

**Exercise 1.** The language contains only a symbol for a binary relation  $e$ . The theory  $T$  says that  $e$  is an equivalence relation and that there are (exactly)  $n$  classes containing  $n$  elements for each  $n \in \omega \setminus \{0\}$ .

Most of the following questions have a short answer.

1. Prove that every saturated model of  $T$  contains a class with infinitely many elements.
2. Prove every model countable model containing  $n$  classes with  $n$  elements for each  $n \in \omega \setminus \{0\}$  and infinitely many infinite classes is saturated.
3. Is the previous claim true for uncountable models?
4. Prove that the theory  $T$  has quantifier elimination.
5. Is  $T$  countably categorical?
6. Is  $T$  is complete?
7. Is  $T$  categorical is some uncountable cardinal?
8. What is  $\text{acl}(\emptyset)$ ?
9. Let  $\mathcal{U} \models T$  be saturated. Let  $e(a, \mathcal{U})$  be finite. What is  $\text{dcl}\{a\}$ ?
10. Let  $e(b, \mathcal{U})$  be infinite. What is  $\text{acl}\{b\}$ ?
11. If  $b$  is like above. What is the orbit of  $b$  under  $\text{Aut}(\mathcal{U})$ ?
12. Is  $T$  strongly minimal?