MEDICAL UNIVERSITY - PLEVEN, BULGARIA

CHEMISTRY TEST 2

Part A: Multiple Choice Questions

1. Atom becomes ion when there is:
   a) gain of electrons
   b) loss of electrons
   c) gain or loss of electrons
   d) neither gain nor loss of electrons

2. Which sublevel can by occupied by a maximum of 10 electrons?
   a) f b) p c) d d) s

3. The nucleus of an atom consists of 8 protons and 6 neutrons. The total number of electrons present in a neutral atom of this element is :
   a) 2 b) 6 c) 8 d) 14

4. Which of the following is true about polar covalent bonds?
   a) electrons are transferred from one atom to another
   b) one atom will have a partial negative charge and another will have a partial positive charge
   c) atoms do not carry a partial charge
   d) both atoms in this type of bond hold a partial negative charge

5. What type of bonding is formed when an ammonia molecule accepts a proton?
   a) ionic b) metallic c) coordinate covalent d) electrovalent

6. The isotope symbol for an ion that has 11 protons, 12 neutrons, and 10 electrons is:
   a) $^{12}_{11}Na^{+}$ b) $^{23}_{11}Na$ c) $^{23}_{12}Mg^{2+}$ d) $^{23}_{11}Na^{+}$

7. Which one of the following molecules has an ionic bond ?
   a) HCl b) PCl_3 c) MgF_2 d) CF_4

8. Which of the following has the strongest bond?
   a) H_2 b) N_2 c) F_2 d) O_2

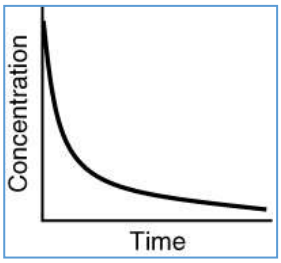
9. In which of the following compounds iron has the highest oxidation state ?
   a) $FeSO_4$ b) $Fe(CH_3COO)_2$ c) Fe_2O_3 d) $FeCl_2$

10. Which of the following is the weakest acid ?
    a) carbonic b) hydrochloric c) nitric d) trichloroacetic

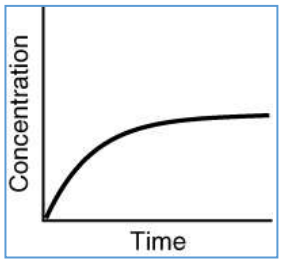
11. Which of following compounds is a weak electrolyte ?
    a) NaOH b) HCl c) H_2S d) $HClO_4$

12. Which of the following reactions is an oxidation-reduction process ?
    a) $HCl + NaOH \rightarrow NaCl + H_2O$
    b) $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$
    c) $C + H_2O \rightarrow H_2 + CO$
    d) $CaCO_3 \rightarrow CaO + CO_2$

13. Which of the following is not a possible graph of concentration versus time for a reactant?



a)



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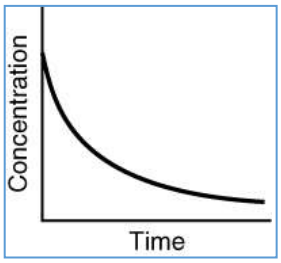

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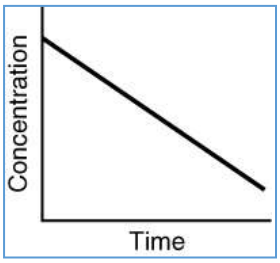


d)

14. If the rate of the reaction ***A + B → products*** is first order in A and second order in B, then the rate law is :

a) rate = k[A][B]^2 b) rate= [A][B]^2 c) rate= k[A].2[B] d) rate= k[A]+2[B]

15. The addition of a catalyst to a reaction provides an alternative mechanism with:
   a) lower activation energy and lower reaction rate
   b) lower activation energy and higher reaction rate
   c) higher activation energy and lower reaction rate
   d) higher activation energy and higher reaction rate

16. When sodium reacts with chlorine to form sodium chloride ($2Na + Cl_2 \rightarrow 2NaCl$), electrons are lost by
   a) sodium, only
   b) chlorine, only
   c) both sodium and chlorine
   d) neither sodium nor chlorine

17. A Brönsted-Lowry base is a(n) :

a) proton donor b) electron donor c) proton acceptor d) electron acceptor

18. The definition of pH is:
   a) log of the hydrogen ion concentration
   b) natural log of the hydrogen ion concentration
   c) negative log of the hydroxide ion concentration
   d) negative log of the hydrogen ion concentration

19. Forward reaction is favored when
   a) concentration of reactants is decreased
   b) concentration of products is increased
   c) concentration of products is decreased
   d) concentration of products is increased and concentration of reactants is decreased

20. If the pH of a solution is 8, what is the molar concentration of hydroxide ions [OH^-] ?

a) 1x10^{-6} mol/L b) 6 mol/L c) 1x10^{-14} mol/L d) 1x10^{-8} mol/L

21. The name given to hydrocarbons containing one double bond is:

a) alkanes b) alkenes c) alkynes d) dienes

22. Select the molecular formula of toluene

a) C_5H_7 b) C_6H_8 c) C_7H_8 d) C_8H_{10}

23. Which of the following compounds contains a carbon atom in *sp*-hybrid state?
a) CO_2 b) $H_3C\text{-}CHO$ c) CH_3COOH d) $H_3C\text{-}CH{=}CH_2$

24. Which of the following would be classified as ether?
a) $CH_3CH{=}CHCH_2CH(CH_3)CH_2CH_3$
b) $CH_3CH(OH)CH_2CH_2CH_3$
c) $C_6H_5OCH_2CH_3$
d) $HOC_6H_5CH_2CH_3$

25. What is the product formed in the reaction

$$CH_3CH_2CH{=}CH_2 + H_2O \xrightarrow{H_2SO_4} ?$$

a) 1-butanol
b) 2-butanol
c) $CH_3CH_2CH(OH)CH_2OH$
d) butanal

26. What is/are the product/s of the following reaction?

$$CH_3CH_2COOCH_2CH_3 + H_2O \underset{}{\overset{H^+}{\rightleftharpoons}}$$

a) diethyl ether
b) propionic acid and propyl alcohol
c) ethyl alcohol and propionic acid
d) ethyl alcohol and propyl alcohol

27. What reagents can be used to synthesize propionamide?
a) butyric acid and ammonia
b) propionic acid and formamide
c) propionic acid and ammonia
d) acetic acid and acetamide

28. When a hydrogen atom in benzene is replaced by a hydroxyl group -OH, the compound is part of a family known as:
a) phenols b) thiols c) ethers d) alcohols

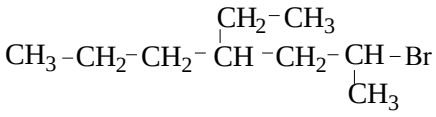
29. Hydrogen bonds CANNOT be formed between which of the following pairs of molecules?
a) formaldehyde and methyl alcohol
b) water and methanal
c) propanone and diethyl ether
d) ethyl alcohol and acetone

30. Primary alcohols on dehydrogenation give :
a) acids b) ketones c) aldehydes d) alkenes

31. Which of the following compounds could be oxidized to form 4-ethyl-3-methylhexanal?
a) 4-ethyl-3-methylhexanoic acid
b) 4-ethyl-3-methyl-2-hexanol
c) 4-ethyl-3-methyl-1-hexanol
d) 4-ethyl-3-methyl-1-hexene

32. Which of the following would give a positive Tollens test ?
a) $CH_3CH_2COCH_3$ b) $CH_3CH{=}CH_2$ c) CH_3CH_2CHO d) CH_3COOH

33. Which are the products of the reaction: $CH_3–CH_2–COOH + Na_2CO_3 \rightarrow$?
   a) CH_3-CH_2-COONa, CO_2 and H_2O
   b) CH_3-CH_2-COONa and CO_2
   c) CH_3-CH_2-COONa and H_2O
   d) CH_3-CH_2-COONa, NaOH and CO_2

34. The correct IUPAC name for the following compound  is :
   a) 4-ethyl-2-methyl-1-bromide
   b) 6-bromo-2-methyl-3-ethylhexane
   c) 2-bromo-3-ethyl-2-methylhexane
   d) 2-bromo-4-ethylheptane

35. Which statement is correct ?
   a) the carbonyl group activity in addition reactions is higher when the hydrocarbon residue is smaller
   b) aldehydes are more reactive than ketones
   c) aldehydes and ketones can add H_2, HCN, ROH, RNH_2, $NaHSO_3$
   d) all of the above

36. 2-Butene will be the product of:
   a) hydration of butane
   b) oxidation of 2-butanol
   c) hydration of propyne
   d) dehydration of 2-butanol

37. Monoaminomonocarboxylic acids have:
   a) acidic character
   b) basic character
   c) amphoteric properties
   d) reducing power

38. Glucose is classified as:
   a) aldopentose b) ketohexose c) ketotriose d) aldohexose

39. Which of the following is not amino acid ?
   a) alanine b) aniline c) asparagine d) leucine

40. When cellulose is hydrolyzed, the final products are molecules of:
   a) glucose b) fructose c) maltose d) ribose

Part B: Short Answer Questions

- **Write your answers in the space provided for each question!**

1. Indicate the number of electrons, protons and neutrons in the isotope $^{79}_{35}\mathbf{Br}$.

No. of electrons = …... No. of protons = …… No. of neutrons = …...

2. In the following equation, identify the acid, base, conjugate acid and conjugate base:

$$\mathbf{HCN + H_2O \rightleftarrows H_3O^+ + CN^-}$$

acid ……. conjugate base ……

base …….. conjugate acid ……

Identify the conjugate acid-base pairs:

……. and **……**

3. Write the structural formula of the compound 2,3-dimethylpentane.

4. Show the equation and name the product formed when propene reacts with HBr.