QUANTUM STATES FOR SINGLE QUBIT SYSTEMS

Question 1

We define a state $|\psi>=\alpha|0>+\beta|1>$ to be a valid quantum state if $|\alpha|^2+|\beta|^2=1$. Which of the following equations describe a valid quantum state?

(a) Example: $|\psi>=\frac{1}{\sqrt{2}}|0>+\frac{1}{\sqrt{2}}|1>$

$$\alpha=\frac{1}{\sqrt{2}}, \beta=\frac{1}{\sqrt{2}}$$

$$\alpha^2+\beta^2=(\frac{1}{\sqrt{2}})^2+(\frac{1}{\sqrt{2}})^2=1$$

Since $\alpha^2+\beta^2=1$, $|\psi>=\frac{1}{\sqrt{2}}|0>+\frac{1}{\sqrt{2}}|1>$ is a valid quantum state.

(b) $|\psi>=\frac{1}{4}|0>+\frac{3}{4}|1>$

(c) $|\psi>=|0>+|1>$

(d) $|\psi>=\frac{5}{13}|0>+\frac{12}{13}|1>$

(e) $|\psi>=\frac{3}{5}|0>+\frac{4}{5}|1>$

(f) $|\psi>=|1>$

(g) $|\psi>=\frac{1}{4}|0>$

(h) $|\psi>=\frac{\sqrt{3}}{2}|0>+\frac{1}{2}|1>$

(i) $|\psi>=\frac{\sqrt{7}}{4}|0>+\frac{\sqrt{5}}{4}|1>$

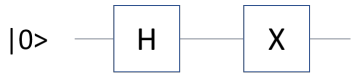
QUANTUM GATES AND MEASUREMENT

Question 2

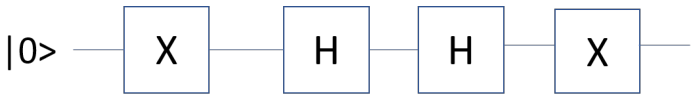
What is the resulting states for each of the circuits below?

(a)

(b)



(c)

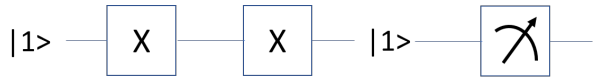


(d)

Question 3

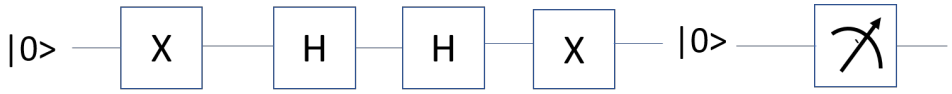
What can we expect on measurement?

(a)



(b)

(c)



(d)