(1) Let $A$ be a strictly $\mathbb{A}^1$-invariant sheaf of abelian groups on $\mathrm{Sm}_k$, viewed as an object of $\mathcal{SH}^{S^1}(k)^\heartsuit$. Show that $\Omega_{\mathbb{G}_m}(A) \in \mathcal{SH}^{S^1}(k)$ corresponds to the sheaf $A_{-1}$ (with $A_{-1}(X)$ defined as a summand of $A(X \times \mathbb{G}_m)$).

(2) Let $X \in \mathcal{S}\mathrm{pc}(k)_*$. Show that $\Sigma^\infty X \in \mathcal{SH}(k)_{\geq 0}$.

(3) Show that the homotopy $t$-structure on $\mathcal{SH}(k)$ is left complete, i.e., every object is the limit of its Postnikov tower. Define a dual notion of right completeness and show that $\mathcal{SH}(k)$ is also right complete.

(4*) Write $\mathcal{SH}(k)^{\mathrm{eff}} \subset \mathcal{SH}(k)$ for the subcategory generated under colimits by the image of $\mathcal{SH}^{S^1}(k) \to \mathcal{SH}(k)$. Construct a $t$-structure on $\mathcal{SH}(k)^{\mathrm{eff}}$ such that $\omega^\infty : \mathcal{SH}(k)^{\mathrm{eff}} \to \mathcal{SH}^{S^1}(k)$ is $t$-exact.

(5) Verify that $\mathrm{Span}(\mathrm{Fin})_\bullet$ is a complete Segal space.

(4) Verify that the canonical functor $\mathrm{Fin} \to \mathrm{Span}(\mathrm{Fin})$ preserves finite coproducts.

(5) Let $\mathcal{C}$ be a symmetric monoidal $\infty$-category and $A \in \mathrm{CAlg}(\mathcal{C})$. Show that the multiplication $m : A \otimes A \to A$ is associative and unital up to homotopy.

(6) Let $\mathcal{C}$ be a symmetric monoidal $\infty$-category. Show that the tensor product on $\mathcal{C}$ satisfies the pentagon axiom. (I.e., given $X, Y, Z, W \in \mathcal{C}$, the two evident equivalences $X \otimes (Y \otimes (Z \otimes W)) \simeq ((X \otimes Y) \otimes Z) \otimes W$ are homotopic.)

(7) Verify that the localizations $\mathcal{P}(\mathrm{Sm}_S) \to \mathcal{S}\mathrm{pc}(S)$ and $\mathcal{P}(\mathrm{Sm}_S)_* \to \mathcal{S}\mathrm{pc}(S)_*$ are symmetric monoidal.

(8) Let $\mathcal{C}$ be a presentably symmetric monoidal $\infty$-category, $X \in \mathcal{C}$ and $W \subset Ar(\mathcal{C})$ a strongly saturated class of morphisms corresponding to a symmetric monoidal localization. Show that $(L_W\mathcal{C})[(L_W X)^{-1}] \simeq L_{W[X^{-1}]}(\mathcal{C}[X^{-1}])$, for a class of morphisms $W[X^{-1}]$ that you should describe.