1   An experiment to determine the acceleration of free fall g is conducted by projecting a stone with speed u at an angle θ to the horizontal. The horizontal distance R travelled by the stone when it returns to the level of projection is measured. Air resistance is negligible.

(a)   In determining the speed of the stone, a student defines speed as "distance travelled per second".

Explain why this definition is incorrect.

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…….[2]

(b)   By expressing the time of flight of the stone T in terms of g, u and θ, show that R is given   by the expression

$$R = \frac{2u^2 \sin\theta \cos\theta}{g}$$

(c) The expression in **(b)** can be written as

$$R = \frac{u^2 \sin 2\theta}{g}$$

The experiment is conducted to obtain the maximum range R_0.

State the value of θ to obtain R_0.

$\theta =$ .... ° [1]

(d) The values of u and R_0 are 45.36 km h^{-1} and 16.3 m, with percentage uncertainties of 3%
and 4% respectively.

Calculate the value of g and present the answer together with its uncertainty.

$g =$ .... ± .... m s^{-2} [4]

[Total: 10]