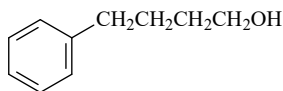


1. What is the name of the alcohol represented by the following formula?

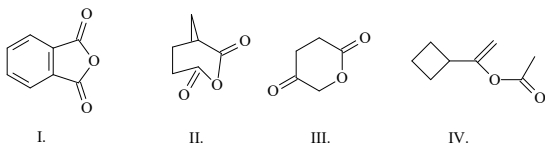


- A. 4-phenylbutan-1-ol.
B. 1-phenylbutan-4-ol.
C. 4-benzylbutan-1-ol.
D. Benzylpropanol alcohol.
2. Which interactions account for the solubility of alcohols in water?
- A. London dispersion forces.
B. Ion-dipole interactions.
C. Van der Waals forces.
D. Hydrogen bonds.
3. What is the pH of an aqueous solution of phenol?
- A. Strongly basic.
B. Weakly basic.
C. Weakly acid.
D. Strongly acid.
4. Which compound is formed when aniline reacts with hydroiodic acid?

- A. Anilinium iodide.
B. *o*-iodoaniline.
C. *p*-iodoaniline.
D. 2,4,5-triiodoaniline.

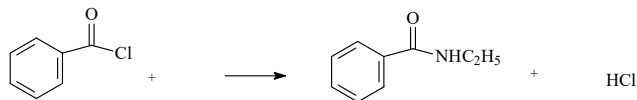
5. How many skeletal isomers of the alkyne C_6H_{10} with a triple bond at the C1 position are possible?
- A. 2.
B. 4.
C. 3.
D. 1.

6. Which of the following formulae does NOT represent an acid anhydride?



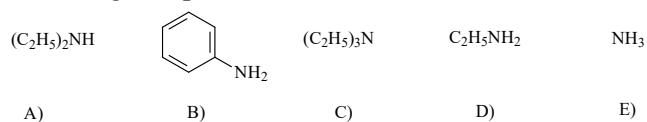
- A. Only III.
B. III and IV.
C. I and III.
D. Only IV.

7. What compound is missing in the following chemical equation?



- A. Ethylamine.
B. Ammonium hydroxide.
C. Ammonia.
D. Ethylamide.

8. In what order does the basicity of the following compounds increase?



- A. $B > E > D > A > C$.
B. $A < B < C < D < E$.
C. $E < A < C < D < B$.
D. $B < E < D < A < C$.

9. Which compound is obtained when 3-chloropentanoic acid is reduced with $LiAlH_4$?

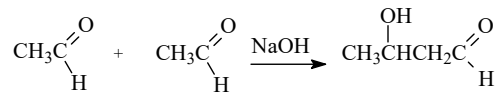
- A. 3-chloropentan-1-one.
B. 3-chloropentan-1-ol.
C. hydrocholic acid and pentan-1-ol.
D. pentanal and chlorine.

10. Which of the following compounds cannot be identified by the iodoform test?

- I. Pentan-2-one II. Hexan-2-on
III. Acetone IV. Heptan-3-on
V. Benzophenone

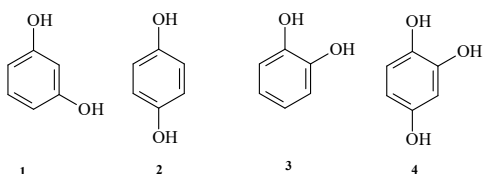
- A. I and II.
B. III, IV and V.
C. IV and V.
D. Only IV.

11. What type of reaction is represented by the following equation?



- A. Keto-enol tautomerism.
 B. Hemiacetal formation.
 C. Base-catalyzed reduction.
 D. Aldol addition (condensation).

12. Which of the following formulae represents the formula of hydroquinone?



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

13. Which of the following substances has the lowest pH value in aqueous solution?

- A. Pentanoic acid.
 B. Methyl acetate.
 C. Benzamide.
 D. 2-chloropropanoic acid.

14. Which of the following compounds cannot undergo a polymerization reaction?

- A. Tetrafluoroethene.
 B. 1,1-dichloroethene.
 C. 1,2-dichloroethane.
 D. 1,3-dichloropropene.

15. Which of the compounds represented by the following structural formulae contains a chiral carbon atom?

- A. $\text{CH}_3\text{OC}_2\text{H}_5$.
 B. $\text{CH}_3(\text{CH}_2)_3\text{CHO}$.
 C. $\text{CH}_3\text{CH}(\text{OH})\text{C}_2\text{H}_5$.
 D. $\text{CH}_3\text{COC}_6\text{H}_5$.

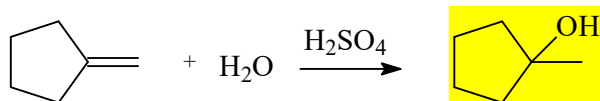
II. TASKS

(In the assigned tasks, write the method of solving and the answer in the provided place)

1. In the space provided, answer each of the following questions!

(9 points)

A) What compound is the product of the following reaction? Name the resulting product.

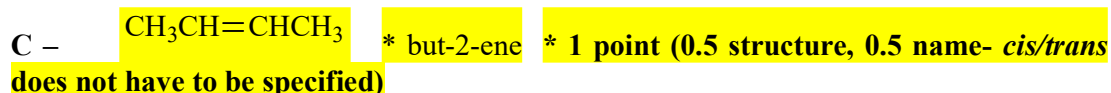
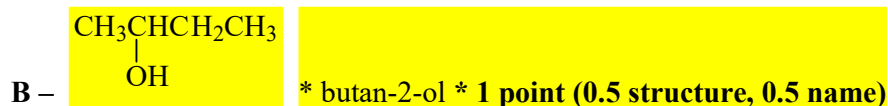
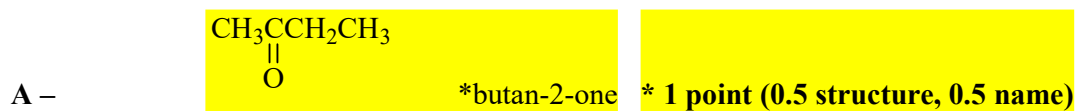


* 1-methylcyclopentanol 2 points (1

structure, 1 name)

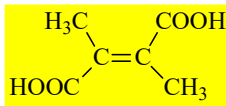
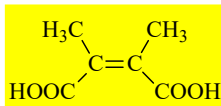
B) The ketone **A** undergoes an iodoform reaction. Upon reduction, this ketone gives compound **B**, which, when heated with sulfuric acid, forms compound **C**. Compound **C** decolorizes a solution of bromine in dichloromethane, and its ozonolysis yields only acetaldehyde. Write the formulae and names of compounds **A**, **B**, and **C**.

Total 3 points

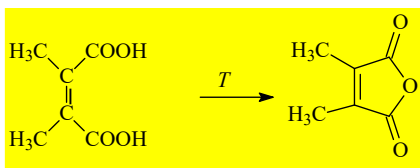


B) Draw the geometric isomers of 2,3-dimethylbutenedioic acid. Which of these isomers can form an anhydride? Write the equation for the reaction in which the corresponding anhydride is obtained when the acid is heated!

Total 4 points

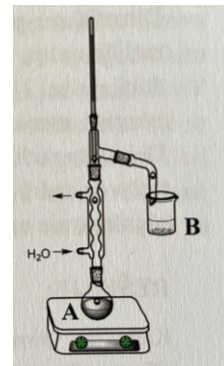


*2 points (1 point for both structure)



*2 point (1 for the correct isomer, 1 for the anhydride structure).

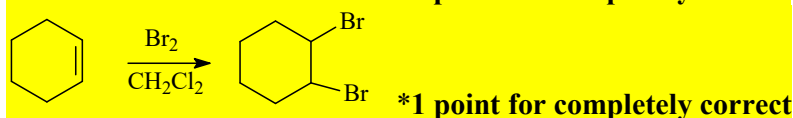
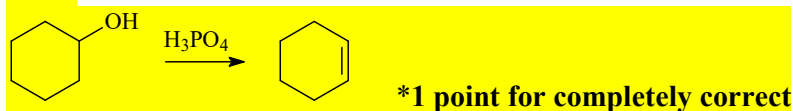
2. In the apparatus shown, a mixture of concentrated phosphoric acid and 100 g of cyclohexanol was heated in the flask labeled 'A,' during which spontaneous distillation occurred, and the distillate was collected in the beaker labeled 'B.' During the heating, the temperature on the thermometer did not exceed 100 °C. After the heating was stopped, a black liquid remained in flask A, while two layers separated in the beaker B. To purify the resulting distillate, the upper layer was dried, and then fractional distillation was performed on it. The pure compound (C) was collected at 83 °C with a total mass of 25.3 g. A small sample of compound C reacted with bromine in dichloromethane, decolorizing the solution. Calculate the yield of the reaction to obtain compound C. Write the equation for the reaction between compound C and bromine in dichloromethane.



$$m(\text{циклохексен})_e = 25,3 \text{ g}$$

$$m(\text{циклохексанол}) = 100 \text{ g}$$

$$y = ?$$



$$M(\text{циклохексанол}) = 6 \cdot A_r(\text{C}) + 12 \cdot A_r(\text{H}) + 1 \cdot A_r(\text{O}) = 6 \cdot 12 + 12 \cdot 1 + 1 \cdot 16 = 100 \text{ g/mol} \quad *0.5 \text{ points}$$

$$M(\text{циклохексен}) = 6 \cdot A_r(\text{C}) + 10 \cdot A_r(\text{H}) = 6 \cdot 12 + 10 \cdot 1 = 82 \text{ g/mol} \quad *0.5 \text{ points}$$

$$n(\text{циклохексанол}) = \frac{m(\text{циклохексанол})}{M(\text{циклохексанол})} = \frac{100 \text{ g}}{100 \frac{\text{g}}{\text{mol}}} = 1 \text{ mol} \quad *1 \text{ point}$$

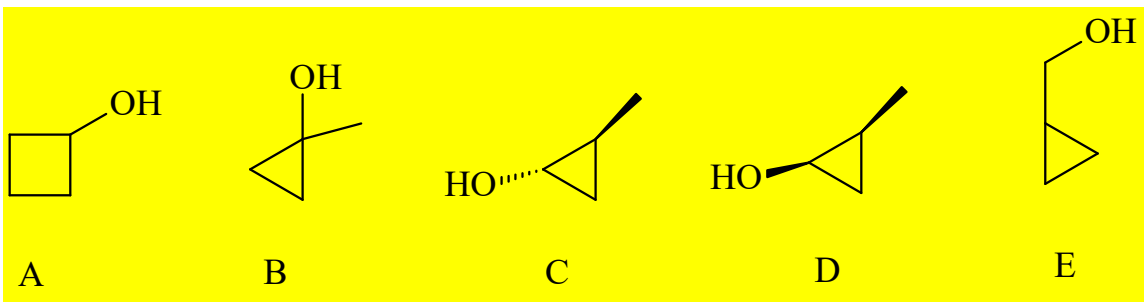
$$n(\text{циклохексанол}) = n(\text{циклохексен}) \quad * \text{ this is not scored!}$$

$$m(\text{циклохексен})_T = n(\text{циклохексен}) \cdot M(\text{циклохексен}) = 1 \text{ mol} \cdot 82 \frac{\text{g}}{\text{mol}} = 82 \text{ g} \quad *1 \text{ point}$$

$$y = \frac{m(\text{циклохексен})_e}{m(\text{циклохексен})_T} \cdot 100 = \frac{25,3 \text{ g}}{82 \text{ g}} \cdot 100 = 30,85 \% \quad *1 \text{ point}$$

3. Given a compound with the molecular formula C_4H_8O , draw the isomers that represent a saturated cyclic alcohol and name them according to IUPAC rules in the space provided.

(5 point)



A: cyclobutanol
B: 1-methylcyclopropanol
C: *trans*-2-methylcyclopropanol
D: *cis*-2-methylcyclopropanol
E: cyclopropylmethanol

- One point for each structure + name. A point is awarded only if both are correct.
- The names for the structures under C and D are considered correct only if *cis/trans* are specified.