(a) Start with

$$P_{ab}(t) = \int_a^b |\Psi|^2 \, dx = \int |\Psi|^2 \, dx \bigg|_{x=b} - \int |\Psi|^2 \, dx \bigg|_{x=a}$$

and

$$\frac{\partial}{\partial t}|\Psi|^2 = \frac{\partial}{\partial x}\left[\frac{i\hbar}{2m}\left(\Psi^* \frac{\partial \Psi}{\partial x} - \Psi \frac{\partial \Psi^*}{\partial x}\right)\right] = -\frac{\partial}{\partial x} J(x,t)$$

Hence

$$\frac{d}{dt} P_{ab}(t) = \int -\frac{\partial}{\partial x} J(x,t) \, dx \bigg|_{x=b} - \int -\frac{\partial}{\partial x} J(x,t) \, dx \bigg|_{x=a}$$

Noting that

$$\int -\frac{\partial}{\partial x} J(x,t) \, dx = -J(x,t)$$

we have

$$\frac{d}{dt} P_{ab}(t) = -J(x,t) \bigg|_{x=b} + J(x,t) \bigg|_{x=a} = J(a,t) - J(b,t)$$

The units of $J(x,t)$ are hertz (inverse seconds) because $P_{ab}(t)$ is dimensionless. The time derivative of a dimensionless quantity is hertz.

Noting that $\int |\Psi|^2 \, dx$ is dimensionless, the units of $|\Psi|^2$ must be inverse meters to cancel with dx.

$$\Psi \Psi^* \propto \frac{1}{\text{meter}}$$

Taking the position derivative divides by meter.

$$\Psi \frac{\partial \Psi *}{\partial x} \propto \frac{1}{\text{meter}^2}$$

Hence

$$\frac{i\hbar}{2m}\left(\Psi \frac{\partial \Psi *}{\partial x} - \Psi^* \frac{\partial \Psi}{\partial x}\right) \propto \frac{\text{joule second}}{\text{kilogram meter}^2} = \frac{1}{\text{second}} = \text{hertz}$$

(b) FIXME