

CHEMISTRY

TEST 3

Part A: Multiple Choice Questions

- The two main parts of an atom are its:
 - nucleus and electrons
 - nucleons and protons
 - oxidation number and valence
 - protons and neutrons
- Orbitals are not occupied by:
 - 0 electrons
 - 1 electron
 - 2 electrons
 - 3 electrons
- Atoms of ^{16}O , ^{17}O , and ^{18}O have the same number of :
 - protons, but a different number of electrons
 - protons, but a different number of neutrons
 - electrons, but a different number of protons
 - neutrons, but a different number of protons
- What is the Hund's Rule?
 - The energy level of an electron is dependent on the shell
 - Electrons fill a single orbital before moving to an empty orbital
 - Two electrons in the same orbital must have separate spins
 - Electrons will enter empty orbitals of the same energy level before pairing up in an orbital with an electron already present
- Which of the following is a definition of a polar covalent bond?
 - When two atoms share one or more electrons with each other
 - When electrons are transferred from one atom to another
 - When each atom has no partial charge associated with it
 - When electrons are unequally shared between two atoms
- Which of the following is an example of an ionic compound?
 - NaF
 - NO_2
 - CO_2
 - CH_4
- Which of the following elements does NOT form an ion with a charge of 1^+ ?
 - fluorine
 - hydrogen
 - potassium
 - sodium
- Bond energy is the energy
 - required to break a chemical bond
 - required to form a chemical bond
 - released when a chemical bond breaks
 - absorbed when a chemical bond forms
- In what type of bonding do atoms completely give up electrons to other atoms ?
 - polar covalent bond
 - non-polar covalent bond
 - ionic bond
 - hydrogen bond

10. Which of the following statements are true regarding electronegativity ?
- If there is a slight difference between electronegativity between atoms then a polar covalent bond will form.
 - If there is a large difference between electronegativity between atoms then an ionic bond will form.
 - On the periodic table, excluding most transition metals and noble gases, as you move from left to right and from bottom to top the electronegativity increases.
 - All of the answers are true statements.
11. Given the reaction: $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$
In the above reaction copper
- gains protons
 - loses protons
 - gains electrons
 - loses electrons
12. When the concentration of reactant molecules is increased, the rate of reaction increases because:
- the average kinetic energy of molecules increases
 - the frequency of molecular collisions increases
 - the rate constant increases
 - the activation energy increases
13. A fast reaction should have
- low activation energy
 - large equilibrium constant
 - catalyst present
 - high activation energy
14. If the concentration of hydrogen is increased twice, the rate of gaseous reaction $3\text{H}_2 + \text{N}_2 \rightarrow 2\text{NH}_3$ will speed up:
- 2 times
 - 4 times
 - 8 times
 - 12 times
15. Change of which of the following conditions alters the state of equilibrium
- temperature
 - pressure
 - concentration of reactants and products
 - all
16. Given the reaction at equilibrium: $2\text{NO}_{(g)} \rightleftharpoons \text{N}_{2(g)} + \text{O}_{2(g)} + \text{Q}$
Which change will shift the equilibrium to the left?
- increasing the volume
 - adding a catalyst
 - increasing the pressure
 - increasing the temperature
17. A Brønsted-Lowry acid is a(n):
- proton donor
 - electron donor
 - proton acceptor
 - electron acceptor
18. In an aqueous solution of 0.010 M HBr (a strong electrolyte), the pOH of the solution is:
- 2
 - 3
 - 7
 - 12
19. When an acid is added to water, what happens to the pH?
- it goes up
 - it goes down
 - it stays the same
 - none of these

20. Identify the acids and the bases in the reaction: $\text{CH}_3\text{COOH} + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{CH}_3\text{COO}^-$
- H_2O and CH_3COOH are acids; H_3O^+ and CH_3COO^- are bases
 - H_2O and CH_3COOH are bases; H_3O^+ and CH_3COO^- are acids
 - H_2O and H_3O^+ are acids; CH_3COOH and CH_3COO^- are bases
 - H_2O and CH_3COO^- are bases; CH_3COOH and H_3O^+ are acids
21. When a double bond is formed between two atoms, one of the bonds is a sigma bond and the other is a pi bond. The pi bond is created by the overlap of :
- sp^2 hybrid orbitals
 - sp^3 hybrid orbitals
 - p orbitals
 - s orbitals
22. Markovnikov's rule would apply to reaction of HCl with:
- $\text{CH}_2=\text{CH}-\text{CH}_3$
 - $\text{CH}_2=\text{CH}_2$
 - $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}_3$
 - $\text{CH}_3-\text{CH}_2-\text{CH}_3$
23. The simplest member of organic compounds is
- methanol
 - methane
 - formaldehyde
 - formic acid
24. Calcium carbide on reaction with water gives
- methane
 - ethane
 - propane
 - acetylene
25. Which among the following product is formed when ethyne reacts with water?
- formaldehyde
 - formic acid
 - acetaldehyde
 - acetic acid
26. Which is the most common product of the reaction between HBr and 1-pentene?
- 1,2-dibromopentane
 - 2-bromopentane
 - 2,3-dibromopentane
 - 1-bromopentane
27. The correct IUPAC name for the following structure $\text{CH}_3\text{CH}_2\text{CH}_2\underset{\text{OH}}{\text{C}}\text{HCH}=\text{CH}_2$ is:
- 5-hexen-4-ol
 - 1-hexen-3-ol
 - 4-hydroxy-5-hexene
 - 3-hydroxy-1-hexene
28. Which of the following can form metallic derivatives by the replacement of hydrogen atoms ?
- ethylene
 - acetylene
 - ethane
 - methane
29. What two functional groups are never found at the end of a carbon chain?
- alcohol and aldehyde
 - ether and aldehyde
 - alcohol and ketone
 - ether and ketone
30. Which of the following is a tertiary alcohol?
- $\text{CH}_3\text{CH}_2\text{OH}$
 - $(\text{CH}_3)_2\text{CHOH}$
 - $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$
 - $(\text{CH}_3)_3\text{COH}$
31. Phenol on nitration with conc. HNO_3 forms:
- 2-nitrophenol
 - 3-nitrophenol
 - 4-nitrophenol
 - 2,4,6-trinitrophenol
32. When phenol dissolves in water, it functions as
- a weak base
 - a weak acid
 - an oxidizing agent
 - a reducing agent

33. Which of the following best describes the carbonyl group?
- The carbonyl group consists of a carbon atom joined to an oxygen atom by a polar double bond.
 - The carbonyl group consists of a carbon atom joined to an oxygen atom by a double bond and to a hydrogen atom by a single bond.
 - The carbonyl group consists of a carbon atom joined to an oxygen atom by a double bond and to a hydroxyl group by a single bond.
 - The carbonyl group consists of a carbon atom joined to an oxygen atom by a relatively nonpolar double bond.
34. What product is formed in the following reaction?
- $$\text{CH}_3\text{CH}_2\text{CH}_2\underset{\text{OH}}{\text{CH}}\text{CH}_3 \xrightarrow[\text{H}_2\text{SO}_4]{\text{KMnO}_4}$$
- predominantly 1-pentene
 - predominantly 2-pentene
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{COCH}_3$
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$
35. Which of the following compounds will be formed by the hydrogenation of butanal ?
- 1-butanol
 - 2-butanol
 - butanoic acid
 - propanone
36. Compare glycerol with ethanol
- they both contain 3 carbons in the skeleton
 - they both have two hydroxyl groups
 - glycerol is trihydric alcohol; ethanol is monohydric alcohol
 - glycerol is a triol; ethanol is diol
37. Which of the following statements concerning standard amino acids is INCORRECT?
- There are about 20 of them.
 - They are all alpha-amino acids.
 - They may only contain one amino group and one acid group each.
 - Some are essential amino acids, meaning they must be obtained through diet.
38. To which group carbohydrates does fructose belong?
- aldopentose
 - ketohexose
 - ketotriose
 - aldohexose
39. What compounds give a positive silver mirror test?
- alcohols
 - phenols
 - aldehydes
 - ketones
40. Saccharose is a disaccharide consisting of what two simple sugars?
- two glucose molecules
 - one glucose molecule and one fructose molecule
 - one glucose molecule and one galactose molecule
 - one molecule of manose and one fructose molecule

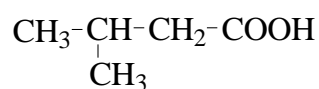
Part B: Short Answer Questions

❖ Write your answers in the space provided for each question!

1. The pH of aqueous solution is 3 at room temperature (25°C). What is the concentration of H⁺ ions?

2. Express the rate law equation for the reaction $2 \text{H}_{2(\text{g})} + \text{O}_{2(\text{g})} \rightarrow 2\text{H}_2\text{O}_{(\text{g})}$

3. What is the IUPAC name of the compound shown?



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4. Show the equation and name the products of the reaction between ethanoic acid and NaOH.