Section A – Multiple Choice

Question	Answer
1	A
2	C
3	C
4	B
5	C
6	C
7	D
8	A
9	D
10	B

Section B – Extended Answers

Marks

Question 11 (4 marks)

(a)   The volume is directly proportional to the temperature.   **2**

1 mark for qualitative relationship
2 marks for quantitative relationship

(b)   The concentration of the gas   **2**
The pressure of the gas

1 mark for each variable identified

Question 12 (5 marks)

(a)   Independent: length of pendulum   **1**
        Dependant: period of pendulum

        1 mark for correct identification of both variables

(b)   Take five measurements, rather than one, for the period of the pendulum at each length.   **2**

        2 marks for outlining a modification that improves reliability.
        1 mark for outlining a modification that would improve the method but not necessarily improve
        its reliability.

(c)   Outline one change you would make to the method to improve the VALIDITY of the experiment. **2**

        Measure the period over five oscillations of the pendulum rather than two.

        2 marks for outlining a modification that improves validity.
        1 mark for outlining a modification that would improve the method but not necessarily improve
        its validity.

Question 13 (5 marks)

(a)   **2**
$$m = \frac{182 \times 10^{-9} - 0}{50}$$
$$= 3.64 \times 10^{-9}$$

        1 mark for using correct values from graph
        1 mark for correct calculation

(b) CV^{-1} **1**

        1 mark for correct units

(c)   The relationship between Q and V for this arrangement is given by the expression   **2**

$$\varepsilon_0 = \frac{Qd}{VA}$$
$$= \frac{Q}{V} \times \frac{d}{A}$$
$$= m \times \frac{d}{A}$$
$$= \frac{(3.64 \times 10^{-9}) \times (0.5 \times 10^{-3})}{0.2}$$
$$= 9.1 \times 10^{-12} \ C \ V^{-1} \ m^{-1}$$

        1 mark for deducing relationship between gradient and other variables
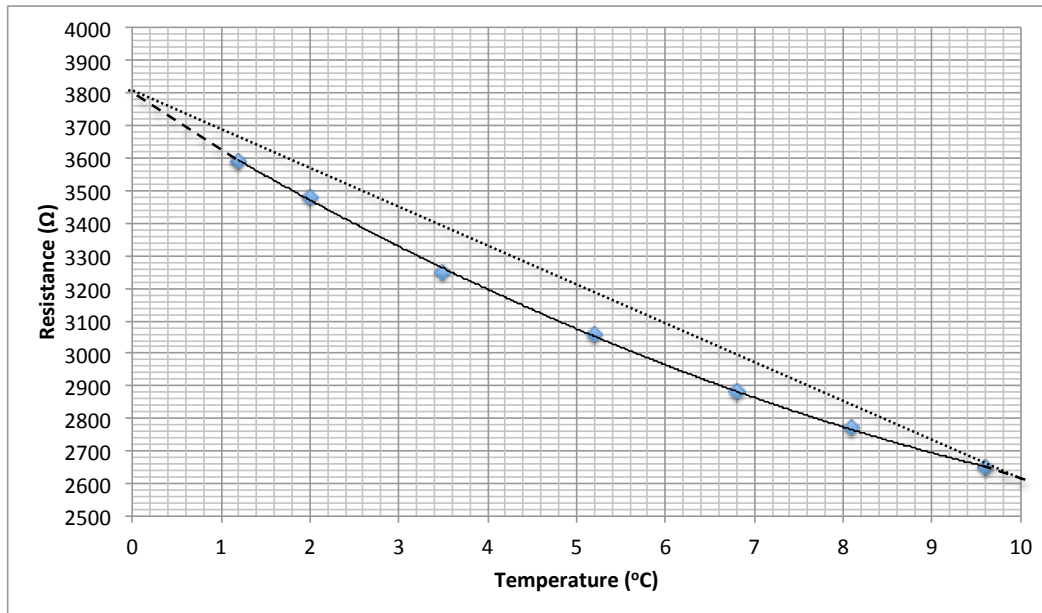   *1 mark for correct substitution and answer*
        Less 1 mark for not changing 0.5 mm into m

Question 14 (11 marks)

(a)   **5**

1 mark for correct scale on each axis
1 mark for labelling each axis correctly, including units
1 mark for plotting the independent variable on the x-axis
1 mark for plotting points correctly
1 mark for drawing smooth curve through the points from 0°C to 10°C

(b)   Use your graph to determine the resistance at 0°C and 10°C.   **2**

$R_{0°C} = 3880 \ \Omega$
$R_{10°C} = 2630 \ \Omega$

1 mark for each correct y-intercept

(c)   *1 mark for straight line drawn correctly on graph*   **1**

(d) $T_{3060\Omega} = 6.2 \ °C$ **1**

1 mark for correct interpolation

(e)   **2**

$$\% \ \text{error} = \frac{6.2 - 5.2}{5.2} \times 100$$
$$= 19\%$$

1 mark for identifying different correctly
1 mark for correct calculation