

Inorganic Chemistry Review

1. All of the substances of the universe that have mass and occupy space are defined as _____.
2. All atoms possess _____, defined as the ability to do work.
3. Bohr proposed that atoms of any kind contain _____ particles. Those located in the nuclear core are called neutrons and protons.
4. The number of protons in a given atom is equal to its _____ number.
5. Isotopes that decay with a nuclear break-up and emit a significant amount of energy are said to be _____.
6. There are 92 naturally occurring _____, each made up of atoms which contain a specific number of protons and a different arrangement of electrons.
7. In molecules, the atoms are held together by _____ bonds.
8. The _____ of water molecules determines its chemistry and thus the chemistry of life.
9. _____ is defined as the negative logarithm of the hydrogen ion concentration in the solution.
10. A substance that acts as a reservoir for H^+ ions, opposing any increase or decrease in concentration, is a(n) _____.
11. Atoms are composed of electrons and a dense nucleus which contains protons and _____.
12. Carbon-12, Carbon-13 and Carbon-14 are examples of _____.
13. Organisms are composed of molecules, which are collections of smaller units, called
 - A. molecules
 - B. atoms
 - C. electrons
 - D. polymers
 - E. ions
14. Negatively charged particles of atoms with almost no mass are called
 - A. electrons
 - B. protons
 - C. neutrons
 - D. ions
 - E. polymers

15. Elements that have atoms with the same atomic numbers but different number of neutrons are called
- A. polymers
 - B. ions
 - C. molecules
 - D. radioactive
 - E. isotopes
16. In chemical reactions, the gain of an electron is called
- A. oxidation
 - B. reduction
 - C. polymerization
 - D. ionization
 - E. covalent bonding
17. When atoms gain or lose electrons, they become negatively or positively charged. They are known as
- A. molecules
 - B. isotopes
 - C. ions
 - D. radioactive
 - E. unstable atoms
18. When two atoms share a pair of electrons, the bonding is referred to as
- A. ionic
 - B. covalent
 - C. unstable
 - D. hydrogen
 - E. polar
19. Water molecules are polar with ends that exhibit partial positive and negative charges. Such opposite charges make water molecules attract each other through bonds called
- A. ionic bonds
 - B. covalent bonds
 - C. hydrogen bonds
 - D. unstable bonds
 - E. radioactive bonds
20. A proton
- A. has one positive charge
 - B. has one Dalton of mass
 - C. is found in the nucleus of the atom
 - D. only a and b are true
 - E. a, b, and c are true

21. An electron
- A. has one negative charge
 - B. has 1/1840 Dalton of mass
 - C. is found in an area around the nucleus, called the orbital
 - D. only a and b are true
 - E. a, b, and c are true
22. The atomic number of an element is equal to the number of
- A. protons only
 - B. neutrons only
 - C. protons plus electrons
 - D. protons plus neutrons
 - E. neutrons plus electrons
23. Ordinary oxygen has an atomic mass of 16 and an atomic number of 8. This means that the number of neutrons in this type of oxygen is
- A. 24
 - B. 8
 - C. 16
 - D. not stable
 - E. none
24. Which of the following is true about orbitals?
- A. They are paths around the nucleus in which the electrons orbit.
 - B. They cannot contain more than two electrons.
 - C. They contain electrons of the same energy.
 - D. a and b only
 - E. a, b, and c
25. A hydrogen molecule formed by sharing of a pair of electrons between two atoms is stable for which of the following reasons?
- A. It has no net negative charge.
 - B. The octet rule is satisfied.
 - C. It has no unpaired electrons.
 - D. a, b, and c
 - E. a and b only
26. Oxygen ordinarily has 8 protons and 8 neutrons. Another rare form has two extra neutrons. These two forms are
- A. oxygen ions
 - B. oxygen isotopes
 - C. oxygen compounds
 - D. oxygen shells
 - E. oxygen orbitals

27. Which of the following elements' isotopic ratios are used to make absolute determinations of the time of formation of materials?
- A. oxygen
 - B. hydrogen
 - C. carbon
 - D. nitrogen
 - E. radon
28. Atoms in which the number of electrons does not equal the number of protons are known as
- A. valences
 - B. ions
 - C. isotopes
 - D. molecules
 - E. orbitals
29. The area around a nucleus where an electron is most likely to be found is called
- A. electrical space
 - B. an organelle
 - C. polar space
 - D. radioactive field
 - E. an orbital
30. Regardless of its shape, a given orbital may contain no more than
- A. 1 electron
 - B. 4 electrons
 - C. 8 electrons
 - D. 2 electrons
 - E. 92 electrons
31. Mendeleev found that when he arranged the known elements according to their atomic mass, the entries in the table exhibited a pattern of chemical properties that repeated itself in groups of eight elements. This led to the generalization now known as
- A. an atomic model
 - B. maximum filling rule of outer electrons
 - C. periodic table
 - D. octet rule
 - E. planetary model

32. All atoms tend to fill their outer energy levels with the maximum number of electrons, usually eight. Depending on whether the atoms satisfied this simple octet rule or not will allow the prediction of
- A. chemical behavior of the atoms
 - B. whether they will be found in nature
 - C. whether they will dissolve in water
 - D. their radioactive energy
 - E. none of the above
33. Sodium has 11 electrons arranged in three energy levels. The outer level has only one electron. In order to become stable, the atom loses an electron thus exposing the previous level with 8 electrons and subsequently becomes an ion with
- A. 1 negative charge
 - B. no charge
 - C. 8 negative charges
 - D. 1 positive charge
 - E. 8 positive charges
34. In the crystal matrix of ordinary salt, the sodium and chlorine are held together by
- A. atomic bonds
 - B. covalent bonds
 - C. ionic bonds
 - D. hydrogen bonds
 - E. nonpolar bonds
35. Products are made in chemical reactions involving the shifting of atoms of one molecule to another in substances called
- A. buffers
 - B. reactants
 - C. compounds
 - D. elements
 - E. ions
36. Chemical reactions can be influenced by
- A. temperature only
 - B. concentration of reactants and products
 - C. catalysts
 - D. only a and b
 - E. a, b, and c

37. Two carbon atoms might be joined to each other by the sharing of two pairs of electrons, forming
- A. a single bond
 - B. an ionic bond
 - C. a carbon bond
 - D. a double bond
 - E. a quadruple (4 point) bond
38. Which of the following is not one of the four most abundant (more than 99%) atoms found in living things?
- A. carbon
 - B. hydrogen
 - C. nitrogen
 - D. oxygen
 - E. phosphorus
39. Life is thought to have evolved from complex molecules formed by the interaction of smaller molecules in oceans and the atmosphere. The substance which brought these molecules together to interact is
- A. hydrogen
 - B. acids
 - C. water
 - D. buffers
 - E. salts
40. Because oxygen is more electronegative than hydrogen, the water molecule is
- A. hydrophobic
 - B. hydrophilic
 - C. organic
 - D. ionic
 - E. polar
41. Water molecules are attracted to each other because of the opposite charges created by partial charge separations within the molecules. These attractions are called
- A. atomic bonds
 - B. covalent bonds
 - C. ionic bonds
 - D. hydrogen bonds
 - E. double bonds

42. Water is extremely important in living things for all of the following reasons except
- A. it adheres to substances (wets them) because it is polar
 - B. it is a highly energetic dietary requirement
 - C. it has high specific heat and resists temperature change
 - D. it is a good solvent; most things dissolve in it
 - E. it has high heat of vaporization and low density of ice
43. Nonpolar molecules tend to aggregate in water because they are forced to come into close proximity with each other due to
- A. ionizing interactions
 - B. hydrophilic interactions
 - C. hydrophobic interactions
 - D. dissolving interactions
 - E. sticky interactions
44. When water ionizes, it produces equal amounts of hydrogen and hydroxide ions, which can reassociate with each other. Water is thus
- A. an acid
 - B. a base
 - C. an alkali
 - D. a base and an acid
 - E. a buffer
45. Compared with a pH of 7, a solution of pH 5 has
- A. 1/100 of the hydrogen concentration
 - B. 5/7 of the hydrogen concentration
 - C. very nearly the same concentration
 - D. 2 times the hydrogen concentration
 - E. 100 times the hydrogen concentration
46. A scientist conducts a procedure that causes nitrogen atoms to gain neutrons. The resulting atoms will be
- A. ions of nitrogen
 - B. positively charged
 - C. negatively charged
 - D. isotopes of nitrogen
 - E. new elements with higher atomic numbers

47. The half-life of Carbon-14 is approximately 5,600 years. Using this information scientists have been able to determine the age of some artifacts left by humans. Suppose that a scientist wanted to know approximately how old a piece of wood was that she found on the floor in an old cave that had recently been discovered. She removed the wood (with permission) to her laboratory. Her wood sample contained 2 grams of Carbon-14. If the age of the wood was determined to be 22,400 years old, how much Carbon-14 originally existed in this piece of wood?
- A. 32 grams
 - B. 16 grams
 - C. 12 grams
 - D. 8 grams
 - E. 4 grams
48. Two hydrogen atoms and one oxygen atom will combine chemically to form a water molecule. The chemical bonds that hold the molecule together are covalent bonds. These covalent bonds convey a polarity to each water molecule. Simply stated, polarity means that there is a positive side and a negative side to the molecule. The positive side of one water molecule is attracted to the negative side of another water molecule, forming a hydrogen bond. Which of the following pure water properties reflects this type of bonding?
- A. the ability to put out fires
 - B. the ability to quench a thirst
 - C. the ability to travel through xylem tubes in a plant's vascular system
 - D. the ability to form hydrogen and oxygen gases
 - E. the ability to conduct electricity
49. Water is most dense and thus heavier at 4 degrees Centigrade. At zero degrees Centigrade ice forms and can float on liquid water. Suppose ice were most dense at zero degrees Centigrade. Select the best explanation of what would happen in aquatic systems.
- A. The ice would cover the surface of the aquatic system and would never melt.
 - B. The ice would cover the bottom of the aquatic system and would build up in layers over time, especially in colder climates.
 - C. The ice would eventually form into large sheets and would travel as a glacier carving out more depressions for lakes to form.
 - D. The cold temperatures and the subsequent ice formation would prevent hydrogen bonds from forming between the water molecules, thus causing the existing ice crystals to become disassociated from each other.

50. Your dog becomes ill and you rush him to the veterinarian's office. A technician draws blood from your dog's leg for a lab test that has been ordered by the vet. After a few minutes the lab results are given to the vet. The vet grabs a bottle from a shelf and begins to fill a syringe with a fluid. You inquire about the fluid. The vet says your dog is in acute acidosis and needs an immediate injection to correct the condition. You know that
- A. Acidosis means that your dog's blood pH has dropped from its normal level and to correct the situation an injection of saline is required to reverse the condition.
 - B. Acidosis means that your dog's blood pH has raised from its normal level and to correct the situation an injection of saline is required to reverse the condition.
 - C. Acidosis means that your dog's blood pH has dropped from its normal level and to correct the situation an injection of a buffering solution is required to reverse the condition.
 - D. Acidosis means that your dog's blood pH has raised from its normal level and to correct the situation an injection of a buffer is required to reverse the condition.
51. Using the information from the previous question, you also know that acidosis means that
- A. your dog's blood pH has moved toward the acidic end of the pH scale and has a higher pH value than normal
 - B. your dog's blood pH has moved toward the acidic end of the pH scale and has a lower pH value than normal
 - C. your dog's blood pH has moved toward the basic end of the pH scale and has a higher pH value than normal
 - D. your dog's blood pH has moved toward the basic end of the pH scale and has a lower pH value than normal
52. As you and a friend are entering a chemistry laboratory at your university, you see a sign that states in big, bold, red letters: **DANGER—RADIOACTIVE ISOTOPES IN USE**. Your friend is an accounting major and has not had any science courses yet. She asks you what a radioactive isotope is and you respond correctly using which of the following choices.
- A. Radioactive isotopes are atoms that are unstable and as a result emit energy in a process called radioactive decay.
 - B. Radioactive isotopes are atoms that are stable and as a result only emit energy if they are exposed to higher temperatures. That is why they are stored in the freezers that are lining the halls of the chemistry building.
 - C. Radioactive isotopes are atoms that are unstable and as a result emit energy in a process known as half-life decomposition.
 - D. Radioactive isotopes are atoms that are unstable but unless actively disturbed by some chemical process will remain intact and pose no problems.

53. A biological researcher is conducting a chemical experiment. He is having trouble with the reaction because too much product is produced and this causes the reaction to slow down. You can see that there is plenty of catalyst in the reaction container. Which solution would you propose to keep the reaction moving along quickly?
- A. Increase the temperature.
 - B. Decrease the temperature.
 - C. Add more reactants.
 - D. Remove some of the reactants and add more catalyst.
 - E. Increase the temperature and remove some of the reactants.
54. Your friend is having a little difficulty understanding the nature of covalent bonding, especially single bonds, double bonds, and triple bonds. He thinks that you can explain the difference. What answer would be correct?
- A. Covalent bonds are bonds between atoms in which the atoms share electrons. For example, a single bond involves one electron, a double bond involves two electrons, and a triple bond involves three electrons.
 - B. Covalent bonds are bonds between atoms in which the atoms shares pairs of electrons. For example, a single bond involves one pair of electrons, a double bond involves two pairs of electrons, and a triple bond involves three pairs of electrons.
 - C. Covalent bonds are bonds between atoms in which the atoms receive electrons. For example, a single bond involves removing one electron, a double bond involves removing two electrons, and a triple bond involves removing three electrons.
 - D. Covalent bonds are bonds between atoms with polar sides. For example, a single bond involves one electron and one proton, a double bond involves two electrons and two protons, and a triple bond involves three electrons and three protons.
55. Capillary action is one of the forces that aids water's upward movement in plants. The more narrow the diameter of the tube, the farther the water column will rise. Capillary action is a result of water molecules
- A. storing heat and thus moving faster because of heat of vaporization
 - B. producing sufficient surface tension to overcome the pull of gravity
 - C. having a strong cohesive force and attaching to the surrounding vessel walls
 - D. having an adhesive force, which allows them to attach to the vessel walls
 - E. being associated with hydrophobic molecules, which can result in upward movement
56. Which of the following is not a property of water?
- A. solubility
 - B. polar
 - C. high Specific Heat
 - D. buffer
 - E. adhesion
57. Which of the following natural phenomena are not a direct result of the properties of water?
- A. insects that walk on water

- B. sugar dissolving in a glass of ice tea
- C. floating icebergs
- D. a and b only
- E. all of the above

58. Match each of the following.

- _____ A. Nuclear particle; no negative charge 1. electron
- _____ B. Nuclear particle; positive charge 2. ion
- _____ C. Smallest particle in the atom 3. isotope
- _____ D. Atom of the same element but with different mass 4. neutron
- _____ E. Atom is negatively charged because it has accepted an electron 5. proton

59. Match each of the following.

- _____ A. C=O 1. covalent single bond
- _____ B. Polar attraction of one water molecule for another. 2. double bond
- _____ C. One atom gains electrons; the other loses one. 3. hydrogen bond
- _____ D. Sharing of a pair of electrons. 4. ionic bond
- _____ E. Two atoms share two pairs of electrons. 5. pair bond

Answer Key

No. on Test	Correct Answer
1	matter
2	energy
3	subatomic
4	atomic
5	radioactive
6	elements
7	chemical
8	polarity
9	pH
10	buffer
11	neutrons
12	isotopes
13	B
14	A
15	E
16	B
17	C
18	B
19	C
20	E
21	E
22	A
23	B
24	E
25	D
26	B
27	C
28	B
29	E
30	D
31	D
32	A
33	D
34	C

35	B
36	E
37	D
38	E
39	C
40	E
41	D
42	B
43	C
44	D
45	E
46	D
47	A
48	C
49	B
50	C
51	B
52	A
53	C
54	B
55	D
56	D
57	E
58	1-D, 2-E, 3-A, 4-C, 5-B
59	1-B, 2-C, 3-D, 4-A, 5-B