1 The first atomic bomb explosion was during the Trinity Test in 1945. Based on a series of photographs of the explosion, along with a size scale and time stamps, British physicist Sir Geoffrey Ingram Taylor was able to estimate the power released by the explosion.

The radius R of the fireball at time t after the explosion was found to be related to the energy E that was released and the density ρ of the surrounding medium as follows:

$$R = E^{0.2} \rho^{-0.2} t^{Z}$$

where Z is a constant.

(a) Show that the value of Z is 0.4.

Z = ... [2]

(b) Given that the radius R is (80 ± 2) m at time t being (0.006 ± 0.001) s with density of air being (1.2 ± 0.1) kg m^{-3}, determine the energy E released by the bomb with its associated uncertainty.

$E \pm \Delta E$ = ... J [3]

(c) Of all the data collected, state and explain which measurement you would improve to increase the precision of your answer in **(b)**.

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[2]

[Total: 7]