Reducing and Oxidising Aldehydes and Ketones

Reduction is easy for both aldehydes and ketones, but in oxidation the aldehyde reacts at once and the ketone resists. The reason is one H atom.

Name: Date: Score: ____ / 19

A. Fill in the blanks

1. $NaBH_4$ reduces an aldehyde to a ____ alcohol.

2. $NaBH_4$ reduces a ketone to a ____ alcohol.

3. Clemmensen reduction uses zinc amalgam and concentrated ____.

4. Wolff-Kishner reduction uses hydrazine and ____.

5. Oxidation of an aldehyde gives a ____ acid.

B. True or False

6. An aldehyde has an H on the carbonyl carbon. True / False

7. A ketone has an H on the carbonyl carbon. True / False

8. Ketones need strong conditions to oxidise. True / False

9. Oxidation of an aldehyde changes the number of carbons. True / False

C. Assertion and reason

10. Assertion (A): Aldehydes are easily oxidised.
Reason (R): They have an H on the carbonyl carbon.

(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): Ketones resist mild oxidants.
Reason (R): Oxidising them needs a C–C bond to break.

(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. Propanone with $NaBH_4$ gives:

(a) propan-1-ol
(b) propan-2-ol
(c) propane
(d) propanoic acid

Answer: _____

13. Ethanal on oxidation gives:

(a) ethanol
(b) ethane
(c) ethanoic acid
(d) methanol

Answer: _____

14. Propanone with Clemmensen reagents gives:

(a) propan-2-ol
(b) propane
(c) ethanoic acid
(d) propene

Answer: _____

15. Strong oxidation of a ketone gives:

(a) one alcohol
(b) an alkane
(c) a mixture of acids with fewer carbons
(d) no change

Answer: _____

E. Numerical problems

16. How many carbons has the acid from propanal?

17. How many reagent systems turn C=O into CH_2 in this topic?

F. Short answer questions

18. Why is an aldehyde oxidised more easily than a ketone?

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. $NaBH_4$	(a) carboxylic acid	1 → ____
2. Clemmensen	(b) alkane	2 → ____
3. Mild oxidant on aldehyde	(c) mixture of acids	3 → ____
4. Strong oxidant on ketone	(d) alcohol	4 → ____

Detailed solutions

1. primary

2. secondary

3. HCl

4. KOH

5. carboxylic

6. True. That is why it oxidises easily.

7. False. It has two carbon groups.

8. True. A C–C bond must break.

9. False. The acid has the same carbons.

10. (a) R explains A.

11. (a) R explains A.

12. (b) propan-2-ol. A secondary alcohol.

13. (c) ethanoic acid. Same two carbons.

14. (b) propane. C=O becomes CH_2.

15. (c) a mixture of acids with fewer carbons. A C–C bond breaks.

16. Same as the aldehyde. **Answer: 3**

17. Clemmensen and Wolff-Kishner. **Answer: 2**

18. It has an H on the carbonyl carbon, so the C–H bond oxidises; a ketone must break a C–C bond.

19. 1 → (d), 2 → (b), 3 → (a), 4 → (c). Each reagent matches its product.