$$\int_0^{\pi} \sin^4 t \cos^2 t \, dt$$

$$= \int_0^{\pi} (\sin^2 t)^2 \left(\frac{1+\cos 2t}{2}\right) dt$$

$$= \int_0^{\pi} \left(\frac{1-\cos 2t}{2}\right)^2 \left(\frac{1+\cos 2t}{2}\right) dt$$

$$= \frac{1}{8} \int_0^{\pi} (1-\cos 2t)(1-\cos^2 2t) \, dt$$

$$= \frac{1}{8} \int_0^{\pi} (1-\cos 2t - \cos^2 2t + \cos^3 2t) \, dt$$

$$= \frac{1}{8} \int_0^{\pi} \left(1-\cos 2t - \frac{1+\cos 4t}{2} + \cos^3 2t\right) dt$$

$$= \frac{1}{8} \int_0^{\pi} \left(\frac{1}{2} - \cos 2t - \frac{1}{2}\cos 4t + \cos^2 2t \cdot \cos 2t\right) dt$$

$$= \frac{1}{8} \left[\int_0^{\pi} \frac{1}{2} dt - \int_0^{\pi} \cos 2t \, dt - \frac{1}{2}\int_0^{\pi} \cos 4t \, dt + \int_0^{\pi} (1-\sin^2 2t) \cos 2t \, dt \right.$$

$$= \frac{1}{8} \left[\frac{\pi}{2} + \frac{1}{2} \int_0^{\pi} (1-\sin^2 2t) \cos 2t \, d(2t) \right.$$

$$= \frac{1}{8} \left[\frac{\pi}{2} + \frac{1}{2} \int_0^{\pi} (1-\sin^2 2t) \, d(\sin 2t) \right]$$

$$= \frac{1}{8} \cdot \left[\frac{\pi}{2} + \frac{1}{2} \left(\sin 2t \Big|_0^{\pi} - \frac{1}{3} (\sin 2t)^3 \Big|_0^{\pi} \right) \right] \rightarrow$$

or use substitution $u = \sin 2t \Rightarrow \int_0^0 (1-u^2) du = 0$

$$= \frac{1}{8}\left(\frac{\pi}{2} + 0\right) = \frac{\pi}{16}$$

Yeah!