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REVIEW a. I,. - - C - - c. - C 3. The effective nuclear charge is a. equal to the suns of the charges of the protons in the nucleus b. equal to the suns of the charges of the protons in the nucleus minus the sum of the electrons in the Outer shell c. lest than tire sum of the charges of the protons in the nucleus due to shielding by the electrons in the outer shell d. lest than the sum of the charges of the protons in tire nucleus due to nisielding by the electrons in the lower, filled shells a. greater than the suns of the charges on the protons in the nucleus 4. isotopes are a. atonts with the same nutotber of neutrons but different nuntbers of protons b. atoms seitls the same number of protons but different numbers of neutrons c. atoms witls tire 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 seith the tame number of neutrons and electrons 5. Radioisotopes are umrstable because a. there Is an equal number of protons and neutrons in the nucleus b. rite attractive nuclear forces anmong the neatrons and protons are too small to balance the repulsive forces ansong tire protons c. tire number of neutrons is greater than the riuumber of protons 2. What is the maximum nunaber of electrons allowed In the tirird electron shell of an atom? a. all C. 32 b. 8 d, 2 e. 64 : c 1 a. O Select the letter of the best atoner below. 1 Which of the following is the correct Lewis diagram for corbon? Knowledge and Understanding Chapter 1 B : Na Chapter 1 Elements and the Penindic Table. MHR 45 Si: Lewis diagrams. Drase rhe correct Lewis diagram for each element. a. .- b. . c. 9. Explain what is incorrect about each of the folloss’ing 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? a. Tin atomic radius decreases going down a group. b. Ile atomic radius increases going across a period from left to right. C. Tie atonric radius Is unrelated to its position in the periodic table. d. Tie atomic radius increases going up a group. a. Tie atomic radius decreases going across a period from left ro right. 7. Which statement about Ionization energy Is true? a. The first ionization energy is greater tItan the second, third, or fourth ionization energy. b. ‘ tIe Ionization energy is the same for atoms of all elements in the sante group. C. For elements in a given period, the ionization energy is greatest for atouts of the elensent with a filled outer electron shell. d. tonization energy decreases going across a group from left to right. a. Tie Ionization energy Is greatest for atoms of elements that have ois one electron in the y 1 valence shell of their atoms. 8. WhIch statement about electronegativity is true? a. Electronegativiry Is the energy change that occurs when an electron is added to an atom. b. Electrcrnegativity is an Indicator of tire degree to whicla the nucleus of an atom attracts shared electrons. c. TIe electronegativit-y of atonts decreases going from left to right across a period. d. tie electronegativity of atoms increases going dosvn a group. a. ‘ tie electronegativit-y of a noble gas is greater than the electronegativity of the halogen thor is in the same period. Answer the qnesrlosu below. 46 MHR . Unit t Matter, Chemical Trends, and Chewical llorrdinq 19. Nuclear reactors create highly unstable, or radioactive, Waste. Ths waste is formed when urat, iunr nuclei in the fuel fission, or split, into smaller nuclei. Par example, a uraniutn-235 U) nucleus might split into a strontiunt-95 Sn) nucleus and a xenonl 37 ( Xe) nucleus. Why are srrontiunr-95 and xenon-t37 nuclei unstable? Why do ynta think than any two smaller nuclei that are produced sohen a uranium-235 nucleus splits will be unstable? Hint: StudyTabie t . 2. 19. Anrinrony has two comnronly occurring isotopes: antimony-l21 and antimony-l23. Antimony-I 21 has a mass of 120. 9038 u, and its isotopic abundance is 57. 30%. Antimony-123 has amass of 122. 9042 a, and Its isotopic abundatrce is 42. 70%. Vr’hat is the average atomic mass of antimony? Thinking and Investigation 17. What metalloids are in Period 5? does this nrean about the resulting ion? 16. If the electron affinity of an element is negative, solsat second ionization energy. 15. Write the general chemical equation that defines the -1 1 name and properties of an element, to develop his periodic table. 11. Explain svham periodicity is as it applies to the elements. Tint is, how are they periodic? 12. Hors’ do chemists describe the atomic radius of an atonr? ‘,?‘ bs’ is it not the same as the radius of a circular object such usa cain, or the distance from the centre to the outer edge of the object? 13. Explain the difference between elecironegativiry and nlctromt affinity. 14. Sketch the following diagram of a periodic table. Outline and label the main-group, transition, and ioner transition elements ss’ith a coloured pen or pencil. Witla a different. coioured pen or pencil, outline and label rite alkali irretals, alkaline earth metals, halogens, noble gases, lazithanoids, and actinoids. REVIEW 10. Describe hose .%tendeleev used cards, each having the Chapter 1 Ta 180. 9 a positively charged ion, its atomic radius decreases dramatically. For example, the radius of a potassium atom, K, is 2. 27 x lo\_iSm. Tie radius of a potassium ion, K is 1. 38 x to\_tOm. Tlink about the electron , tm configuration of the alkali nretals. and suggest a reason for this significant difference in the atomic radius ofa neutral atom and the atomic radius of its positively charged ian. 22. When an alkali metal loses an electron and becomes 9t 22 Zr TI 47. 98 drasr’n in the modern fornr. Tie columns represent groups, and the rosss represent periods. ‘ lie only data in each cell are the chemical symbol and the average atomic sveighr. The cell with a question mark should contain data for one of the elements that seas missing from Mendeleev’s periodic table. Thee 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 moans of the missing element. 21. lie table beloss’ is an excerpt from the periodic table, elements shown in the periodic table below, aarssser the following questions. a. Which of the four elements sharon has the highest electronegutivity? b. Which of the four elements shown has the lowest electronegarivity? C. Explain hose you were able to answer parts a. and b. 20. Without looking up the electronegativities of the -0, 35. You have two white crystalline aoltds. One is on tonic compound, and the other isa molecular compo und. Design an investigation to determine which is which, Assume that your investigation cannot involve dissolving them in water, 36. Water and methanol, CH (a type of alcoho OH 5 l), mix together in any proportions. Pind their boiling points. Then, based on the boiling points you fsnd, design s method you could use to separate water and methan ol that see mined togeilter. 37. Suppose that you have two colourless solations. One is a solution of an ionic compouod in water, and the other tan solution of a molecular compound in water. Design an investigation to deiernsine which solution is which. Describe the testa you would perform and the results you would expect for each solution. Application a graplsic organizer. To help you, the Chapter 2 St. usttnnry lists the Key Terms and Key Conce pts. Refer to Using Graphic Organizers in Appendix A to help you decide which graphic organizer to use. 34. Summarize your learning in this chapte r asing H HC 0 31. Molecules of methane, CH and water IiO, , 4 have similar masses, However, their boiling points are very different. The boiltngpoisat of metltsneia –161°C, and the boiling point of water is + 100°C. Draw sketch es of these molecules, and use your sketches to exploi n why their boiling points are so different. 32. Write the names of the following toes: t, t0, 10, ", I0,, lO.’. The lesi four ions are palystonsic ions. Design a different Issalting system that you think would be descriptive of the ions and easy to remember. 33. Draws struciural formula based on the Lewis structure shown here. Explain, in detail, the relationship between the two dIagrams. intermolecular forces. 3D. Thebatltogpoints of argon (–186°C) and fluorine (–188°C) use quite similar. Write a paragr aph that you could read to help a Grade 10 student unders tand why these bailing points are similar, based on water, mouso, aum85\*I - elrct, Ode neaative /‘‘- polar Chapter 2 Chomlcsl Bonding. MHR 91 nonpolar grease from clothing. 39. In 1906, the Nobel Prize in Chemistrywns awarded to Preach chemist, Henri Moissuas, for isolating fluorine tn tin pure elemental form. Why would this schievenseni be drservtng of such a prestigious honour? Use your understanding of the properties of the elements, as wail us chemical bonds, ta 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 tn water, Nevertheless, detergents, which seem to dissolv e in con remove oil and grease from clothing in water. A space. ttUing model of a typical detergent molecule is shown below. Study the model, and provid e a possible explanation for how detergents can remov e – –ct, sas - awer. apy- 38. Pure sodium can be extructed from sodium chlorid e using a pmcess calied electrolysis. Sodium tons can pick up etectrens from one electrode and form sodium atoms. Chioride tons can give up electrons to the other olectmde and farm chlorine atoms, which then combine to form molecules of chlorin e gas. The diagram thown here isa simplified sketch af 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 aadiusss snetel aad chlorine gas. Describe the challenges you would have to overco me 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 ass etaustple to show the difference between a simple average and a weighted average. 31. State the periodic law, sad, asiog a flowchart, describe the observations that lcd to its development. 29. Draw a concept map to explain the meaning of “ effective nuclear charge’ lathe eifeciive nuclear - Every Bohr calculated for electrons around the nucleus of a hydrogen atom and the electron cloud that represents the solution to the Schriidiager wave equation. 26,: element hat predictahie chemical and pitysicul properties determined by its electron configuruitots. 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. Poe each leg, states characteristic of that element and relate that cbarsctertstic to the electron configuration of the element. 27. Use labelled diagrams in explain how the Bohr model of the atom improved on the model that Rutherford had developed. What new information did Bohr discover that hod not been available to Rutherford? 28. Write an e-motl ton classmate wlto is studying for so exam, explaining hose one isotope of mognestum differs from another isotope of msgnestuao. How are the isotopes the sasne? 25. Describe the connection between the radius that Communication halogens explains their large negative electron affinitiest 24 Draws graph of electronegutivity versus atomic number, using the values to the periodic table in Figuep 1. 22 on page 36. Connect the potats for the elements of each period with a difllteent-cotoured pencil or pen. Examine the graph end answer the following questions. a. Describe any forms of pertodicily that you observe, b. Describe the trends that you observe withie any given period. C. Describe the trends that you observe within any given group. d. Explain the rensotis for the treads bused on the properties of the elements. 23. What characteristic of the electron coafigstratioa of Chapter 1 Elemeats and rho PerIodic Table - MH8 47 electronics so you can work with a team that is developiog sotaller and more efficient microchips. Why would it be important Cot you to have a strong background in chemistry? 40. lntsgtne shut you want to pursue a career in computer is not? 39. Breathing a halogen, such as chlorine or bromine vopaur, can seriously harm the nose, throat, and lungs. In contrast, breathing small amounts of n noble gas is oat harmful. Yoa might have heard someaae talk after breathing helium. Why do you ilsink breathing a halogen is harmful, whereas breathing a noble gas 38. Explain why gold can housed 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, is accumulates In the thyroid gland. Thre, it is used in the synthesis of thyroid hormone. Iodine-lIt isa radioactive isotope of indine that is sometimes used to treat an overactive thyreid. Radioactive substances are usually considered 36Th alkali metals are banned front many classrooms. Based oat their properties, explain why they are banned. Application 32. Prepare on oral presentation for chemistry class in which you discuss some advantages of using a Lewis diagram rather than anothnt type of diagram such as a Bohr-Rutherford diagram or a chemical symbol. 33. Uses diagram so explntn how chemists measure the radius of an atom isa a solid material, such us a metal, 34. Make stable with the headings Property, Trend Going Down a Group, and Trend Going Across a Period. Under Property, list Atomic P. adlus, Ionization Energy, Electron Affinity, and Electronegstivity. Pill in the table by indicatlngwhether the tread is increasing or decreasing. Poe each property, write a discussion about the factors that affect that property and why the properly follows the trend in your table, 35. Summarize your learning in this chapter using a graphic organIzer. Ta help you, the Chapter 1 Summary listt the Key Terms and Key Concepts. Refer to Using Graphic Organizers in Appendix A to help you decide which graphic organizer louse. REVIEW :: Select the letter of the best answer below. 1. Vs’hich 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 coatains the Sante number ot 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. art electron pair : ° d. a banding pair a. an unbound pair 3. The electronegativity of magnesium is 1. 3, and the electronegativity of oxygen is 3. 4. The band that forms bet-ss’een thent is a. niostly ionic b. polar covalent C. slightly polar covalent d. non-polar covalent e. none of the above 4. The chemical name of Mg(CIO is )a 3 a. magnesiuns chloride b. magnesium dichlorite c. magnesium chlorite d. ntsgnrsium chlorate a. magnesiuns hypochloritr 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 nunsber d. is the non-metal a. has the greoter mass 6. The chensical name of SiBr is 4 a. monosilmcon letrnbromide b. silicon hexabromide C. monosilicon pentabromide d. silicon octabramide 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 conspound to conduct electric current? 16. Statewblch type of compound, ionic or molecular, forces. 89 15. Describe the two forces that make up intermolecul ar 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 H is true? a. A commspound that has a very high melting point is a liquid at room temperature. b. Ionic bands are stronger than intermolecular forces, C. Non-polar molecules experience no intermolecular forces. d. A compound that has avery low boiling point iso liquid 01 room temperature. a, Dipole-dipole forces are stronger than the force between oppositely charged ions. 8. Which compound is inmost likely lobe soluble in water? a. anon-polar compound b. a slightly polar compound C. a polar compound d, anionic compound a. all of tIme above Answer the questions below. 9. In this chapter, you road 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 coissist of non-metals are found in the atmosphere. How would you classify these gaseous conmpounds? Why? 11. Alumlnuni ions have a charge of 3+ and oxide ions have a charge of 2–. How cams aluminum ions and oxide ions conthine to form a compound with a net charge of zero? 12, Copy tire follosving 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)m f. NFI 3 NO 4 (nq) 5 g. ItaCrO h. H (s) 4 P0 3 I. KOH : H: C: F: : F: : o 90 MHR. Unit 1 Matter, Chemical Trends, and Chemical Bonding a. gold(llt) chloride g. aqueous hydrogen b. magnesium oxide chloride C. lithium nItrIte h. sulfuric acid d. calcluus phosphide I. cobalt(It) hydroxide a. mnmmganese(tI) sulfide j. lithIum hydroxide f. calcium hypochlorite 21. Drase a Lewis structure of each molecule consisting of the folloss’lng 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 togetbee d. three carbon atoms bonded together iou chain; tlsree hydrogen atoms bonded to each of the carbon atoms on the ends; an oxygen atom bonded to the central carbon atom 20. Write the formula for each compound. 19. Name each compound. a, MgCI, b. Na 0 2 C. PeCI, d. CuO a. Ba(ClO)m H H C:: 0: H C:: C:: 0: H 0 17. Use Less’ls 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. calciuns and oxygen 18. Each of the followIng Lewis structerri has an error In it, State what the error is, and draw the correct Leseis structure, Thinking and Investigation Chapter 2 1f compounds would be gases’ Do you agree or disagree with this statement? Explain your reasoning, as if you ss’ere explaining it to a classmate ti-ho did not understand intermolecular forces. 29. “ 11 there ss’ere no intermolecalar forces, all molecular It is important louse chemicals properly to minimire the risks to human health and the environment. You rend 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 mode safe by reacting it with another element or compound, Share your findings in the format of yout 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. Shose and explain the calculations you used to identifi- the bonds. a. calcium chloride b. carbon dioxide C. nItrogen d. sIlicon tetrachloride 26. The type of chemical bond in a compound determines time 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. dlhydrogen 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, is sodium sulfate. C. The compound KNO Is potassium nitrate. b. N, O, C. CO d. Cl, O a. SO, 22. Name each compound.