Consider the following German words:

- [bux] Buch ‘book’
- [mik] mich ‘me’
- [koxan] kochen ‘to cook’
- [bux] Bach ‘brook’
- [mecan] Mädchen ‘girl’
- [lax] Loch ‘hole’
- [laxan] lachen ‘laugh’
- [flu:xt] flucht ‘flight’
- [Jtorc] Storch ‘stork’
- [furct] Furcht ‘fear’
- [brox] Bruch ‘break’

- [kuxan] Kuchen ‘cake’
- [milx] Milch ‘milk’
- [fe:tor] Fächer ‘fan’
- [naxt] Nacht ‘night’
- [uxt] acht ‘eight’
- [hox] hoch ‘high’
- [Jpre:can] sprechen ‘speak’
- [elx] Elch ‘elk’
- [byg:tr] Bücher ‘books’
- [man:çmal] manchmal ‘sometimes’

Notes:

- Assume I have provided all relevant data.
- The data are slightly simplified.
- [a] ≠ [a], use the IPA chart to properly interpret all the symbols.
- Recall that phonology is concerned with sounds of language; spelling is irrelevant.

Answer the following phonology questions:

1. Are [ç] and [x] allophones of the same phoneme? Why?

2. If yes, write a rule realizing that phoneme. If there are alternative formulations, write the simplest one. First, express the rule in words, then use the formalism we used in class.