

# Review

[Science](#), [Chemistry](#)



REVIEW a. 1., - - C - - c. - C 3. The effective nuclear charge is a. equal to the sum of the charges of the protons in the nucleus b. equal to the sum of the charges of the protons in the nucleus minus the sum of the electrons in the Outer shell c. less than the sum of the charges of the protons in the nucleus due to shielding by the electrons in the outer shell d. less than the sum of the charges of the protons in the nucleus due to shielding by the electrons in the lower, filled shells a. greater than the sum of the charges on the protons in the nucleus 4. isotopes are a. atoms with the same number of neutrons but different numbers of protons b. atoms with the same number of protons but different numbers of neutrons c. atoms with the same sum of neutrons plus protons but different numbers of neutrons and of protons d. atoms with the same number of protons and electrons e. atoms with the same number of neutrons and electrons 5. Radioisotopes are unstable because a. there is an equal number of protons and neutrons in the nucleus b. the attractive nuclear forces among the neutrons and protons are too small to balance the repulsive forces among the protons c. the number of neutrons is greater than the number of protons 2. What is the maximum number of electrons allowed in the third electron shell of an atom? a. all C. 32 b. 8 d, 2 e. 64 : c 1 a. 0 Select the letter of the best answer below. 1 Which of the following is the correct Lewis diagram for carbon? Knowledge and Understanding Chapter 1 B : Na Chapter 1 Elements and the Periodic Table. MHR 45 Si: Lewis diagrams. Draw the correct Lewis diagram for each element. a. .- b. . c. 9. Explain what is incorrect about each of the following d. the attractive forces among the protons are less than the repulsive forces among the neutrons a. the repulsive forces among the electrons are greater than the repulsive

forces among the protons

6. Which statement about the size of the atomic radius is correct?

- Tin atomic radius decreases going down a group.
- The atomic radius increases going across a period from left to right.
- The atomic radius is unrelated to its position in the periodic table.
- The atomic radius increases going up a group.

7. Which statement about ionization energy is true?

- The first ionization energy is greater than the second, third, or fourth ionization energy.
- The ionization energy is the same for atoms of all elements in the same group.
- For elements in a given period, the ionization energy is greatest for atoms of the element with a filled outer electron shell.
- Ionization energy decreases going across a group from left to right.

8. Which statement about electronegativity is true?

- Electronegativity is the energy change that occurs when an electron is added to an atom.
- Electronegativity is an indicator of the degree to which the nucleus of an atom attracts shared electrons.
- The electronegativity of atoms decreases going from left to right across a period.
- The electronegativity of atoms increases going down a group.

9. The electronegativity of a noble gas is greater than the electronegativity of the halogen that is in the same period.

Answer the questions below.

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19. Nuclear reactors create highly unstable, or radioactive, waste. This waste is formed when uranium nuclei in the fuel fission, or split, into smaller nuclei. For example, a uranium-235 ( $^{235}\text{U}$ ) nucleus might split into a strontium-95 ( $^{95}\text{Sr}$ ) nucleus and a xenon-137 ( $^{137}\text{Xe}$ ) nucleus. Why are strontium-

95 and xenon-137 nuclei unstable? Why do you think that any two smaller nuclei that are produced when a uranium-235 nucleus splits will be unstable? Hint: Study Table 2.19. Antimony has two commonly occurring isotopes: antimony-121 and antimony-123. Antimony-121 has a mass of 120.9038 u, and its isotopic abundance is 57.30%. Antimony-123 has a mass of 122.9042 u, and its isotopic abundance is 42.70%. What is the average atomic mass of antimony? Thinking and Investigation 17. What metalloids are in Period 5? Does this mean about the resulting ion? 16. If the electron affinity of an element is negative, what is its second ionization energy. 15. Write the general chemical equation that defines the name and properties of an element, to develop his periodic table. 11. Explain why periodicity is as it applies to the elements. That is, how are they periodic? 12. How do chemists describe the atomic radius of an atom? 'r' is it not the same as the radius of a circular object such as a coin, or the distance from the centre to the outer edge of the object? 13. Explain the difference between electronegativity and ionization energy. 14. Sketch the following diagram of a periodic table. Outline and label the main-group, transition, and inner transition elements with a coloured pen or pencil. With a different coloured pen or pencil, outline and label the alkali metals, alkaline earth metals, halogens, noble gases, lanthanoids, and actinoids. REVIEW 10. Describe how Mendeleev used cards, each having the Chapter 1 Table 180. 9. a positively charged ion, its atomic radius decreases dramatically. For example, the radius of a potassium atom, K, is  $2.27 \times 10^{-8} \text{ m}$ . The radius of a potassium ion,  $\text{K}^+$ , is  $1.38 \times 10^{-8} \text{ m}$ . Think about the electron configuration of the alkali metals. and suggest a reason for this significant

difference in the atomic radius of a neutral atom and the atomic radius of its positively charged ion. 22. When an alkali metal loses an electron and becomes a cation, its atomic radius decreases. 23. The periodic table is organized into columns and rows. The columns represent groups, and the rows represent periods. The only data in each cell are the chemical symbol and the average atomic weight. The cell with a question mark should contain data for one of the elements that is missing from Mendeleev's periodic table. The other cells contain data for titanium (Ti), zirconium (Zr), and tantalum (Ta). Titanium is lustrous, conducts electric current, and is ductile. Zirconium is malleable, ductile, and lustrous.

Tantalum is strong and very ductile, and conducts electric current. Predict the properties and the approximate atomic mass of the missing element. 21. The table below is an excerpt from the periodic table, elements shown in the periodic table below, answer the following questions. a. Which of the four elements shown has the highest electronegativity? b. Which of the four elements shown has the lowest electronegativity? c. Explain how you were able to answer parts a. and b. 20. Without looking up the electronegativities of the elements, predict the following. You have two white crystalline solids. One is an ionic compound, and the other is a molecular compound. Design an investigation to determine which is which. Assume that your investigation cannot involve dissolving them in water. 36. Water and methanol,  $\text{CH}_3\text{OH}$  (a type of alcohol), mix together in any proportions. Find their boiling points. Then, based on the boiling points you found, design a method you could use to separate water and methanol that is not distillation. 37. Suppose that you have two colourless solutions. One is a solution of an ionic compound in water, and the other is a solution of a molecular compound in water. Design an investigation

to determine which solution is which. Describe the tests you would perform and the results you would expect for each solution. Application a graphic organizer. To help you, the Chapter 2 Student Study Guide lists the Key Terms and Key Concepts. Refer to Using Graphic Organizers in Appendix A to help you decide which graphic organizer to use.

34. Summarize your learning in this chapter using a concept map. Molecules of methane,  $\text{CH}_4$  and water,  $\text{H}_2\text{O}$ , have similar masses. However, their boiling points are very different. The boiling point of methane is  $-161^\circ\text{C}$ , and the boiling point of water is  $+100^\circ\text{C}$ . Draw sketches of these molecules, and use your sketches to explain why their boiling points are so different.

32. Write the names of the following ions:  $\text{Na}^+$ ,  $\text{Cl}^-$ ,  $\text{Ca}^{2+}$ ,  $\text{SO}_4^{2-}$ . The last four ions are polyatomic ions. Design a different naming system that you think would be descriptive of the ions and easy to remember.

33. Draw structural formula based on the Lewis structure shown here. Explain, in detail, the relationship between the two diagrams. Intermolecular forces.

3D. The boiling points of argon ( $-186^\circ\text{C}$ ) and fluorine ( $-188^\circ\text{C}$ ) are quite similar. Write a paragraph that you could read to help a Grade 10 student understand why these boiling points are similar, based on water, molecular mass, and polarity.

Chapter 2 Chemical Bonding. MHR 91 nonpolar grease from clothing.

39. In 1906, the Nobel Prize in Chemistry was awarded to French chemist, Henri Moissan, for isolating fluorine in its pure elemental form. Why would this achievement be deserving of such a prestigious honour? Use your understanding of the properties of the elements, as well as chemical bonds, to explain your answer.

40. You might have heard advertisements about detergents that 'break up grease!' Oil and grease consist of large non-polar molecules, which

are very insoluble in water, Nevertheless, detergents, which seem to dissolve in water can remove oil and grease from clothing in water. A space-filling model of a typical detergent molecule is shown below. Study the model, and provide a possible explanation for how detergents can remove oil from water.

38. Pure sodium can be extracted from sodium chloride using a process called electrolysis. Sodium ions can pick up electrons from one electrode and form sodium atoms. Chloride ions can give up electrons to the other electrode and form chlorine atoms, which then combine to form molecules of chlorine gas. The diagram shown here is a simplified sketch of the apparatus.

Imagine that you were asked to design the containers and other equipment for this process. Review what you have learned about compounds that carry an electric current and about the properties of sodium metal and chlorine gas. Describe the challenges you would have to overcome when designing the equipment. Present some possible solutions to these challenges. charge of an atom larger or smaller than the actual nuclear charge? How does the effective nuclear charge influence the size of an atom? 30, Use a sample to show the difference between a simple average and a weighted average.

31. State the periodic law, and using a flowchart, describe the observations that led to its development. 29. Draw a concept map to explain the meaning

of "effective nuclear charge" in the effective nuclear charge - Every Bohr calculated for electrons around the nucleus of a hydrogen atom and the electron cloud that represents the solution to the Schrödinger wave equation. 26, the element that predicts the chemical and physical properties determined by its electron configurations. Choose an element from Group 1, Group 2, or Group 17. Draw the Bohr-Rutherford diagram for that element and use it as the centre of a

spider map with at least four or more legs. For each leg, state characteristic of that element and relate that characteristic to the electron configuration of the element.

27. Use labelled diagrams to explain how the Bohr model of the atom improved on the model that Rutherford had developed. What new information did Bohr discover that had not been available to Rutherford?

28. Write an e-mail to a classmate who is studying for an exam, explaining how one isotope of magnesium differs from another isotope of magnesium. How are the isotopes the same?

25. Describe the connection between the radius that Communication halogens explains their large negative electron affinity.

24. Draw a graph of electronegativity versus atomic number, using the values to the periodic table in Figure 1.22 on page 36. Connect the dots for the elements of each period with a different-colored pencil or pen. Examine the graph and answer the following questions.

- Describe any forms of periodicity that you observe.
- Describe the trends that you observe within any given period.
- Describe the trends that you observe within any given group.
- Explain the reasons for the trends based on the properties of the elements.

23. What characteristic of the electron configuration of Chapter 1 Elements and the Periodic Table - MH8 47 electronics so you can work with a team that is developing smaller and more efficient microchips. Why would it be important for you to have a strong background in chemistry?

40. Intergovernmental you want to pursue a career in computer science? 39. Breathing a halogen, such as chlorine or bromine vapor, can seriously harm the nose, throat, and lungs. In contrast, breathing small amounts of a noble gas is not harmful. You might have heard someone talk after breathing helium. Why do you think breathing a halogen



is harmful, whereas breathing a noble gas 38. Explain why gold can be used in Jewellery, in crowns for teeth, and also as a conductor in electronic devices, to be dangerous because they damage tissues. Provide a possible reason why this dangerous substance is used for medical purposes. 37. When iodine is taken into the body, it accumulates in the thyroid gland. There, it is used in the synthesis of thyroid hormone. Iodine-131 is a radioactive isotope of iodine that is sometimes used to treat an overactive thyroid. Radioactive substances are usually considered 36. Alkali metals are banned from many classrooms. Based on their properties, explain why they are banned. Application 32. Prepare an oral presentation for chemistry class in which you discuss some advantages of using a Lewis diagram rather than another type of diagram such as a Bohr-Rutherford diagram or a chemical symbol. 33. Use a diagram to explain how chemists measure the radius of an atom in a solid material, such as a metal, 34. Make a table with the headings Property, Trend Going Down a Group, and Trend Going Across a Period. Under Property, list Atomic Radius, Ionization Energy, Electron Affinity, and Electronegativity. Fill in the table by indicating whether the trend is increasing or decreasing. For each property, write a discussion about the factors that affect that property and why the property follows the trend in your table, 35. Summarize your learning in this chapter using a graphic organizer. To help you, the Chapter 1 Summary lists the Key Terms and Key Concepts. Refer to Using Graphic Organizers in Appendix A to help you decide which graphic organizer to use. REVIEW :: Select the letter of the best answer below. 1. Which statement about ionic compounds is false? a. An ionic compound is comprised of ions held together by an electrostatic force.

b, Anionic compound typically consists of a metal ion and a non-metal ion. C. An ionic compound contains the same number of oppositely charged ions. d. An ionic compound has a zero net charge. a. The composition of an ionic compound can often be predicted by the octet rule. 2. The circled electrons in this Lewis diagram are called a. unpaired electrons b. free electrons C. a lone electron pair : ° d. a bonding pair a. an unbound pair 3. The electronegativity of magnesium is 1.3, and the electronegativity of oxygen is 3.4. The bond that forms between them is a. mostly ionic b. polar covalent C. slightly polar covalent d. non-polar covalent e. none of the above 4. The chemical name of  $Mg(ClO_2)_3$  is a. magnesium chloride b. magnesium dichlorite c. magnesium chlorite d. magnesium chlorate a. magnesium hypochlorite 5. The element that comes second in the name of a binary molecular compound is the element that a. has the lower group number b. has the higher group number C. has the higher period number d. is the non-metal a. has the greater mass 6. The chemical name of  $SiBr_4$  is a. monosilicon tetrabromide b. silicon hexabromide C. monosilicon pentabromide d. silicon octabromide e. silicon tetrabromide

Knowledge and Understanding Chapter 2  
 CF Chapter 2 Chemical Bonding. MHR can conduct electric current. What conditions are necessary for this type of compound to conduct electric current? 16. State which type of compound, ionic or molecular, forces. 89 15. Describe the two forces that make up intermolecular forces between two conditions. What are these conditions? Explain. 14. The boiling point of a compound depends on a balance "bond dipole"  $H-C-Cl$  13. Explain the meaning of the term "ionic bond" is true? a. A compound that has a very high melting point is a liquid at room temperature. b. Ionic bonds are stronger

than intermolecular forces, C. Non-polar molecules experience no intermolecular forces. d. A compound that has a very low boiling point is a liquid at room temperature. a, Dipole-dipole forces are stronger than the force between oppositely charged ions. 8. Which compound is most likely to be soluble in water? a. a non-polar compound b. a slightly polar compound C. a polar compound d. an ionic compound a. all of the above Answer the questions below. 9. In this chapter, you read that ores are metals combined with non-metals, How would you classify the compounds that are found in ores? Why? 10. Several different gaseous compounds that consist of non-metals are found in the atmosphere. How would you classify these gaseous compounds? Why? 11. Aluminum ions have a charge of  $3+$  and oxide ions have a charge of  $2-$ . How can aluminum ions and oxide ions combine to form a compound with a net charge of zero? 12. Copy the following diagram and complete a Lewis structure for the compound. Draw a circle around each atom and its electrons and describe how each atom satisfies the octet rule. H

H 7. Which statement about the properties of compounds REVIEW J.

Cd(OH)<sub>2</sub> f.  $\text{NF}_3$  3  $\text{NO}_2$  4 (aq) 5 g.  $\text{I}_2$  h.  $\text{H}_2\text{S}$  4  $\text{P}_2\text{O}_3$  i.  $\text{KOH}$  : H: C: F: : F: : O

90 MHR. Unit 1 Matter, Chemical Trends, and Chemical Bonding a. gold(II) chloride g. aqueous hydrogen b. magnesium oxide chloride C. lithium nitrite h. sulfuric acid d. calcium phosphide i. cobalt(II) hydroxide a. manganese(II) sulfide j. lithium hydroxide f. calcium hypochlorite 21.

Draw a Lewis structure of each molecule consisting of the following combinations of atoms. a. one carbon atom bonded to three hydrogen atoms and one chlorine atom b. one carbon atom bonded to two sulfur atoms c. two iodine atoms bonded together d. three carbon atoms bonded together

chain; three hydrogen atoms bonded to each of the carbon atoms on the ends; an oxygen atom bonded to the central carbon atom. Write the formula for each compound. 19. Name each compound. a.  $\text{MgCl}_2$ , b.  $\text{Na}_2\text{O}$ , c.  $\text{PbCl}_2$ , d.  $\text{CuO}$

17. Use Lewis diagrams to predict the ratio of metal to non-metal ions in a compound formed by each pair of elements. a. magnesium and fluorine b. potassium and bromine c. rubidium and chlorine d. calcium and oxygen

18. Each of the following Lewis structures has an error in it. State what the error is, and draw the correct Lewis structure.

Thinking and Investigation Chapter 2

16. 'If compounds would be gases' Do you agree or disagree with this statement? Explain your reasoning, as if you were explaining it to a classmate who did not understand intermolecular forces.

29. "If there were no intermolecular forces, all molecular substances would be gases. It is important to use chemicals properly to minimize the risks to human health and the environment. You find that when sodium, a highly reactive metal, is combined with chlorine, a toxic gas, the product, sodium chloride, is very safe. Using print and Internet resources, research another element or compound that can be made safe by reacting it with another element or compound. Share your findings in the format of your choosing.

27. In some Lewis diagrams, one of the chemical symbols might have no dots. Draw an example of this, and explain why one of the symbols has no dots.

28. Identify the chemical bonds in the following compounds as mostly ionic, polar covalent, slightly polar covalent, or non-polar covalent. Show and explain the calculations you used to identify the bonds. a. calcium chloride b. carbon dioxide c. nitrogen d. silicon tetrachloride

26. The type of chemical bond in a compound determines its physical and chemical

properties of that compound. Name and sketch two different types of chemical bonds. For each bond type, describe two ways in which it influences the properties of the compound.

25. ' 1 Communication 23. Write the formula for each compound. a. dihydrogen monoxide b. sulfur trioxide c. silicon tetrachloride

24. Identify the errors in each phrase or statement, and rewrite it correctly, a. four molecules of potassium bromide b. The compound NaHSO<sub>4</sub> is sodium sulfate. c. The compound KNO<sub>3</sub> is potassium nitrate. b. N, O, C. CO d. Cl, O a. SO<sub>2</sub>

22. Name each compound.