The Cannizzaro Reaction

Two identical aldehyde molecules, two different products. How an aldehyde with no α-hydrogen, in concentrated alkali, is oxidised and reduced in the same reaction.

Name: Date: Score: ____ / 19

A. Fill in the blanks

1. The Cannizzaro reaction needs an aldehyde with no ____ hydrogen.

2. The Cannizzaro reaction uses ____ NaOH or KOH.

3. In the Cannizzaro reaction one molecule is oxidised and the other is ____.

4. Oxidation and reduction of the same compound in one reaction is called ____.

5. The key step passes a ____ ion directly from one molecule to the other.

B. True or False

6. Ethanal gives the Cannizzaro reaction. True / False

7. Benzaldehyde has no α-hydrogen. True / False

8. The hydride ion moves freely through the solution. True / False

9. Benzoic acid is obtained only after acidifying the salt. True / False

C. Assertion and reason

10. Assertion (A): Benzaldehyde gives the Cannizzaro reaction.
Reason (R): It has no α-hydrogen.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

11. Assertion (A): The Cannizzaro reaction is a disproportionation.
Reason (R): One molecule is oxidised and another identical molecule is reduced.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

D. Choose the correct option

12. Which gives the Cannizzaro reaction?

(a) CH_3CHO
(b) CH_3CH_2CHO
(c) $HCHO$
(d) CH_3COCH_3

Answer: _____

13. With conc. NaOH, benzaldehyde gives:

(a) benzoic acid only
(b) sodium benzoate and benzyl alcohol
(c) an aldol
(d) benzene

Answer: _____

14. The oxidation number of the carbonyl carbon in benzaldehyde is:

(a) 0
(b) +1
(c) +2
(d) −1

Answer: _____

15. Formaldehyde with conc. NaOH gives:

(a) methanol and sodium methanoate
(b) ethanol only
(c) ethanal
(d) methane

Answer: _____

E. Numerical problems

16. Find the oxidation number of the CH_2OH carbon in benzyl alcohol.

17. How many molecules of benzaldehyde react for each molecule of benzyl alcohol formed?

F. Short answer questions

18. Write the balanced equation for the Cannizzaro reaction of benzaldehyde.

G. Match the columns

19. Match each item in Column A with the correct item in Column B.

Column A	Column B	Your answer
1. No α-hydrogen + conc. NaOH	(a) Reduction	1 → ____
2. α-hydrogen + dilute NaOH	(b) Aldol	2 → ____
3. Carbonyl carbon +1 → +3	(c) Oxidation	3 → ____
4. Carbonyl carbon +1 → −1	(d) Cannizzaro	4 → ____

Detailed solutions

1. alpha

2. concentrated

3. reduced

4. disproportionation

5. hydride

6. False. It has α-hydrogens, so it gives aldol.

7. True. The carbon next to C=O is a ring carbon with no H.

8. False. It is passed directly between the two molecules.

9. True. The base step gives sodium benzoate.

10. (a) R explains A.

11. (a) R explains A.

12. (c) HCHO. HCHO has no α-hydrogen.

13. (b) sodium benzoate and benzyl alcohol. One oxidised, one reduced.

14. (b) +1. C=O counts +2, C–H −1, C–C 0.

15. (a) methanol and sodium methanoate. HCHO has no α-hydrogen.

16. C–O counts +1; 2 C–H count −2; C–C counts 0. **Answer: −1**

17. 2 C_6H_5CHO give 1 C_6H_5COONa and 1 $C_6H_5CH_2OH$. **Answer: 2**

18. 2 C_6H_5CHO + NaOH (conc.) → C_6H_5COONa + $C_6H_5CH_2OH$

19. 1 → (d), 2 → (b), 3 → (c), 4 → (a). Each condition or change matches its name.