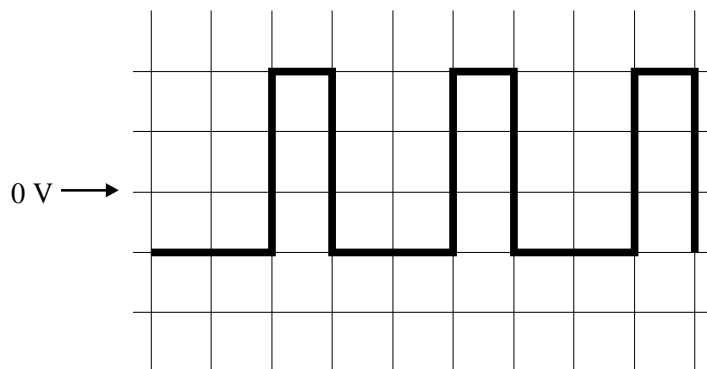


Oscilloscope questions – A Level Standard

1. The diagram shows a trace on the screen of an oscilloscope. The Y-sensitivity of the oscilloscope is set at 5.0 V per division and the time base is set at 0.50 ms per division.



- (a) For the trace, determine

- (i) the maximum positive value of potential difference,

.....

- (ii) the maximum negative value of potential difference,

.....

- (iii) the frequency of the signal.

.....

(4)

- (b) The trace shows the variation in the potential difference across a  $100\Omega$  resistor. Calculate the energy dissipated in the resistor

- (i) for the first 1.00 ms,

.....

.....

- (ii) between 1.00 ms and 1.50 ms,

.....

.....

- (iii) in one cycle,

.....

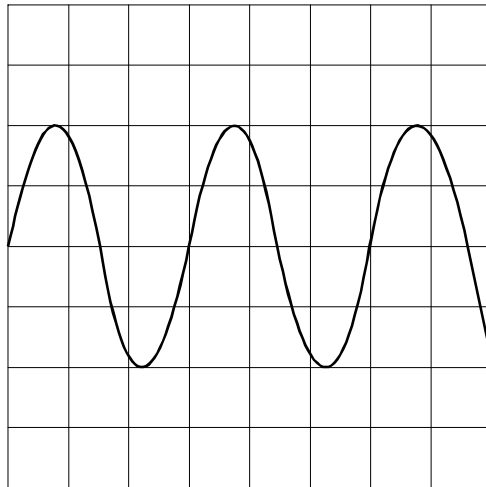
- (iv) in one second.

.....

(5)  
(Total 9 marks)

Oscilloscope questions – A Level Standard

2. An alternating current (a.c.) source is connected to a resistor to form a complete circuit. The trace obtained on an oscilloscope connected across the resistor is shown.



The oscilloscope settings are: Y sensitivity 4.0V per division,  
time base 1.0 ms per division.

- (i) Determine the peak voltage of the a.c. source.

.....  
.....

- (ii) Hence calculate the r.m.s. voltage.

.....  
.....

- (iii) Determine the time period of the a.c. signal.

.....  
.....

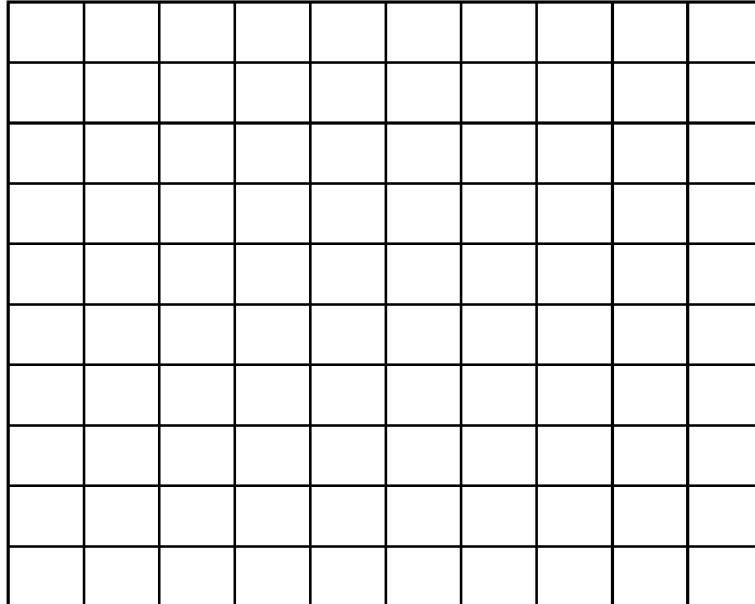
- (iv) Hence calculate the frequency of the a.c. signal.

.....  
.....

(4)  
(Total 4 marks)

Oscilloscope questions – A Level Standard

3. A cathode ray oscilloscope is used to study the waveform of a sinusoidal alternating voltage of frequency 100 Hz and peak voltage 2.0 V. If the time base is set to  $2.0 \text{ ms div}^{-1}$  and the voltage sensitivity is  $0.5 \text{ V div}^{-1}$ , draw, in the grid below, the trace you would expect to see on the screen.



(Total 4 marks)

4. (a) The circuit shown in **Figure 1** may be used to determine the internal resistance of a battery. An oscilloscope is connected across the battery as shown. **Figure 2** represents the screen of the oscilloscope.

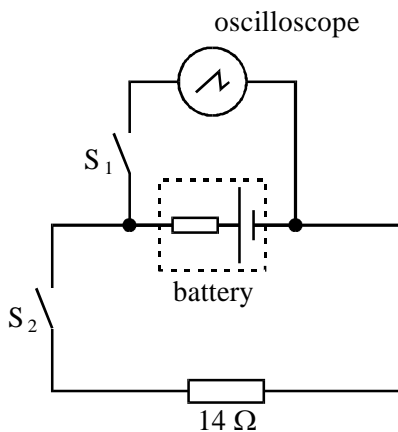


Figure 1

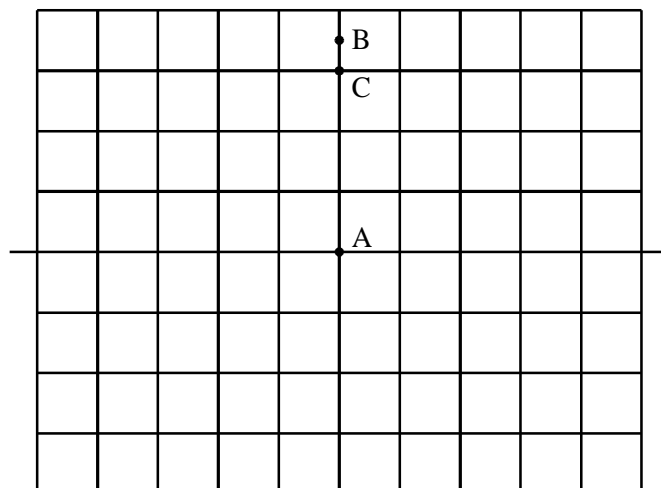


Figure 2

Oscilloscope questions – A Level Standard

The time base of the oscilloscope is switched off throughout the experiment. Initially the switches  $S_1$  and  $S_2$  are both open. Under these conditions the spot on the oscilloscope screen is at A.

- (i) Switch  $S_1$  is now closed, with  $S_2$  remaining open. The spot moves to B. State what the deflection AB represents.

.....

- (ii) Switch  $S_1$  is kept closed and  $S_2$  is also closed. The spot moves to C. State what the deflection AC represents.

.....

- (iii) The vertical sensitivity of the oscilloscope is  $0.50 \text{ V div}^{-1}$ . Calculate the current through the  $14 \Omega$  resistor with both switches closed.

.....

.....

.....

- (iv) Hence, calculate the internal resistance of the battery.

.....

.....

.....

**(6)**

- (b) The oscilloscope is now connected to an alternating voltage source of rms value  $3.5 \text{ V}$ .

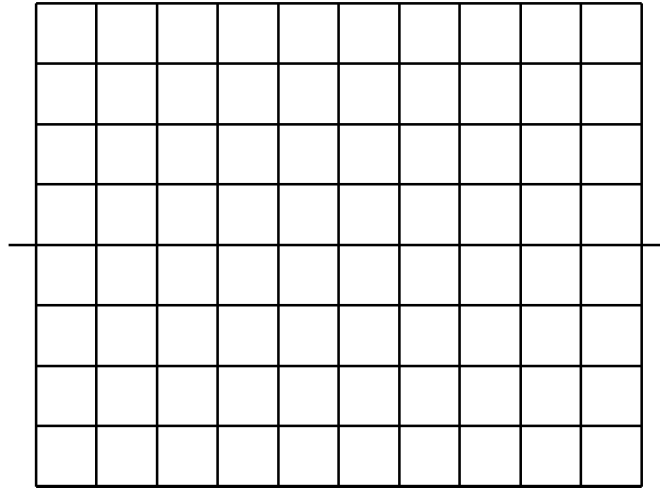
- (i) Calculate the peak value of the alternating voltage.

.....

.....

Oscilloscope questions – A Level Standard

- (ii) Draw on **Figure 3** what you would expect to see on the oscilloscope screen, if the time base is still switched off and the voltage sensitivity is altered to  $2.0 \text{ V div}^{-1}$ .

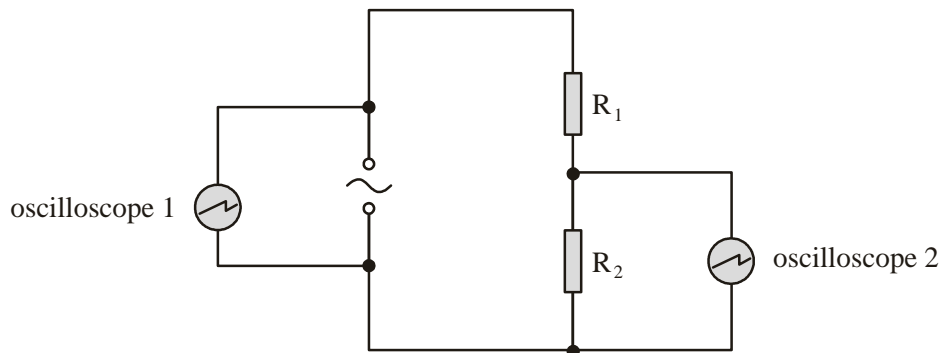


**Figure 3**

(3)  
(Total 9 marks)

5. The circuit in **Figure 1** shows a sinusoidal ac source connected to two resistors,  $R_1$  and  $R_2$ , which form a potential divider. Oscilloscope 1 is connected across the source and oscilloscope 2 is connected across  $R_2$ .

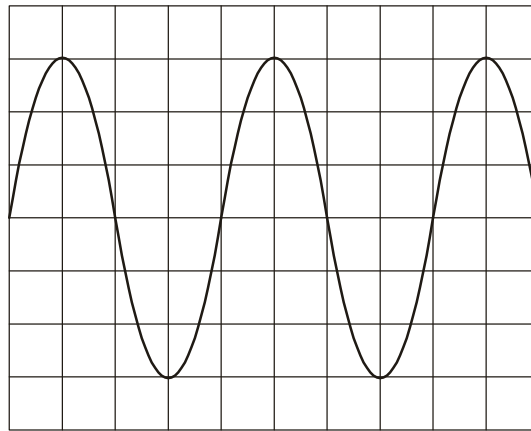
**Figure 1**



Oscilloscope questions – A Level Standard

- (a) **Figure 2** shows the trace obtained on the screen of oscilloscope 1. The time base of the oscilloscope is set at 10 m s per division and the voltage sensitivity at 15 V per division.

**Figure 2**



For the ac source, calculate

- (i) the frequency,

.....  
 .....

- (ii) the rms voltage.

.....  
 .....  
 .....

**(4)**

- (b) The resistors have the following values:  $R_1 = 450 \Omega$  and  $R_2 = 90 \Omega$ . Calculate

- (i) the rms current in the circuit,

.....

- (ii) the rms voltage across  $R_2$ .

.....

**(2)**

Oscilloscope questions – A Level Standard

- (c) Oscilloscope 2 is used to check the calculated value of the voltage across  $R_2$ . The screen of oscilloscope 2 is identical to that of oscilloscope 1 and both are set to the same time base. Oscilloscope 2 has the following range for voltage sensitivity: 1 V per div., 5 V per div., 10 V per div. and 15 V per div.

State which voltage sensitivity would give the most suitable trace. Explain the reasons for your choice.

.....

.....

.....

.....

.....

(3)  
(Total 9 marks)