Kinematics Homework

1) Consider the reaction

$$^4He + {}^{40}Ca \rightarrow {}^3H + {}^{41}Sc$$
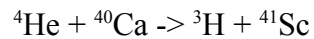
Find the minimum laboratory kinetic energy for the ^4He projectile if ^{40}Ca is stationary.

You must use the mass tables. Give your answer in MeV.

2) An experimenter bombards a target of ^{54}Cr with alpha particles such as

$$^4He + {}^{54}Cr \rightarrow p + {}^{57}Mn$$
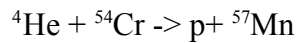
Suppose the incoming alpha particle has 26MeV kinetic energy in the lab, the Chromium nucleus is stationary and protons are detected at 30 degrees.

a) What is the kinetic energy of the detected proton?,
b) What is the angle of emission of ^{57}Mn and its kinetic energy?,

You must use the mass tables. Give your answer in MeV.