

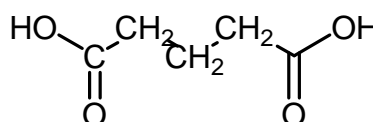
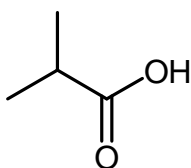
The test consists of 4 pages. **Print your name legibly on each page now.**
A fifth page contains a table with some pK values. You may tear it off and use it as scratch paper. Please put your answers on the test pages, though.
If something is not clear, raise your hand and ask!

Page	Points
1	<u>22</u>
2	<u>28</u>
3	<u>34</u>
4	<u>16</u>
Total	<u>100</u>

Points

(8) 1. Give the **IUPAC name** and the **common name** for the following carboxylic acids:

2 pts each



IUPAC name 2-methylpropanoic acid

IUPAC name pentanedioic acid

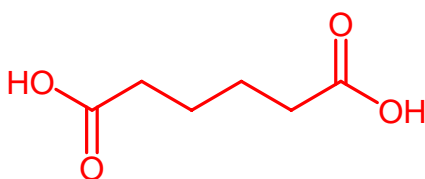
Common name isobutyric acid

Common name glutaric acid

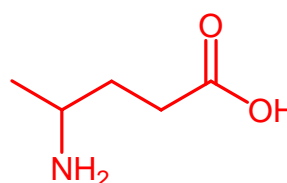
(8) 2. Draw the structure of the following carboxylic acids:

4 pts each

adipic acid



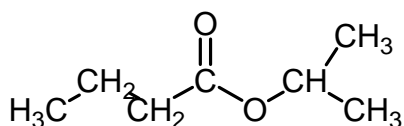
4-aminopentanoic acid



(6) 3. Give the **IUPAC name** of the following ester, and the **IUPAC names** of the acid and alcohol from which it is made.

2 pts each

IUPAC Names

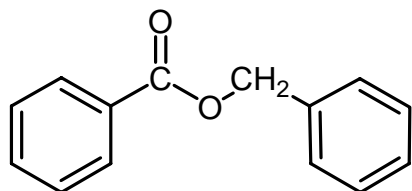


Ester: 1-methylethylbutanoate

Acid: butanoic acid

Alcohol: 2-propanol

- (6) 4. Give the **common name** of the following ester, and the **common names** of the acid and alcohol from which it is made.



2 pts each

Common Names

Ester: benzylbenzoate

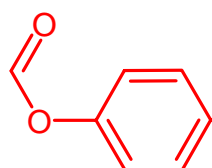
Acid: benzoic acid

Alcohol: benzyl alcohol

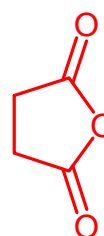
- (8) 5. Draw the structure of the following :

4 pts each

phenyl formate

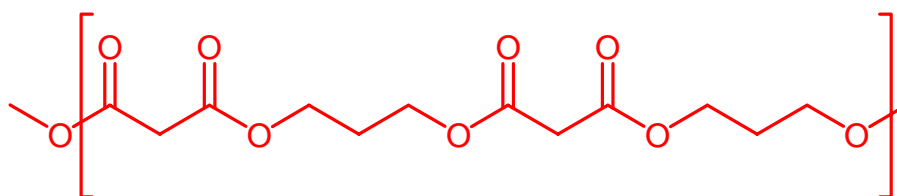


succinic anhydride



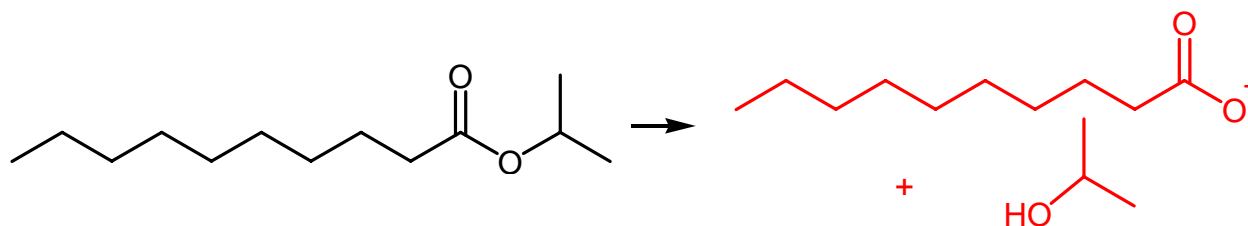
- (6) 6. A **polyester** is prepared by reaction of 1,3-propanediol and malonic acid. Draw the structure of this polymer, showing at least two repeating units of the polymer.

2 pts dialcohol; 2 pts diacid; 2 pts correct connections and 2 units total



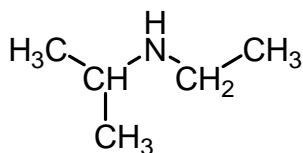
- (8) 7. Draw the structure of the **saponification** products of the following ester. Be sure to indicate the appropriate protonation state and charge on the products.

4 pts each product. -2 pts if incorrect charge and protonation state. -2 pts if wrong number of C atoms.

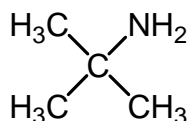


(10) 8. Classify the following amines as **primary**, **secondary**, or **tertiary**:

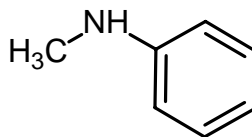
2.5 pts each



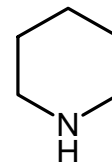
secondary



primary



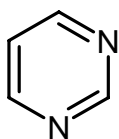
secondary



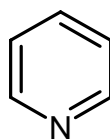
secondary

(6) 9. Give the name of the following heterocyclic amines:

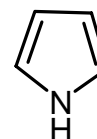
2 pts each. 1 pt for misspelling



pyrimidine



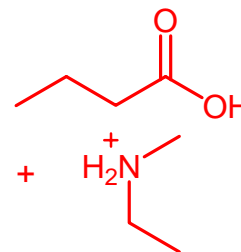
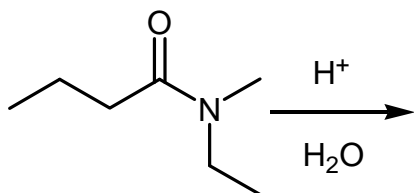
pyridine



pyrrole

(10) 10. Give the **common name** of the following amide, and draw the structures of the products formed by **acid hydrolysis**. Be sure to show the proper protonated form of each product, and its charge, if any.

2 pts name, 4 pts each structure, (2 pts if wrong protonation state and charge)

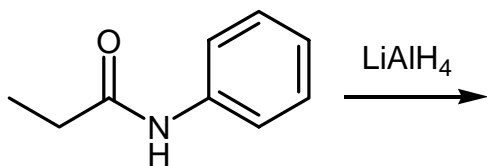


Common

Name: N-ethyl-N-methylbutyramide

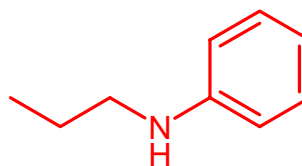
(8) 11. Give the **IUPAC name** of the following amide, and draw the structure of the product formed by its **reduction** with LiAlH_4 . Give the **IUPAC name** for the reduction product.

2 pts each name; 4 pts structure



IUPAC

Name: N-phenylpropanamide

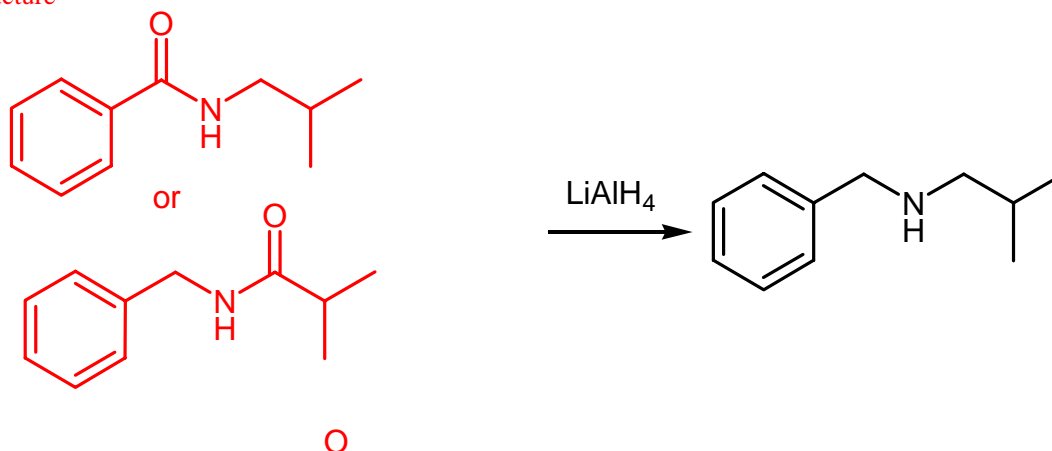


IUPAC

Name: N-1-propylaniline

(4) 12 Draw the structure of an amide that can be reduced to give the following amine:

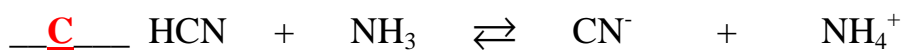
4 pts structure



(12) 13 Using the pK values from page 5, determine whether the following acid-base reactions:

- A. Favor products in a greater than 10:1 ratio.
- B. Favor products in a less than 10:1 ratio.
- C. Form approximately equal amounts of reactants and products.
- D. Favor reactants in a less than 10:1 ratio.
- E. Favor reactants in a greater than 10:1 ratio.

(Put the appropriate letter in the blank to the left of the reaction.)



Relative Strengths of Some Acids and Bases:

Acid	Approx. pK _a	Base
HCl	-7	Cl ⁻
H ₃ O ⁺	-2	H ₂ O
C ₆ H ₅ NH ₃ ⁺	5	C ₆ H ₅ NH ₂
C ₅ H ₅ NH ⁺	5	C ₅ H ₅ N
RCO ₂ H	5	RCO ₂ ⁻
H ₂ CO ₃	6	HCO ₃ ⁻
NH ₄ ⁺	9	NH ₃
HCN	9	CN ⁻
C ₆ H ₅ OH	10	C ₆ H ₅ O ⁻
HCO ₃ ⁻	10	CO ₃ ⁻²
RNH ₃ ⁺	11	RNH ₂
H ₂ O	16	HO ⁻
RCH ₂ OH	16	RCH ₂ O ⁻