A cannon, located 100m from the base of a vertical 30m cliff, shoots a 10kg shell at a velocity of 55m/s. Assume that air resistance is negligible.

a) For what range of angles above the horizontal can the cannon ball be fired and land on the top of the cliff (i.e. the horizontal ground above cliff not the vertical face of the cliff)?

b) If the cannon is fired at an angle that allows it to land on top of the cliff as calculated in part (a), what is the cannon ball’s speed the instant before it strikes the cliff? If the cannon ball strikes the top of the cliff, explain how this final velocity (i.e. the instant before impact) of the cannon ball depends on the angle at which the cannon is fired.