 3.0 to 7.0 s
 - 7.0 to 8.0 s
 - 8.0 to 10 s
- What is the acceleration of the sprinter during the first 3 s of the race?
 - -2.0 m/s^2
 - -1.0 m/s^2
 - 1.0 m/s^2
 - 2.0 m/s^2
- What is the SI unit for acceleration?
 - m
 - s
 - m/s
 - m/s^2
- If a ball is thrown straight up into the air with an initial velocity of 24 m/s, how long does it take for the ball to reach its maximum height? (Assume the acceleration of gravity is 9.8 m/s^2 downward.)
 - 2.0 s
 - 2.4 s
 - 4.2 s
 - 9.8 s
- A piece of a potato fired from a potato gun accelerates from rest to a velocity of 60 m/s in 0.08 s. What is the acceleration?
 - -650 m/s^2
 - 650 m/s^2
 - 750 m/s^2
 - 7500 m/s^2
- How long does it take a skier to accelerate from 28 m/s to 47 m/s if the skier is accelerating at 4.0 m/s^2 ?
 - 3.7 s
 - 4.75 s
 - 47.5 s
 - 76 s
- A golf ball is struck from a tee and accelerates from rest at 560 m/s^2 forward. What is the velocity of the ball after 0.05 s?
 - 1120 m/s
 - 112 m/s
 - 28 m/s
 - 2.8 m/s

8. At what velocity will a penny strike the sidewalk if it is dropped from the Empire State Building and takes 11.27 s to fall the 373 m distance to the ground? You may ignore the effects of air resistance.
- (Remember that the acceleration due to gravity is -9.8 m/s^2 .)
- A. 110.45 m/s
 - B. -110.45 m/s
 - C. 125.20 m/s
 - D. -125.20 m/s
9. Which of the following is the factor with the greatest effect on the acceleration of an object falling due to gravity?
- A. Earth's magnetic poles
 - B. the object's temperature
 - C. the object's mass
 - D. air resistance

Use the graph below to answer question 10.



10. Which statement below best describes what is happening to the object in the graph?
- A. The object has a constant velocity.
 - B. The object is experiencing positive acceleration.
 - C. The object is experiencing negative acceleration.
 - D. This object is travelling in the same direction for this data set.

Practice Questions Answers

Section 4.1

1. C
2. C
3. A
4. A
5. B
6. D
7. C
8. C
9. B
10. C

Section 5.2

1. A
2. D
3. D
4. A
5. A
6. C
7. C
8. B
9. D
10. B

Section 7.1

1. D
2. B
3. A
4. B
5. D
6. C
7. B
8. C
9. A
10. D

Section 8.2

1. C
2. D
3. B
4. C
5. B
6. C
7. C
8. A
9. D
10. B

Section 4.2

1. D
2. D
3. C
4. D
5. A
6. C
7. A
8. C
9. D
10. B

Section 5.3

1. B
2. A
3. D
4. B
5. C
6. C
7. D
8. C
9. B
10. A

Section 7.2

1. C
2. A
3. C
4. C
5. C
6. A
7. D
8. D
9. B
10. A

Section 9.1

1. A
2. D
3. B
4. C
5. A
6. D
7. C
8. A
9. B
10. A

Section 4.3

1. B
2. C
3. C
4. C
5. D
6. B
7. A
8. A
9. C
10. D

Section 6.1

1. C
2. D
3. D
4. A
5. B
6. C
7. D
8. B
9. D
10. A

Section 7.3

1. C
2. A
3. D
4. C
5. B
6. C
7. D
8. B
9. D
10. A

Section 9.2

1. A
2. D
3. D
4. B
5. C
6. B
7. C
8. A
9. D
10. C

Section 5.1

1. C
2. B
3. C
4. B
5. A
6. A
7. D
8. D
9. C
10. A

Section 6.2

1. D
2. B
3. C
4. C
5. A
6. A
7. D
8. D
9. C
10. B

Section 8.1

1. D
2. A
3. A
4. C
5. B
6. D
7. A
8. A
9. C
10. B