

Name: \_\_\_\_\_

ID #: \_\_\_\_\_

**Physics 222 - Spring 2019**  
**★ Homework ★**  
**Chapter 18**

1) 18.2

2) 18.3

3) 18.5

4) A particle (A) collides with a stationary particle (B), resulting in the production of three particles, A, B, and C.

a) Calculate the minimum energy,  $\mathcal{E}_{min}$ , for this reaction in terms of the masses of A, B, and C.

b) Suppose A = B = proton (rest energy = 938 MeV) and C = a neutral pion,  $\pi^0$  (rest energy = 135 MeV), what is  $\mathcal{E}_{min}$  for the proton in this case.