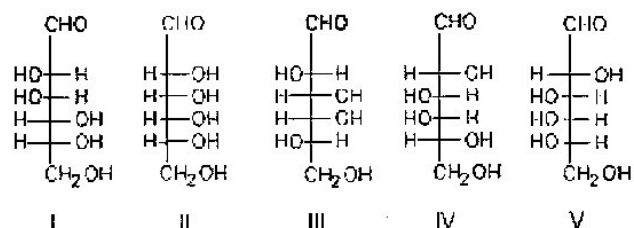


Note: the multiple choice questions may not be in the same order

Name: _____ Date: _____

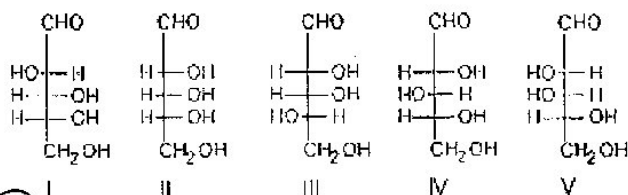
Part I. (40 Marks)

1. A D-aldohexose, X, is subjected to a Ruff degradation. The degradation product is treated with nitric acid to yield an optically inactive aldaric acid. A possible structure for X is:



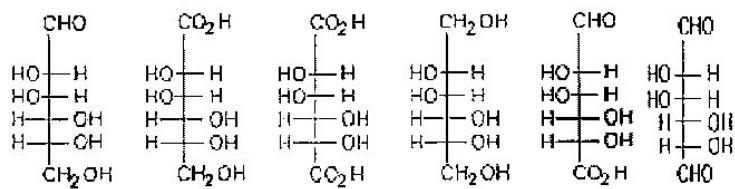
- A) I
 B) II
 C) III
 D) IV
 E) V

2. Which of the following would yield D-glucose and D-mannose when subjected to a Kiliani-Fischer synthesis?



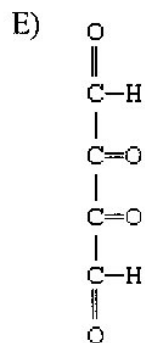
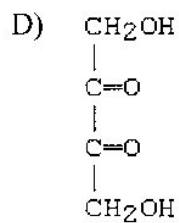
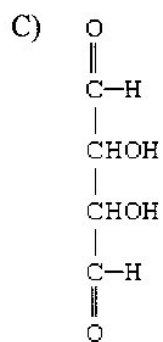
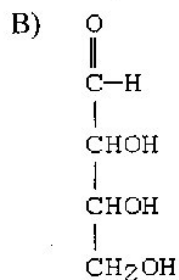
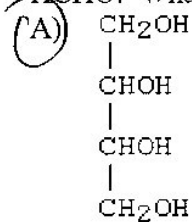
- A) I
 B) II
 C) III
 D) IV
 E) V

3. Reaction of I (below) with bromine water would yield:



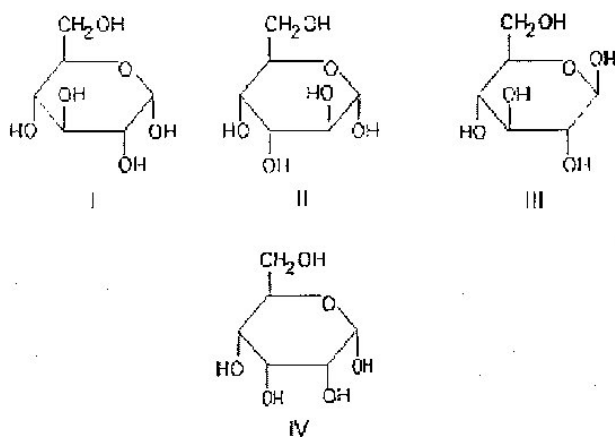
- A) II
- B) III
- C) IV
- D) V
- E) VI

4. A compound X reacts with 3 mol of HIO_4 to yield 2 mol of HCO_2H and 2 mol of HCHO . What is the structure of X?



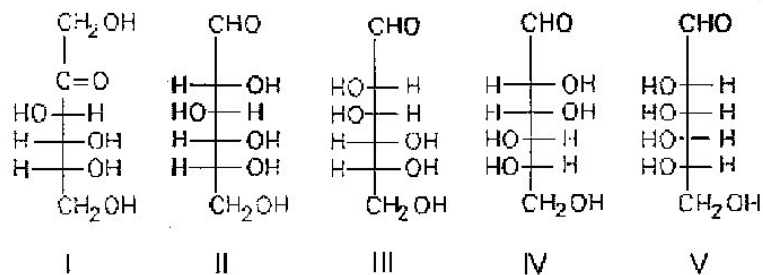
5. The Ruff degradation is the reaction of an aldose with:
- $\text{Br}_2/\text{H}_2\text{O}$; then HCN ; then H_3O^+ ; then $\text{Na-Hg}, \text{H}_2\text{O}$
 - HCN ; then $\text{Ba}(\text{OH})_2$; then H_3O^+ ; then $\text{Na-Hg}, \text{H}_2\text{O}$
 - HCN ; then H_3O^+ ; then $\text{Ba}(\text{OH})_2$; then $\text{Na-Hg}, \text{H}_2\text{O}$
 - $\text{Br}_2/\text{H}_2\text{O}$; then $\text{CaCO}_3, \text{H}_2\text{O}_2, \text{Fe}_2(\text{SO}_4)_3$
 - $\text{Br}_2/\text{H}_2\text{O}$

6. Which are the anomers?



- I and II
- I and III
- II and III
- II and IV
- III and IV

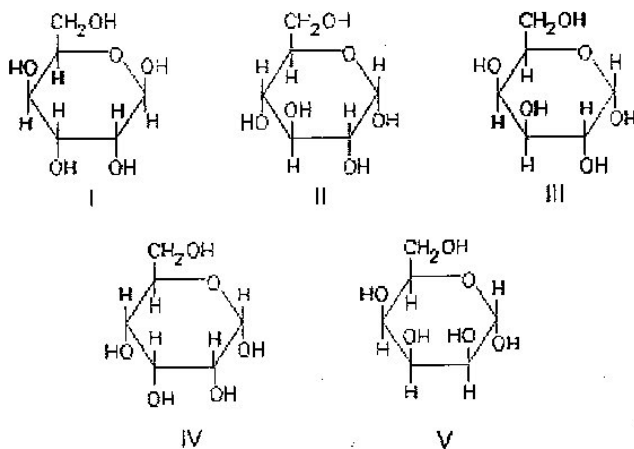
7. Epimers are represented by:



- I and II
- II and III
- I, II, and III
- III and IV
- I, II, and V

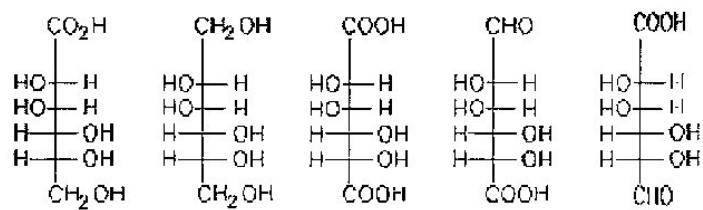
8. What can be said, correctly, about a monosaccharide, the name of which is preceded only by (+) ?
- A) The compound is the α -anomer.
 - B) The compound exists in the pyranose form.
 - C) The compound rotates the plane of polarized light with $\alpha > 0$.
 - D) The compound has the same stereochemistry at the penultimate carbon as D-(+)-glucose.
 - E) The compound exists only in open-chain form.

9. Which compound is D-galactose?



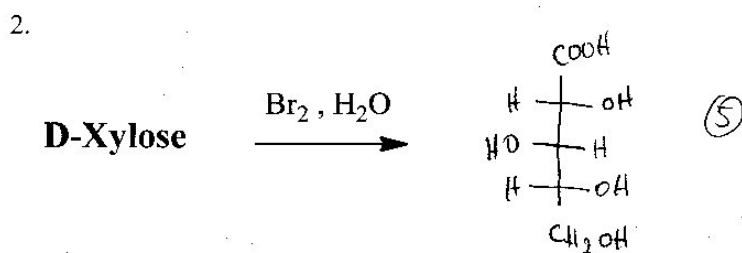
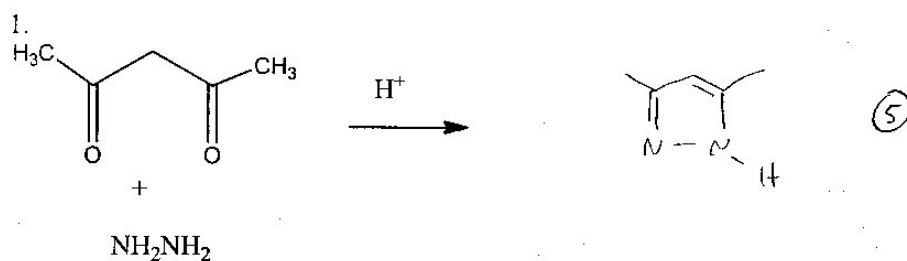
- A) I
- B) II
- C) III
- D) IV
- E) V

10. An aldonic acid is represented by:



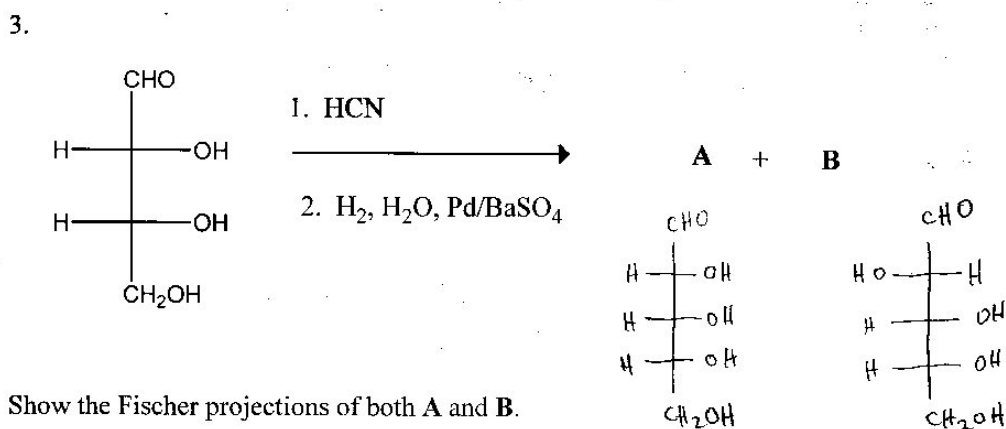
- I II III IV V
- (A) I
 B) II
 C) III
 D) IV
 E) V

II. (22 marks) Give the major product of the following reactions:



-2 if wrong structure or wrong transformation

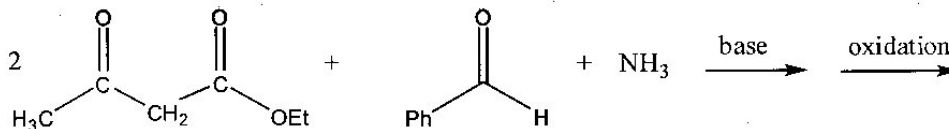
Show the Fischer projection of this product.



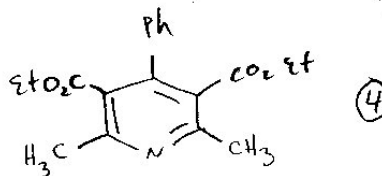
Show the Fischer projections of both A and B.

-2 if using transformation

4.

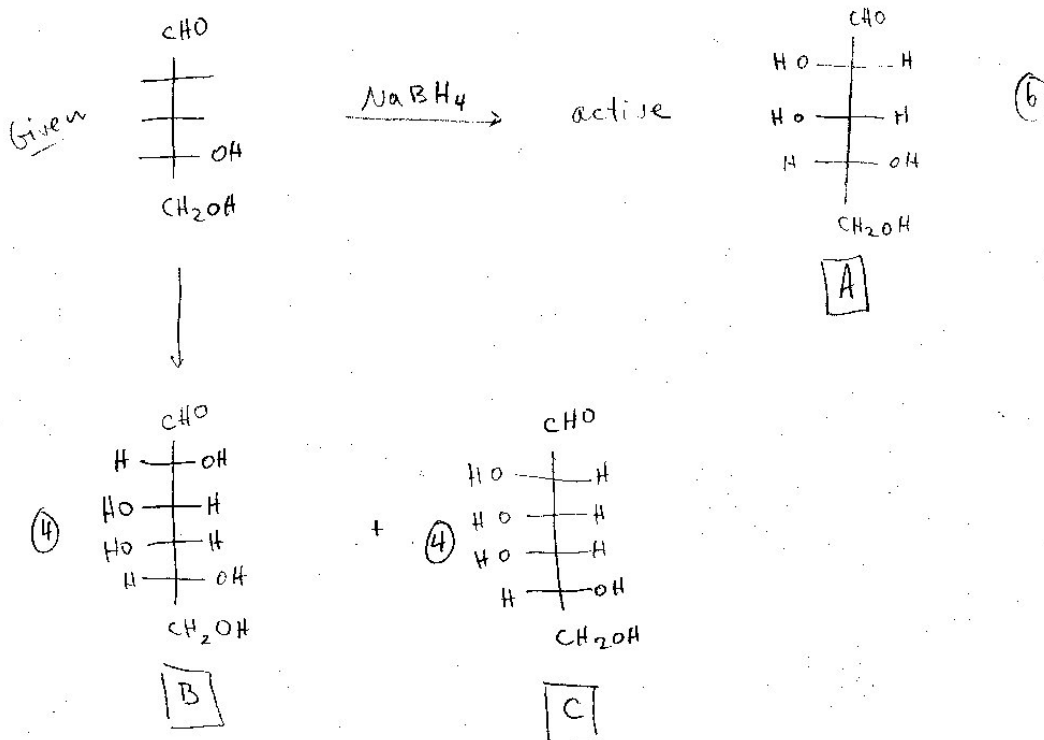


2 if missing substituents or at wrong position



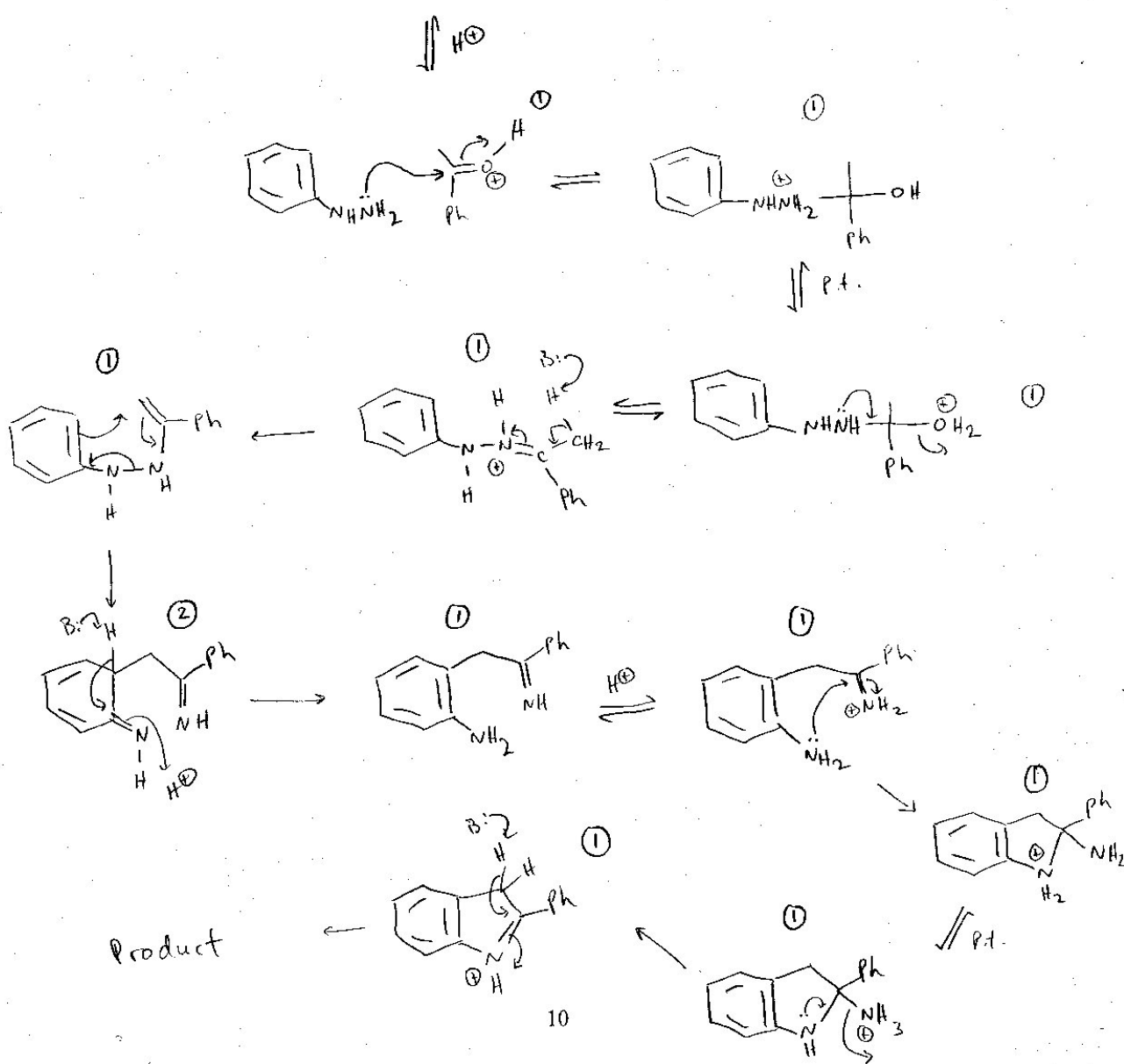
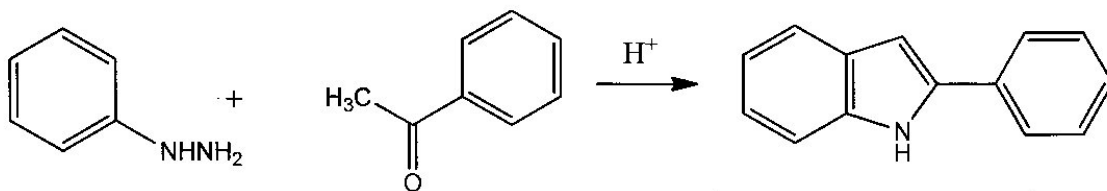
III. (14 Marks) A D-aldopentose **A** is reduced with NaBH_4 to an optically active alditol. Upon Kiliani-Fischer synthesis, **A** is converted to two D-aldohexoses, **B** and **C**. **B** is oxidized with HNO_3 to an optically inactive aldaric acid, and **C** is oxidized by HNO_3 to an optically active aldaric acid.

What are the structures of sugars **A**, **B** and **C**? (Show their Fischer projections)



2 if wrong transformation but B & C are C2-epimers

IV. (12 marks) Provide a detailed mechanism for the following transformation:



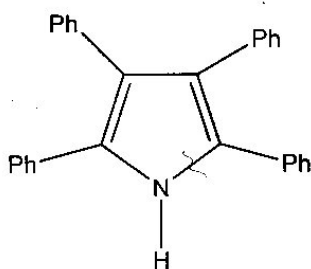
V. (12 marks)

Provide

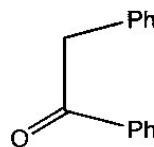
(a) disconnections and

(b) a synthesis for the following molecules, clearly indicating all starting materials and conditions.

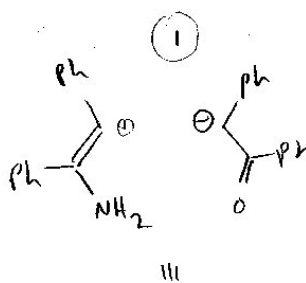
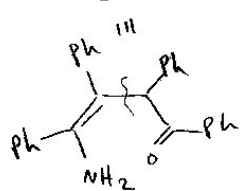
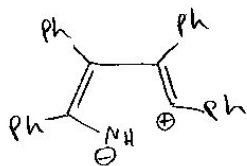
(6 marks)
1.



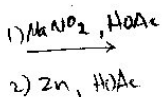
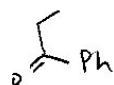
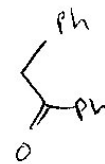
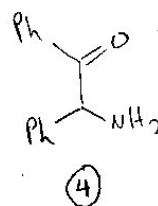
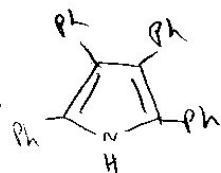
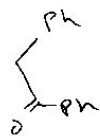
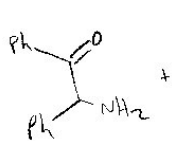
from



enamine



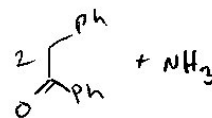
Forward:



Product

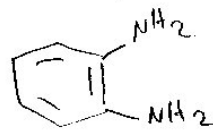
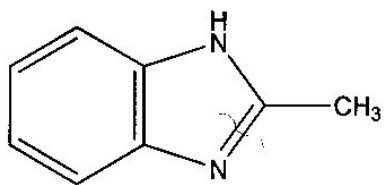
11

1 mark for
3 marks for this



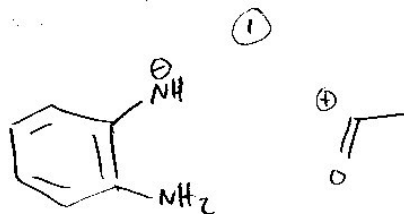
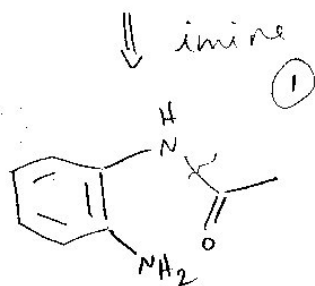
+ NH_3

2. (6 marks)

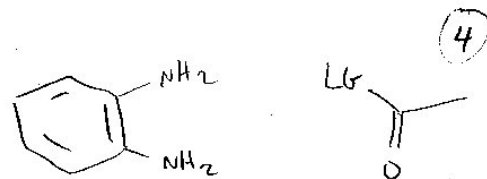


III

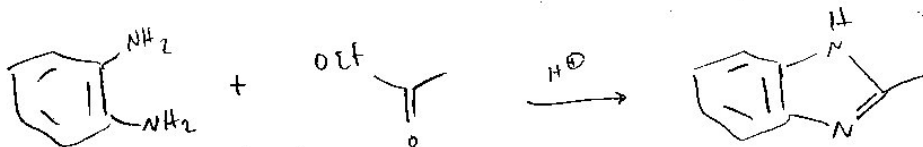
from 1,2-Benzenediamine



III



Forward:



1 if give $\text{H}_2\text{C}=\text{O}$ or similar