# Spickzettel Quantencomputing

### Gates

| Name | Notation | Matrix |
|---|---|---|
| Pauli X |  | $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ |
| Pauli Y |  | $\begin{pmatrix} 0 & -\mathbf{i} \\ \mathbf{i} & 0 \end{pmatrix}$ |
| Pauli Z |  | $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ |
| Hadamard |  | $\frac{1}{\sqrt{2}}\begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$ |
| Phase |  | $\begin{pmatrix} 1 & 0 \\ 0 & e^{\mathbf{i}\frac{\pi}{2}} \end{pmatrix}$ |
| $\frac{\pi}{8}$ |  | $\begin{pmatrix} 1 & 0 \\ 0 & e^{\mathbf{i}\frac{\pi}{4}} \end{pmatrix}$ |
| X-Rotation |  | $\begin{pmatrix} \cos(\frac{\theta}{2}) & -\mathbf{i}\sin(\frac{\theta}{2}) \\ -\mathbf{i}\sin(\frac{\theta}{2}) & \cos(\frac{\theta}{2}) \end{pmatrix}$ |
| Y-Rotation |  | $\begin{pmatrix} \cos(\frac{\theta}{2}) & -\sin(\frac{\theta}{2}) \\ \sin(\frac{\theta}{2}) & \cos(\frac{\theta}{2}) \end{pmatrix}$ |
| Z-Rotation |  | $\begin{pmatrix} e^{\mathbf{i}\frac{-\theta}{2}} & 0 \\ 0 & e^{\mathbf{i}\frac{\theta}{2}} \end{pmatrix}$ $\begin{pmatrix} 1 & 0 \\ 0 & e^{\mathbf{i}\theta} \end{pmatrix}$ |
| CNOT |  | $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix}$ |
| CZ |  | $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix}$ |