Biology The Dynamic Science 5th edition Russell Test Bank

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TRUE/FALSE

1 : The four elements that make up more than 96.5% of the weight of living organisms are oxygen, carbon, hydrogen, and calcium.
A : true
B : false

Correct Answer : B

2 : Carbon dioxide is an element.
A : true
B : false

Correct Answer : B

3 : Hydrogen, atomic number 1, has three isotopes, ^{1}H, ^{2}H, ^{3}H. ^{1}H is comprised of one proton, one neutron, and one electron.
A : true
B : false

Correct Answer : B

4 : Atoms with atomic numbers between lithium and neon have two energy levels.
A : true
B : false

Correct Answer : A

5 : In the representation of hydrogen gas, H-H, the dash represents two electrons being shared equally.
A : true
B : false

Correct Answer : A

6 : Proteins in thermophiles must be stabilized by van der Waals forces, because hydrogen bonds cannot be maintained at high temperatures.
A : true
B : false

Correct Answer : A

7 : Ice floats in liquid water because there are, on average, fewer hydrogen bonds between molecules in ice than water, resulting in a lower density.
A : true
B : false

Correct Answer : B

8 : The polarity of water allows it to create a hydration layer that prevents salt from coming back out of solution after it has been dissolved.
A : true
B : false

Correct Answer : A

9 : Acid precipitation can have a pH as low as 3.
A : true
B : false

Correct Answer : A

10 : Buffers can increase the pH of a solution when acids are added.
A : true
B : false

Correct Answer : B

SHORT RESPONSE

11 : Why is iodine considered a trace element, and what is its biological function in humans?

Correct Answer : Iodine is 0.0004% of a human's weight, compared to elements that occur at quantities greater than 0.01%. Iodine is required for proper thyroid gland function. Lack of iodine affects metabolism and growth. In the short-term, iodine deficiency results in lethargy, apathy, and sensitivity to cold temperatures; in the long-term, iodine deficiency causes a goiter.

12 : Explain how radiometric dating allows scientists to determine the age of a particular fossil.

Correct Answer : Radioactive isotopes decay in a very predictable way. By knowing the approximate concentration of a radioisotope that is naturally present, and determining the concentration of the radioisotope in the fossil, you can calculate the length of time that it took for the radioactive isotope to decay to the level in the fossil.

13 : If van der Waals forces are weak, how can geckos utilize these forces to cling to and walk up vertical smooth surfaces?

Correct Answer : The toes of geckos are covered by millions of hairs (setae). At the tip of each setae are hundreds of thousands of pads, where each pad forms a weak interaction with a smooth surface due to van der Waal forces. Collectively, these forces form strong attractive forces.

14 : Describe the difference between cohesion and adhesion, and how they, together, allow water to move upward in plants.

Correct Answer : Cohesion is the resistance of molecules to separate from each other, where adhesion is the ability of molecules to stick to surfaces. Cohesion in water is the resistance to separate due to the hydrogen-bond lattice. Adhesion in water is the ability of hydrogen bonds to form with charged and polar groups associated with surfaces. A water column in a plant is a result of cohesion—water molecules being held together—and maintained by water adhering to the walls of the water conducting tissue (xylem).

15 : The pH of your stomach is between 1 and 3. Use your knowledge of polar and nonpolar substances to explain why the acids in your stomach do not alter the pH of your blood.

Correct Answer : Cells are comprised of a lipid bilayer that excludes hydrophillic substances, including acids. The cells lining the inside of the stomach prevent the acid from moving across the cell membrane into the blood stream.

MULTIPLE CHOICE

16 : Four elements, including ____, make up more than 96.5% of the mass of most living organisms.
A : sodium
B : potassium
C : phosphorus
D : nitrogen
E : calcium

Correct Answer : D

17 : A trace element is one found in specific organisms in ____ quantities and is ____ for normal biological functions.
A : moderate; unnecessary
B : moderate; vital
C : small; unnecessary
D : large; unnecessary
E : small; vital

Correct Answer : E

18 : Prolonged iodine deficiency causes ____, a condition in which the thyroid gland enlarges so much that the front of the neck swells significantly.
A : gout
B : cancer
C : a goiter
D : anemia
E : granuloma

Correct Answer : C

19 : The smallest unit that retains the chemical and physical properties of an element is a(n) ____.
A : proton
B : compound
C : molecule
D : neutron
E : atom

Correct Answer : E

20 : The substance H_2O is considered to be ____.
A : both a molecule and a compound
B : a compound but not a molecule
C : neither a molecule nor a compound
D : a molecule but not a compound
E : both a molecule and an ion

Correct Answer : A

21 : The substance O_2 is considered to be ____.
A : both a molecule and a compound
B : a compound but not a molecule
C : neither a molecule nor a compound
D : a molecule but not a compound
E : both a molecule and an ion

Correct Answer : D

22 : Diluted acetic acid, CH_3COOH, is commonly called vinegar. How many atoms of hydrogen are present in one molecule of acetic acid?
A : one
B : two
C : three
D : four
E : five

Correct Answer : D

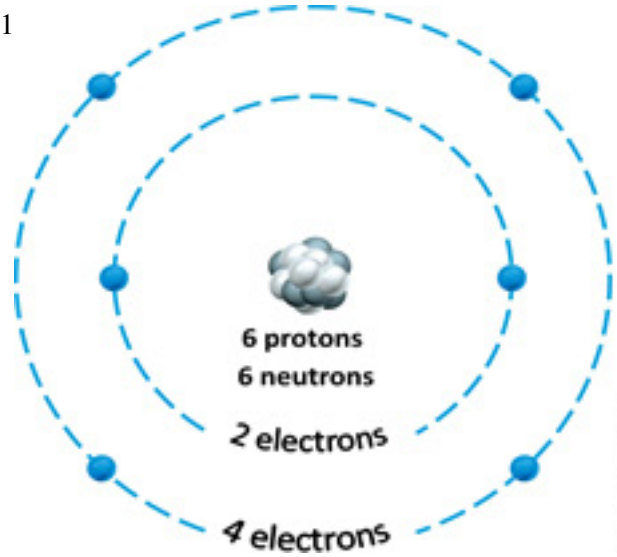
23 : Radioactive ____ is commonly used to treat patients with dangerously overactive thyroid glands.
A : carbon
B : radium
C : iodine
D : thallium
E : cobalt

Correct Answer : C

24 : An oxygen atom has ____ surrounding a nucleus composed of ____.
A : neutrons; electrons and protons
B : electrons; protons and neutrons
C : protons and electrons; neutrons
D : protons; neutrons and electrons
E : electrons and neutrons; protons

Correct Answer : B

25 : Figure 2.1



Answer the question using the accompanying figure. The mass number of the atom depicted in the figure is ____.
A : 4
B : 6
C : 8
D : 12
E : 18

Correct Answer : D

26 : ??Answer the question using the accompanying figure. The atomic number of the atom depicted in the figure is ____.
A : 4
B : 6
C : 8
D : 12
E : 18

Correct Answer : B

27 : ??Answer the question using the accompanying figure. The atom depicted in this figure can form ____ covalent bonds with another atom.
A : 0
B : 2
C : 4
D : 3
E : 6

Correct Answer : C

28 : Which of the three atomic particles are charged?
A : electrons and protons
B : neutrons only
C : protons and neutrons
D : electrons only
E : protons, neutrons, and electrons

Correct Answer : A

29 : Isotopes of the same element differ from each other in the number of ____.
A : electrons and protons
B : neutrons only
C : protons and neutrons
D : electrons only
E : protons, neutrons, and electrons

Correct Answer : B

30 : A carbon atom with six protons, seven neutrons, and six electrons has a mass number of ____.
A : 6
B : 7
C : 12
D : 13
E : 19

Correct Answer : D

31 : 14C is heavier than ^{12}C because it has ____.

A : two more electrons than ^{12}C
B : two more neutrons than ^{12}C
C : two more protons than ^{12}C
D : two more protons and two more electrons than ^{12}C
E : one more proton and one more neutron than ^{12}C

Correct Answer : B

32 : When the isotope ^{14}C undergoes radioactive decay, a neutron splits into an electron and a proton, with ejection of the electron. This decay produces an atom of ____.

A : iron
B : carbon
C : hydrogen
D : oxygen
E : nitrogen

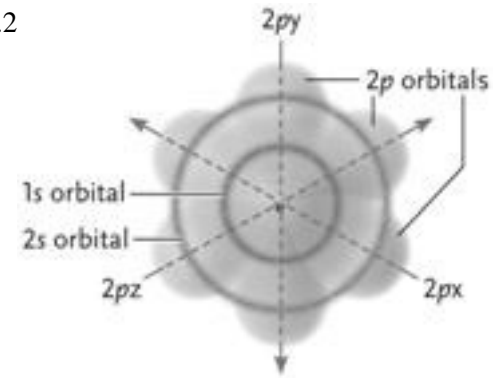
Correct Answer : E

33 : An orbital describes the ____ of an electron.

A : exact location
B : exact path
C : most frequent locations
D : charge
E : chemical bonds

Correct Answer : C

34 : Figure 2.2

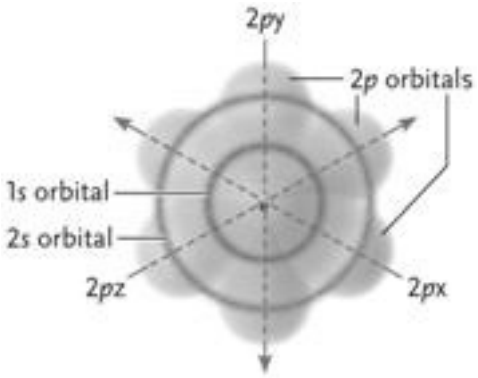


Answer the question using the accompanying figure. The electrons at the lowest energy level in the neon atom depicted are found in which orbital?

A : 1*s*
B : 2*s*
C : 2*p*x
D : 2*p*y
E : 2*p*z

Correct Answer : A

35 : Figure 2.2



Answer the question using the accompanying figure. All of the orbitals shown in the neon atom are completely filled with electrons. How many electrons does this neon atom have?
A : five
B : six
C : eight
D : 10
E : 16

Correct Answer : D

36 : Sodium has one valence electron in its third energy level. To reach a stable energy configuration, sodium will tend to____.
A : take up an electron from another atom
B : move its valence electron to the second energy shell
C : give up an electron to another atom
D : share its valence electron with another atom
E : move an electron from the second energy level to the valence shell

Correct Answer : C

37 : Which element is most likely to share electrons with other atoms in joint orbitals?
A : chlorine (seven valence electrons)
B : calcium (two valence electrons)
C : argon (eight valence electrons)
D : carbon (four valence electrons)
E : potassium (one valence electron)

Correct Answer : D

38 : Which element is likely to be chemically unreactive?
A : chlorine (seven valence electrons)
B : calcium (two valence electrons)
C : argon (eight valence electrons)
D : carbon (four valence electrons)
E : potassium (one valence electron)

Correct Answer : C

39 : Which element is most likely to accept an electron from another atom?
A : chlorine (seven valence electrons)
B : calcium (two valence electrons)
C : neon (eight valence electrons)
D : carbon (four valence electrons)

E : potassium (one valence electron)

Correct Answer : A

40 : The attraction between Na^+ cations and Cl^- anions form ____ that hold the ions together in the compound NaCl.
A : polar covalent bonds
B : van der Waals forces
C : ionic bonds
D : hydrogen bonds
E : nonpolar covalent bonds

Correct Answer : C

41 : Metallic ions such as Ca^{2+}, Na^+, and Fe^{3+} readily form ____.
A : polar covalent bonds
B : van der Waals forces
C : ionic bonds
D : hydrogen bonds
E : nonpolar covalent bonds

Correct Answer : C

42 : The chemical bonds that are formed when atoms share electrons equally are called ____.
A : polar covalent bonds
B : van der Waals forces
C : ionic bonds
D : hydrogen bonds
E : nonpolar covalent bonds

Correct Answer : E

43 : Electronegativity is the tendency of an atom to attract ____ to itself in a chemical bond.
A : neutrons
B : protons
C : electrons
D : delta forces
E : polar associations

Correct Answer : C

44 : The chemical linkages that exert an attractive force over the greatest distance are ____.
A : polar covalent bonds
B : van der Waals forces
C : ionic bonds
D : hydrogen bonds
E : nonpolar covalent bonds

Correct Answer : C

45 : Chemical bonds that are formed when one atom with a partial positive charge (created from unequal sharing of electrons) is electrically attracted to another atom with a partial negative charge (also created from unequal sharing of electrons) are called ____.

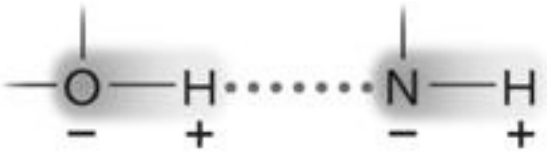
A : polar covalent bonds
B : van der Waals forces
C : ionic bonds
D : hydrogen bonds
E : nonpolar covalent bonds

Correct Answer : D

46 : Molecules such as H-H and O=O are held together by ____.
A : polar covalent bonds
B : van der Waals forces
C : ionic bonds
D : hydrogen bonds
E : nonpolar covalent bonds

Correct Answer : E

47 : Figure 2.3



Answer the question using the accompanying figure. The molecule shown is held together by ____.
A : polar covalent bonds
B : van der Waals forces
C : ionic bonds
D : hydrogen bonds
E : nonpolar covalent bonds

Correct Answer : D

48 : A polar covalent bond would be most likely to form between ____.
A : atoms with different electronegativities
B : cations and anions
C : atoms with partial positive and partial negative charges
D : atoms with filled valence shells
E : atoms of the same element

Correct Answer : A

49 : Which type of chemical linkage is the weakest?
A : polar covalent bonds
B : van der Waals forces
C : ionic bonds
D : hydrogen bonds
E : nonpolar covalent bonds

Correct Answer : B

50 : Geckos are able to cling to vertical walls due to ____.
A : polar covalent bonds
B : van der Waals forces
C : ionic bonds

D : hydrogen bonds
E : nonpolar covalent bonds

Correct Answer : B

51 : In contrast to ionic bonds, covalent bonds ____.
A : hold atoms together
B : have distinct, three-dimensional forms
C : transfer electrons from one atom to another
D : are rarely broken
E : are transient

Correct Answer : B

52 : In a molecule of methane, CH_4, each hydrogen atom shares an orbital with the carbon atom. The total number of shared electrons in CH_4 is ____.
A : one
B : two
C : four
D : five
E : eight

Correct Answer : E

53 : In the presence of water, nonpolar associations form between molecules or regions of molecules that are ____.
A : partially charged
B : hydrophobic and hydrophilic
C : hydrophobic
D : fully charged
E : hydrophilic

Correct Answer : C

54 : A mixture of vegetable oil and water will separate into layers because oil is ____ and forms ____.
A : hydrophobic; nonpolar associations
B : hydrophilic; nonpolar associations
C : hydrophilic; polar associations
D : hydrophobic; polar associations
E : hydrophobic; ionic associations

Correct Answer : A

55 : The formation and breaking of bonds between atoms requires ____.
A : a chemical reaction
B : van der Walls forces
C : partial charges
D : an empty valence shell
E : an enzyme

Correct Answer : A

56 : A molecule of water in the middle of a chunk of ice will usually have ____ hydrogen bonds with other water molecules.

A : two
B : three
C : 3.4
D : four
E : six

Correct Answer : D

57 : Which substance would have the most difficulty entering a water lattice?
A : table salt (NaCl)
B : a nonpolar molecule
C : a sodium ion
D : a proton (H^+)
E : an electron

Correct Answer : B

58 : Water has an unusually high boiling point for its molecular weight because water molecules ____.
A : are very dense
B : get much heavier as they are heated
C : are held to each other by hydrogen bonds
D : are held together by covalent bonds
E : form hydration layers

Correct Answer : C

59 : The hydrogen-bond lattice causes water to have an unusually ____ specific heat, an unusually ____ heat of vaporization, and an unusually ____ density in solid form.
A : high; high; high
B : low; low; low
C : high; low; high
D : high; high; low
E : low; low; high

Correct Answer : D

60 : Water has an important stabilizing effect on temperature in living organisms and their environments because as water absorbs heat, much of the energy is used to ____ instead of raising the temperature.
A : create hydrogen bonds
B : create covalent bonds
C : break surface tension
D : break hydrogen bonds
E : create hydration layers

Correct Answer : D

61 : Figure 2.4



The water strider shown in the figure above is able to stand on water because of the ____ of water.
A : covalent bonds
B : surface tension
C : van der Waals forces
D : density
E : hydration layer

Correct Answer : B

62 : When water molecules exposed to the air form hydrogen bonds between adjacent water molecules below and beside them, molecules in the upper layer become more resistant to separating from those underneath. This property of water is known as ____.
A : cohesion
B : adhesion
C : a hydration layer
D : a water lattice
E : surface tension

Correct Answer : E

63 : How many calories, as defined in chemistry, are in one calorie, which is the unit used to quantify the amount of energy in the food we eat?

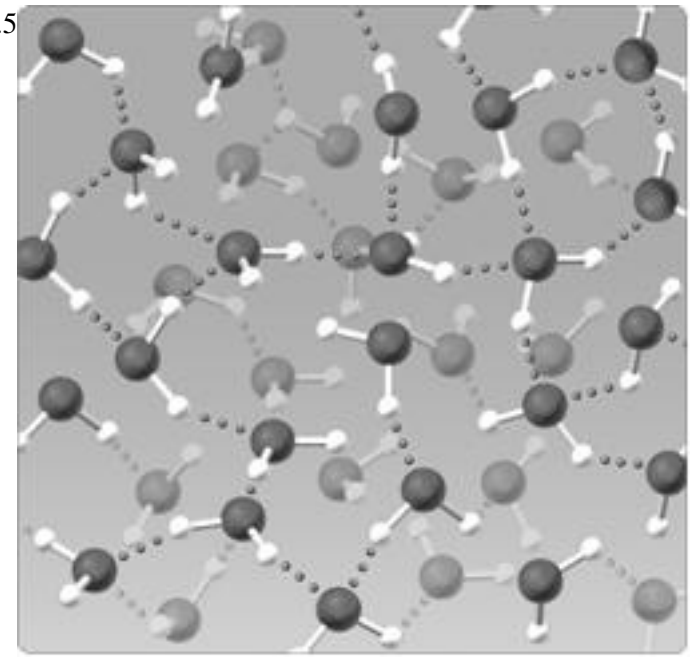
A : 10
B : 100
C : 1,000
D : 10,000
E : 100,000

Correct Answer : C

64 : Multiple hydrogen bonds together stabilize proteins into a spiral structure called a ____.
A : water lattice
B : alpha helix
C : chemical groups
D : delta minus
E : delta plus

Correct Answer : B

65 : Figure 2.5



The water lattice illustrated in the figure above forms as a result of ____ between water molecules.
A : covalent bonds
B : hydrogen bonds
C : nonpolar interactions
D : ionic bonds
E : van der Walls forces

Correct Answer : B

66 : Biological membranes are held together mainly by ____.
A : hydrogen bonds between lipid molecules
B : hydration layers over lipid molecules
C : exclusion of the nonpolar regions of lipids by water
D : hydrogen bonds between water molecules
E : surface tension at the interface between layers of water molecules

Correct Answer : C

67 : A ____ is formed when a ____ is dissolved in a ____.

A : solution; solute; solvent
B : solute; solvent; solution
C : solution; solvent; solute
D : solvent; solution; solute
E : solvent; solute; solution

Correct Answer : A

68 : When sugar dissolves in water, water is acting as a ____ and the sugar molecules are acting as ____.
A : solution; solvents
B : solute; solutions
C : solvent; solutes
D : solute; solvents
E : solvent; solutions

Correct Answer : C

69 : When salt dissolves in water, the water molecules form ____ around the Na^+ and Cl^- ions.
A : covalent bonds
B : hydration layers
C : nonpolar interactions
D : membranes
E : ionic bonds

Correct Answer : B

70 : Water has a molecular weight of 18 g per mole, and glucose has a molecular weight of 180 g per mole. Which masses of water and glucose would have an approximately equal number of molecules?
A : 1 g of water and 180 g of glucose
B : 90 g of water and 9 g of glucose
C : 180 g of water and 1 g of glucose
D : 9 g of water and 90 g of glucose
E : 90 g of water and 90 g of glucose

Correct Answer : D

71 : Avogadro's number represents the ____.
A : number of grams in a mole of substance
B : number of moles in a gram of substance
C : number of atoms in one gram of substance
D : atomic weight of an atom divided by the weight of an atom of that element
E : weight of an atom of an element divided by the atomic weight of that element

Correct Answer : D

72 : Ethanol, the alcohol found in wine and beer, has the molecular formula CH_3CH_2OH. What is the molecular weight of ethanol if the atomic weight of C=12, H=1, and O=16?
A : 29 g/mol
B : 30 g/mol
C : 34 g/mol
D : 45 g/mol
E : 46 g/mol

Correct Answer : E

73 : The most common isotope of carbon has an atomic number of 6 and a mass number of 12, while the most common isotope of oxygen has an atomic number of 8 and a mass number of 16. A molecule of CO_2 made up of these common isotopes has a molecular weight of ____.
A : 28
B : 44
C : 56
D : 14
E : 22

Correct Answer : B

74 : When added to water, a base will act as a(n) ____ and cause the pH of the solution to ____.
A : proton acceptor; rise
B : proton donor; rise
C : proton acceptor; fall
D : proton donor; fall
E : acid; fall

Correct Answer : A

75 : When added to water at neutral pH (7.0), an acid will ____.
A : act as a proton donor, raising the pH of the solution
B : act as a proton acceptor, raising the pH of the solution
C : act as a proton donor, lowering the pH of the solution
D : act as a proton acceptor, lowering the pH of the solution
E : do nothing since the aqueous solution is neutral

Correct Answer : C

76 : In water, NaOH almost completely separates into Na^+ and OH^- ions. Thus, NaOH is _____.
A : a strong acid
B : a strong base
C : a weak acid
D : a weak base
E : neutral

Correct Answer : B

77 : Seawater typically is ____.
A : highly basic
B : neutral
C : somewhat basic
D : somewhat acidic
E : highly basic

Correct Answer : C

78 : A pH of 6 is ____ times more ____ than a pH of 2.
A : 3; acidic
B : 4; acidic
C : 3; basic

D : 10,000; basic
E : 40; basic

Correct Answer : D

79 : Pure water has a pH of 7.0, therefore, ____.

A : $[H^+] < [OH^-]$
B : $[H^+] = [OH^-]$
C : $[H^+] = 0$
D : $[OH^-] = 0$
E : $[H^+] > [OH^-]$

Correct Answer : B

80 : Lemon juice has a pH of 2.0, therefore, ____.

A : $[H^+] < [OH^-]$
B : $[H^+] = [OH^-]$
C : $[H^+] = 0$
D : $[OH^-] = 0$
E : $[H^+] > [OH^-]$

Correct Answer : E

81 : Solution A has a pH of 6 and solution B has a pH of 8. Therefore, ____.

A : A has 10 times greater H^+ concentration than B.
B : B has 10 times greater H^+ concentration than A.
C : A has 100 times greater H^+ concentration than B.
D : B has 100 times greater H^+ concentration than A.
E : A has 1,000 times greater H^+ concentration than B.

Correct Answer : C

82 : Without ____, living organisms would often experience major changes in pH in their cells.
A : buffers
B : acids
C : surface tension
D : nonpolar bonds
E : bases

Correct Answer : A

83 : Most pH buffers are ____.
A : strong acids
B : weak acids or weak bases
C : weak acids
D : strong bases
E : strong acids or strong bases

Correct Answer : B

84 : Consider the equilibrium established in the carbonic acid-bicarbonate buffer system, which maintains pH balance in mammalian blood: $H_2CO_3 \rightarrow HCO3- + H+$

During hypoventilation, breathing rate decreases, and therefore elimination of CO2 during exhalation decreases. How is optimal blood pH maintained when acid levels increase in our blood from hypoventilating?

A : Excess H+ from the acid reacts with H_2CO_3 to decrease pH level.
B : Excess H+ from the acid reacts with H_2CO_3 to increase pH level.
C : Excess H+ from the acid reacts with H_2CO_3 to maintain pH level.
D : Excess H+ from the acid reacts with HCO3- to increase pH level.
E : Excess H+ from the acid reacts with HCO3- to maintain pH level.

Correct Answer : E

85 : High levels of carbon dioxide in the atmosphere are causing ____.
A : the pH of the ocean to increase
B : the pH of the ocean to decrease
C : the natural buffers in the ocean to die
D : increased calcification of the coral reefs
E : increased biodiversity in coral reefs

Correct Answer : B

MATCHING

86 : Match each of the following terms with its correct definition.

A : element	A : Anything that occupies space and has mass
B : compound	B : A pure substance that cannot be broken down into simpler substances by ordinary chemical or physical techniques
C : matter	C : An atom with the same number of protons as another atom but a different number of neutrons
D : orbital	D : The locations around an atomic nucleus where an electron occurs most frequently
E : isotope	E : A molecule whose component atoms are different from each other

Correct Answer :
A : B

B : E

C : A

D : D

E : C

87 : For each of the following situations, choose the correct type of chemical bond. Some choices may be used more than once.

A : Occurs in sodium chloride (NaCl)	A : ionic bonds
B : The weakest of the chemical linkages listed	B : nonpolar covalent bonds
C : Generates regions of partial positivity and partial negativity within a molecule	C : polar covalent bonds

D : Characteristic of molecules that contain atoms of only one kind
E : Forms when atoms gain or lose valence electrons completely
F : Attraction that arises when the constant movement of electrons, by chance, produces temporary zones of partial positive and partial negative charges
G : Occurs when electrons are shared unequally between two atoms
H : Creates a region that is hydrophobic
I : Occurs between water molecules
J : Occurs in molecular oxygen (O2)

Correct Answer :
A : A

B : E

C : C

D : B

E : A

F : E

G : C

H : B

I : D

J : B

D : hydrogen bonds

E : van der Waals forces