Question 39 **(16 marks)**

A student wanted to investigate how changing temperature would influence how rapidly oxalic acid solution would decolourise an acidified potassium permanganate solution.

The student was provided with the following chemicals and equipment:

- 0.1 mol L^{-1} acidified potassium permanganate solution
- 0.1 mol L^{-1} oxalic acid solution
- 250 mL conical flasks
- Bunsen burner
- tripod and gauze mat
- thermometer
- stop watches
- 5.00 mL, 10.00 mL, 20.00 mL and 25.00 mL pipettes
- distilled water
- 25.0 mL measuring cylinders.

(a) State a hypothesis for this investigation. (2 marks)

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(b) Identify the independent and dependent variables. (2 marks)

Independent variable: _____

Dependent variable: _____

(c) Identify **two** control variables. (2 marks)

One: _____

Two: _____

(d) Describe a procedure for this investigation. (6 marks)

(e) Outline the difference between systematic and random errors. Use an example of each from this investigation to support your answer. (4 marks)