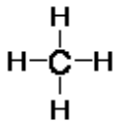
**Student Name:** **Grade:** 09

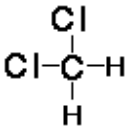
**Test Name:** November Chemistry for All: Unit 4 - Introduction to Bonding **Version:** 1

1. 

Based upon the structural formula for methane, $CH_4$, what can be determined about this molecule's polarity?

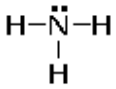
(a) Methane is a polar molecule.
(b) Methane is a non-polar molecule.
(c) Methane is both polar and non-polar
(d) Methane is neither polar or non-polar.

2. Based upon the structural formula for dichloromethane, $CH_2Cl_2$,what



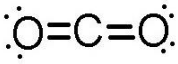
can be determined about this molecule's polarity?

(a) This molecule is polar.
(b) This molecule is non-polar.
(c) This molecule is both polar and non-polar.
(d) This molecule is neither polar or non-polar.

3. 

Based upon the structural formula for ammonia, $NH_3$, what can be determined about this molecule's polarity?

(a) This molecule is polar.
(b) This molecule is non-polar.
(c) This molecule is both polar and non-polar.
(d) This molecule is neither polar or non-polar.

4. 

Based upon the structural formula for carbon dioxide, $CO_2$, what can be determined about this molecule's polarity?

(a) This molecule is polar.
(b) This molecule is non-polar.
(c) This molecule is both polar and non-polar.
(d) This molecule is neither polar or non-polar.

5. How many double bonds are found in the structural formula of propene, $C_3H_6$?

(a) 0
(b) 1
(c) 2
(d) 3

6. How many carbons atoms are necessary when drawing the structural formula for the molecule, ***octane***?

(a) 6
(b) 8
(c) 16
(d) 18

7. The structure for 1-pentyne, $C_5H_8$, would include:

(a) all single bonds
(b) a double bond
(c) a triple bond
(d) a quadruble bond

8. The double bond found in the structure of 2-butene, $C_4H_8$, is between which two carbons?

(a) 1st and 2nd carbon
(b) 2nd and 3rd carbon
(c) 1st and 3rd carbon
(d) 2nd and 4th carbon

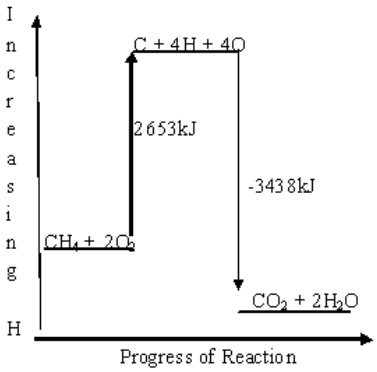
9. The molecule heptane, $C_7H_{x,}$ contains how many hydrogens in its structure?

(a) 7
(b) 14
(c) 16
(d) 30

10. During the chemical reaction for the decomposition of water the oxygen atoms separate from the hydrogen atoms. As this happens,

(a) energy is released as the distance between the oxygen and hydrogen atoms increases.
(b) energy is absorbed as the distance between the oxygen and hydrogen atoms increases.
(c) energy is released as the distance between the oxygen and hydrogen decreases.
(d) energy is absorbed as the distance between the oxygen and hydrogen decreases.

11. Using the reaction enthalpy diagram showing the combustion of methane, what can be determined about this chemical reaction?




(a) The reaction is endothermic.
(b) The reaction is exothermic.
(c) The reaction is both endothermic and exothermic.
(d) The reaction is neither endothermic or exothermic.

12. What is happening to the strength of the intermolecular forces as water is melting?

(a) decreases
(b) increases
(c) stays the same
(d) varies

13. As the number of bonds between two atoms increases, what can be said about the strength of the bond and the length of the bond?

(a) the strength of the bond increases and the length of the bond increases.
(b) the strength of the bond decreases and the length of the bond decreases
(c) The strength of the bond decreases and length of the bond increases.
(d) the strength of the bond increases and the length of the bond decreases.

14. What is known about the strength of the C-O bond in the molecules carbon monoxide and carbon dioxide?

(a) The carbon oxygen bond of carbon monoxide is stronger than that of carbon dioxide because carbon monoxide contains a triple bond.

(b) The carbon oxygen bond of carbon monoxide is weaker than that of carbon dioxide because carbon monoxide has a triple bond.

(c) The carbon oxygen bond of carbon monoxide is stronger because the carbon oxygen bond is longer than the carbon oxygen bond of carbon dioxide.

(d) The carbon oxygen bond of carbon monoxide is weaker than that of carbon dioxide, because it is shorter than the carbon oxygen bonds of carbon dioxide.

15. Compared to the single bond between carbons of alkanes the double bond between the carbons of alkenes is

(a) longer and stronger.

(b) longer and weaker.

(c) shorter and stronger.

(d) shorter and weaker.

16. A triple bond between nitrogen atoms is

(a) weaker and shorter than a single bond between nitrogen atoms.

(b) weaker and longer than a single bond between nitrogen atoms.

(c) stronger and shorter than a single bond between nitrogen atoms.

(d) stronger and longer than a single bond between nitrogen atoms.

17. The diatomic form of nitrogen makes up more than seventy percent of the earth's atmosphere. In spite of this most plants are unable to use nitrogen directly from the atmosphere. What about the chemical structure of $N_2$ would be a reason for this finding?

(a) The weakness of the triple bond found between the two nitrogen atoms.

(b) The strength of the triple bond found between the two nitrogen atoms.

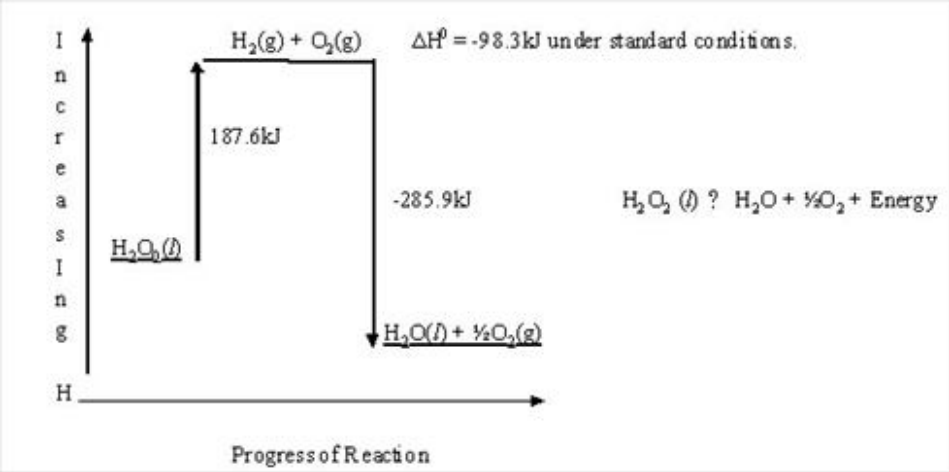
(c) The uncertainity of the strength of the triple bonds between the two nitrogen atoms.

(d) The inability of the two nitrogens atoms to create a triple bond.

18. During the decomposition of the ozone molecule, $O_3$, into oxygen ($O_2$) and a free radical ($O\cdot$), what is known about the chemical bonds and energy?

(a) Bonds are being broken and it requires energy to break bonds.
(b) Bonds are being broken and energy is lost.
(c) Bonds are being formed and it takes energy to form bonds.
(d) Bonds are being fromed and energy is lost.

19. According to the enthalpy diagram for the decomposition of hydrogen peroxide, what is known about the energy in the first part of this reaction in which hydrogen peroxide breaks down into hyrogen gas and oxygen gas?




(a) Energy is released in order to break the hydrogen peroxide bonds.
(b) Energy is absorbed to break the hydrogen peroxide bonds.
(c) Nothing is known about the energy for the decomposition of hydrogen peroxide.
(d) Energy is gained and then lost to produce the hydrogen and oxygen gas in the first step.

20. As two atoms of hydrogen move toward each other there is an attraction between the unlike charges of the two atoms, and a repulsion between like charges of the two atoms. Eventually the attraction just balances the repulsion, at this distance

(a) moving the atoms closer together will cause a decline in the potential energy of the system.

(b) moving the atoms farther apart will cause a decline in the potential energy of the system.

(c) moving the atoms closer together or further apart has no affect on the systems potential energy.

(d) the system is at its lowest potential energy, and any change in atom position will require energy.

21. A decomposition reaction is conducted in a test tube, a student notes that the test tube is warm, this is because a decomposition reaction

(a) absorbs heat to break bonds.

(b) loses heat to break bonds.

(c) absorbs heat to form bonds.

(d) loseds heat to form bonds.

22. When a small amount of an unknown substance in the solid and liquid phases are placed in separated containers, what will be observed?

(a) The solid will fill the container and take the shape of the container, where as a liquid will not fill the container and take the shape of the container.

(b) The solid will not full the container and will take the shape of the container, where as a liquid will not fill the container and will take the shape of the container.

(c) The solid will not fill the container or take on the container's shape, where as a liquid will fill the container and will take on the container's shape.

(d) The solid will not fill the container or take on the container's shape, where as a liquid will not fill the container and will take on the container's shape

23. A solid is different from a liquid in that

(a) the particles of a solid are in contact with each other and can move past each other, and those of a liquid are not in contact with each other and can move past each other.

(b) the particles of a solid are in contact with each other and cannot move past each other, and those of a liquid are in contact with each other and can move past each other.

(c) the particles of a solid not in contact with each other and cannot move past each other, and those of a liquid are in contact with each other and can move past each other.

(d) the particles of a solid are in contact with each other and cannot move past each other, and those of a liquid are not in contact with each other and can move past each other.

24. At room temperature and pressure, carbon dioxide (atomic mass: 46.005amu/$CO_2$) is a gas, where as water (atomic mass: 18.015amu/$H_2O$) is a liquid. The reason that the more massive carbon dioxide is a gas while water is a liquid is

(a) There is a stronger attraction between the polar carbon dioxide molecules than exists between the non-polar molecules of water.

(b) There is a stronger attraction between the non-polar carbon dioxide molecules than exists between the polar molecules of water.

(c) There is less attraction between the non-polar molecules of carbon dioxide than exists between the polar molecules of water.

(d) There is less attraction between the polar molecules of carbon dioxided than exists between the non-polar molecules of water.

25. Three substances, one solid, one liquid and one gas exist in a lab at room temperature,which of the following phases has the weakest intermolecular (attractive) forces?

(a) solids

(b) liquids

(c) gases

(d) cannot be known

26. Methane, $CH_4$ is a gas at room temperature and pressure, while $CH_2Cl_2$, dichloromethane is a liquid under the same conditions. What explains the different in the states of these two compounds?

(a) Methane is non-polar and therfore has stronger attractive forces.
(b) Dicloromethane is non-polar therefore has stronger attractive forces.
(c) Methane is polar and therefore has stronger attractive forces.
(d) Dichoromethane is polar and therefore has stronger attractive forces.

27. Isomers are

(a) molecules that have the same structural formula but different chemical formula.
(b) molecules that have the same chemical formula but different structural formulas.
(c) molecules that that have the same structural formula but a different number of bonds between at least one pair of carbons.
(d) molecules that have the same chemical formula but a different number of bonds between at least one pair of carbons.

28. Octane, $C_8H_{18}$, is known to have many isomers. What can be said about the different isomers of octane?

(a) The physical properties will be the same, but the chemical properties will be different.
(b) The chemical properties will be the same, but the physical properties will be different.
(c) Both the physical and chemical properties of the isomers will be the same.
(d) Both the physical and chemical properties of the isomers will be different.

29. Which phrase below would correctly complete, "Isomers have _____".?

I. the same number of atoms.
II. the same number of bonds.
III. the same empirical formula.

(a) Statement I only
(b) Statements I and II
(c) Statements II and III
(d) Statements I, II and III

30. How many structual isomers exist for the molecule, $C_5H_{12}$?

(a) 1
(b) 2
(c) 3
(d) 4

31. The five structural isomers of $C_5H_{10}$, must contain how many double bonds?

(a) 0
(b) 1
(c) 2
(d) 3

32. A polymer is

(a) a large molecule composed of repeating structural units connected by covalent chemical bonds.
(b) the portion of the large molecule made up of repeating structural units that repeats.
(c) the portion of a molecule that terminates the production of a repeating molecule.
(d) a catalyst that allows for the synthesis of multiple bonds of alkenes.

33. The monomer that makes up a protein is a(n)

(a) fatty acid.
(b) amino acid.
(c) cellulose.
(d) monosaccharide

34. A common monomer known to make up starches is a(n)

(a) fatty acid.
(b) amino acid.
(c) cellulose.
(d) glucose

35. The knowledge and use of synthetic or lab produced polyers began:

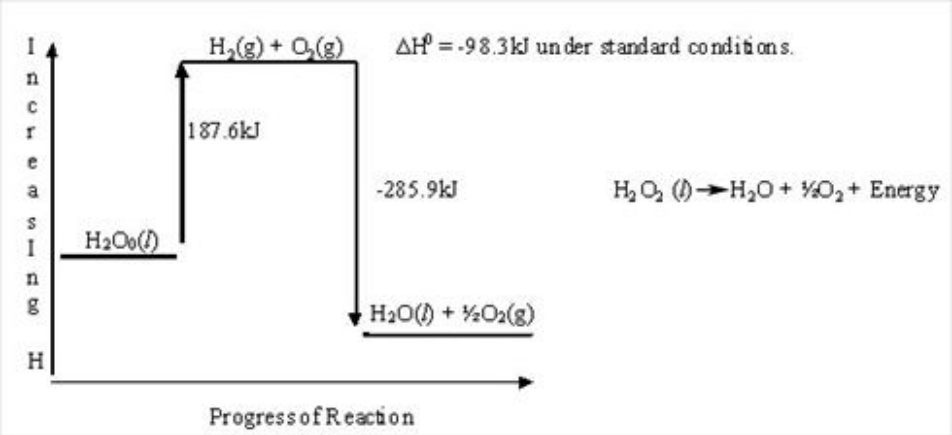
(a) just over 100 years ago.
(b) since before recorded history.
(c) since discovery of plastics.
(d) since the discovery of biological polymers.

36. Polymers are created:

(a) only synthetically in a lab.
(b) only biologically in nature.
(c) neither synthetically in a lab or biologically in nature.
(d) both synthetically in a lab and biologically in nature.

**Instructions for questions 37 through 38.**

Use the following enthalpy diagram for the decomposition of hydrogen peroxide to answer the following two questions.




37. The transition or intermediate step for the decompostion of hydrogen peroxide ($H_2O_2$) to hydrogen and oxygen gas results in a system that has a

(a) higher potential energy and is therefore more stable.
(b) lower potential energy and is therefore more stable.
(c) higher potential energy and is therefore less stable.
(d) lower potential energy and is therefore less stable.

38. The final products for the decompostion of hydrogen peroxide results in a system that has a

(a) higher potential energy and is therefore more stable.
(b) lower potential energy and is therefore more stable.
(c) higher potential energy and is therefore less stable.
(d) lower potential energy and is therefore less stable.

39. As two atoms of hydrogen move toward each other there is an attraction between the unlike charges of the two atoms, and a repulsion between like charges of the two atoms. Eventually the attraction just balances the repulsion, at this distance

(a) moving the atoms closer together will cause a decline in the potential energy of the system.

(b) moving the atoms farther apart will cause a decline in the potential energy of the system.

(c) moving the atoms closer together or further apart has no affect on the systems potential energy.

(d) the system is at its lowest potential energy, and any change in atom position will require energy.

40. The combustion of methane proceeds as follows: $CH_4(g) + 2O_2(g) \Rightarrow CO_2(g) + 2H_2O(g)$ + Energy. Use the table of bond energies to determine the amount of energy released in the complete combustion of one mole of methane.

(a) 6090kJ/Mol $CH_4$

(b) -808kJ/Mol $CH_4$

(c) 808kJ/Mol $CH_4$

(d) -354kJ/Mol $CH_4$