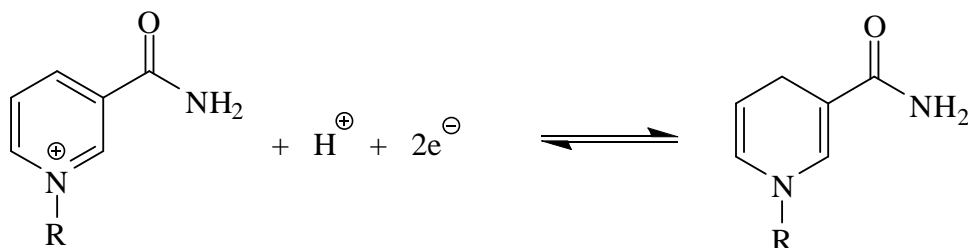


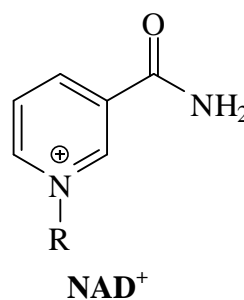
**Marks**  
**4**

- $\text{NAD}^+$  and  $\text{NADH}$  are coenzymes used by animals in oxidation and reduction reactions. They are related by the following half-reactions.

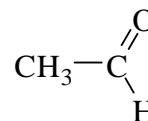


Which of these coenzymes is used in the biological oxidation of ethanol,  $\text{CH}_3\text{CH}_2\text{OH}$ ?

**An oxidizing agent is itself reduced. As shown in the equation, it is  $\text{NAD}^+$  which is reducible.**



What is the product of the biological oxidation of ethanol,  $\text{CH}_3\text{CH}_2\text{OH}$ ?



Which of  $\text{NAD}^+$  and  $\text{NADH}$  is aromatic? Give reasons for your answer.

**$\text{NAD}^+$  is aromatic. It is cyclic, planar, conjugated, and has  $4n+2 \pi$  electrons.  $\text{NADH}$  is not fully conjugated and is therefore not aromatic.**