



Name and surname of the contestant: _____

Name and surname of the mentor: _____

School: _____ County: _____

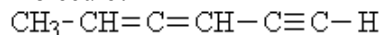
For Committee members

Total points: _____

From MC questions: _____ problems: _____

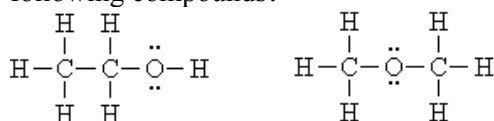
Checked by (signature): _____

I. MULTIPLE CHOICE EXAM WITH ONLY ONE CORRECT ANSWER

(It is properly answered by circling **only one** of the provided answers under A, B, C, D or E)1. How many σ -bonds are there in the following molecule?

- A. 10
B. 11
C. 8
D. 15
E. 7

2. What is the relationship between the following compounds?

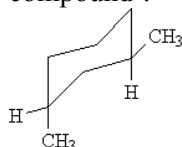


- A. Isotopes
B. Homologues.
C. Isomers.
D. Enantiomers.
E. There is no common relationship.

3. Label the "intruder" !

- A. CN^-
B. RNH_2
C. BF_3
D. $:\text{CH}_3$
E. HO^-

4. What is the IUPAC name of the following compound ?



- A. Dimethylcyclohexane.
B. Dimethylbenzene.
C. 1,3- Dimethylcyclohexane.
D. *cis*-1,3- Dimethylcyclohexane.
E. *trans*-1,3- Dimethylcyclohexane.

5. How many structural isomers does hexane have?

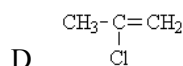
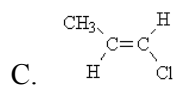
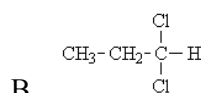
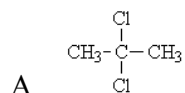
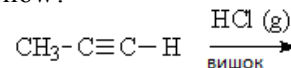
- A. 2 B. 3 C. 4
D. 5 E. 6

6. What compound is obtained from the reaction given below?



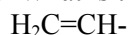
- A. Propane. B. Methane. C. Ethane.
D. Pentane. E. Butane.

7. What compound is obtained from the reaction given below?



- E. None of the above.

8. What is the name of the following group?



- A. Ethyl.
B. Vinyl.
C. Methylene.
D. Ethynyl.
E. Allyl.

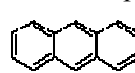
9. How many isomeric tribromobenzenes are possible?

- A. 1 B. 0 C. 2
D. 3 E. 4

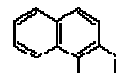
10. Which of the following structural formula is the correct formula of phenanthrene?



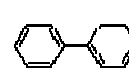
I



II



III

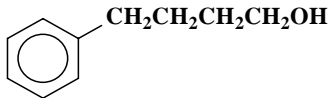


IV

- A. IV.
B. None of the above.
C. I.
D. II.
E. III.

11. Which of the following statements is correct!

- A. Propanone can be reduced to propan-2-ol.
B. Propanone can be oxidized to propan-2-ol.
C. Propanone can be reduced to propan-1-ol.
D. Propanone can be oxidized to propan-1-ol.
E. Propanone can be oxidized to propane.

12. What is the value for the C-C-C angle in cyclopropane?
 A. 30 °. B. 60 °. C. 90 °.
 D. 120 °. E. 109 °.
13. What compound is obtained from the reaction given below?
 $\text{CH}_3\text{CH}=\text{CH}_2 + \text{H}_2\text{O} \rightarrow ?$
 A. Propan-1-ol.
 B. Propanal.
 C. Propanone.
 D. Propan-2-ol.
 E. Propyne.
14. Order the following alkanes by increasing boiling points (from lowest to highest bp)?
 I. $\text{C}_{12}\text{H}_{26}$ II. $\text{C}_{33}\text{H}_{68}$ III. C_7H_{16} IV. $\text{C}_{55}\text{H}_{112}$
 A. III > I > II > IV
 B. IV < II < III < I
 C. IV > II > I > III
 D. III > II > IV > I
 E. I > III > II > IV
15. Which compound is obtained by reaction of propylmagnesium chloride and water?
 A. Propyl chloride.
 B. Propene.
 C. Propan-1-ol.
 D. Propyne.
 E. Propane .
16. Which compound by elimination of bromine gives pent-2-ene?
 A. 2,3-dibromopentane.
 B. 1,2-dibromopentane.
 C. 2-bromopentane.
 D. 1-bromopentane.
 E. 3-bromopentane.
17. For which of the following compounds geometric isomerism is not possible?
 A. Hept-3-ene.
 B. Hex-2-ene.
 C. But-2-ene.
 D. Pent-1-ene.
 E. Oct-3-ene.
18. Which of the following compounds cannot undergo polymerization?
 A. Tetrafluoroethene.
 B. Chloroethene.
 C. 1,2-Dichloroethane.
 D. Propene.
 E. 2-Methylbuta-1,3-diene.
19. What is **n** in the general molecular formula of the cycloalkanes?
 A. $n \geq 3$.
 B. $n \leq 3$.
 C. $n \geq 1$.
 D. $n \geq 2$.
 E. $n = 1$
20. Which reaction is characteristic for benzene?
 A. Electrophilic addition.
 B. Electrophilic substitution.
 C. Nucleophilic substitution.
 D. Nucleophilic addition.
 E. Elimination.
21. The reactivity of benzene towards electrophilic nitration is
 A. Greater than the reactivity of toluene.
 B. Greater than the reactivity of phenol.
 C. equal to the reactivity of phenol.
 D. less than the reactivity of toluene and phenol.
 E. equal to the reactivity of toluene.
22. What is the IUPAC name of the compound given below?

 A. 4-phenylbutan-1-ol.
 B. 1-phenylbutan-4-ol.
 C. Benzylpropyl alcohol.
 D. Butanol benzene.
 E. 4-benzylbutan-1-ol.
23. In the reaction with alkali metals, the alcohols act as:
 A. proton acceptors.
 B. salts.
 C. amphiprotolytes.
 D. bases.
 E. acids.
24. What is the pH of aqueous solution of phenol?
 A. Acidic.
 B. Neutral.
 C. Weakly basic.
 D. Strongly basic.
 E. Phenol does not dissolve in water.
25. What is the hybridization of the carbon atom in the aldehyde functional group?
 A. sp B. sp^2 C. sp^3
 D. sp^2-p E. sp^2-s

II. PROBLEMS

(Write your final answer in the provided rectangular space under each given problem.
For full credit, please show your complete calculations on the additional sheets!)

1. How many chlorine atoms are there in 307.2 g tetrachloromethane?

Answer:

2. Calculate the mole and mass fractions of the elements in 1,2-dichlorobenzene!

Answer:

3. After elemental analysis of an organic compound the following mass fractions of elements were obtained: $w(\text{C}) = 65.4\%$, $w(\text{H}) = 5.5\%$ and $w(\text{O}) = 29.1\%$.

From the provided information determine the empirical formula of the compound!

Answer:

4. After combustion of 33.5 g propene, 16.1 g of water were isolated. What is the percent yield of the above-mentioned reaction?

Answer:

5. What mass of water will be obtained after combustion of 209 g methanol?

Answer:

Potentially useful information for answering the given problems:

$$A_r(\text{H}) = 1.01; \quad A_r(\text{C}) = 12.0; \quad A_r(\text{O}) = 16.0; \quad A_r(\text{Cl}) = 35.4;$$