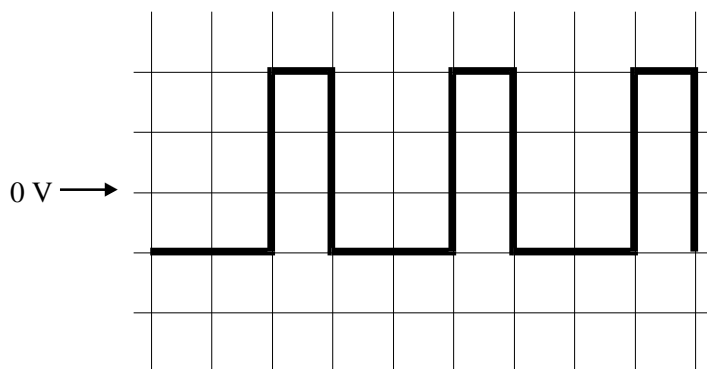


Oscilloscope questions - AS Level Standard - 42 marks Total

Q1. 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 100Ω 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.

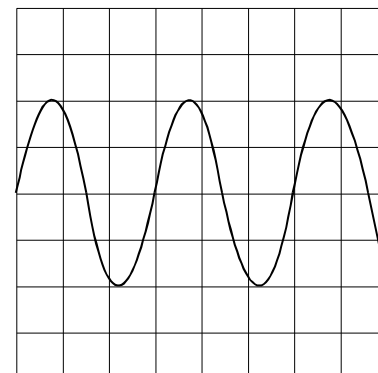
(5)

(Total 9 marks)

Q2. 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.

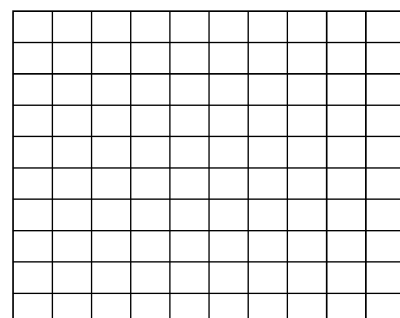
- (i) Determine the peak voltage of the a.c. source.
- (ii) Hence calculate the r.m.s. voltage.
- (iii) Determine the time period of the a.c. signal.
- (iv) Hence calculate the frequency of the a.c. signal.



(4)

(Total 4 marks)

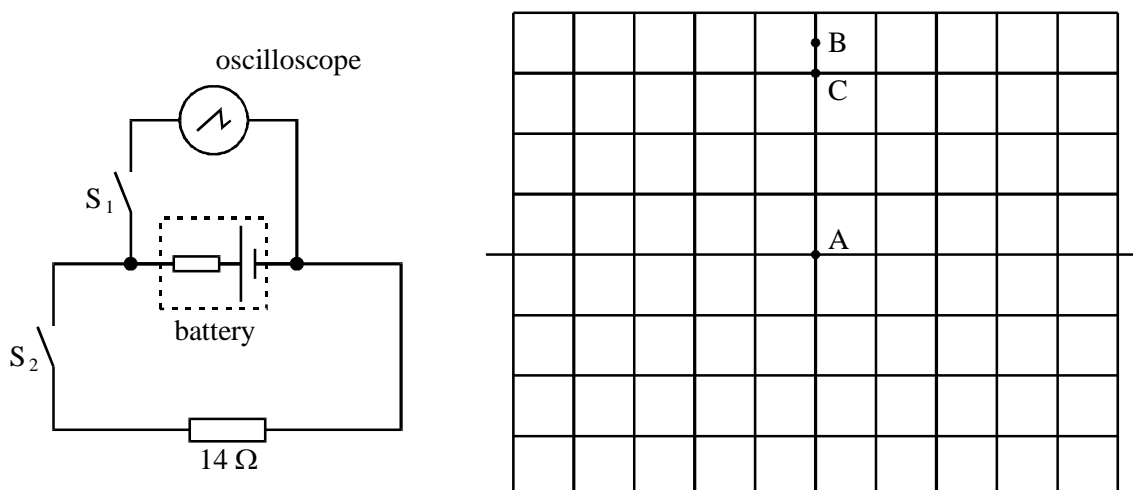
Q3. A cathode ray oscilloscope is used to study the waveform of a sinusoidal alternating voltage of frequency 100 Hz and peak voltage 2.0 V. If the time base is set to 2.0 ms div^{-1} and the voltage sensitivity is 0.5 V div^{-1} , draw, in a copy of the grid on the right, the trace you would expect to see on the screen.



(Total 4 marks)

Oscilloscope questions - AS Level Standard - 42 marks Total

- Q4. (a) The circuit shown below may be used to determine the internal resistance of a battery. An oscilloscope is connected across the battery as shown. The grid represents the screen of the oscilloscope.



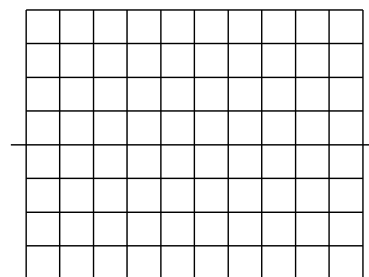
The time base of the oscilloscope is switched off throughout the experiment. Initially the switches S₁ and S₂ are both open. Under these conditions the spot on the oscilloscope screen is at A.

- Switch S₁ is now closed, with S₂ remaining open. The spot moves to B. State what the deflection AB represents.
- Switch S₁ is kept closed and S₂ is also closed. The spot moves to C. State what the deflection AC represents.
- The vertical sensitivity of the oscilloscope is 0.50 V div^{-1} . Calculate the current through the 14Ω resistor with both switches closed.
- 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 V.

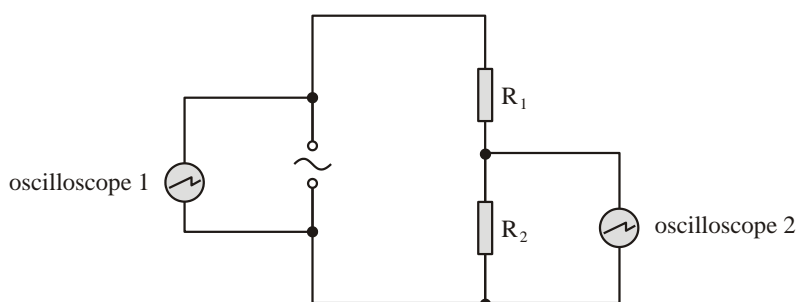
- Calculate the peak value of the alternating voltage.
- Draw on a grid like that on the right what you would expect to see on the oscilloscope screen, if the time base is still switched off and the voltage sensitivity is altered to 2.0 V div^{-1} .



(3)

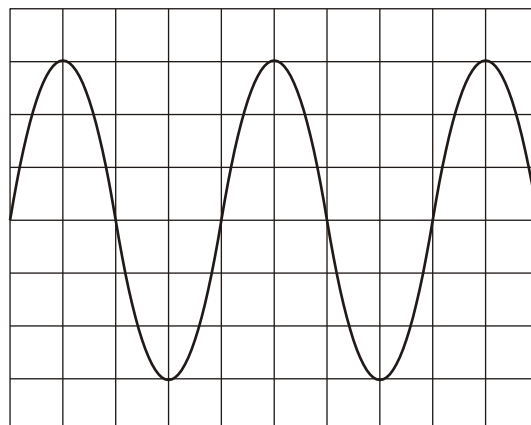
(Total 9 marks)

- Q5. The circuit on the right shows a sinusoidal ac source connected to two resistors, R₁ and R₂, which form a potential divider. Oscilloscope 1 is connected across the source and oscilloscope 2 is connected across R₂.



Oscilloscope questions - AS Level Standard - 42 marks Total

- (a) The grid on the right shows the trace obtained on the screen of oscilloscope 1. The time base of the oscilloscope is set at 10 ms per division and the voltage sensitivity at 15 V per division.



(4)

For the ac source, calculate

- (i) the frequency,
- (ii) the RMS voltage.

- (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)

- (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.

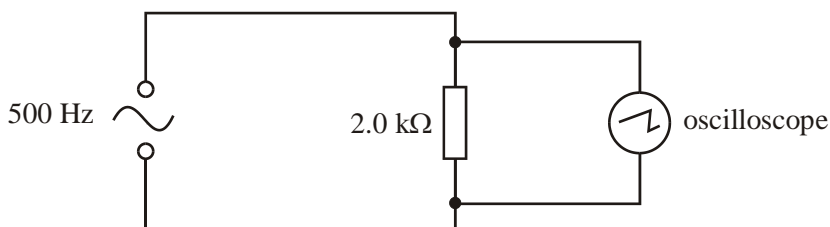
(3)

(Total 9 marks)

- Q6. A sinusoidal alternating voltage source of frequency 500 Hz is connected to a resistor of resistance $2.0 \text{ k}\Omega$ and an oscilloscope, as shown in on the right.

- (a) The RMS current through the resistor is 5.3 mA. Calculate the peak voltage across the resistor.

(2)

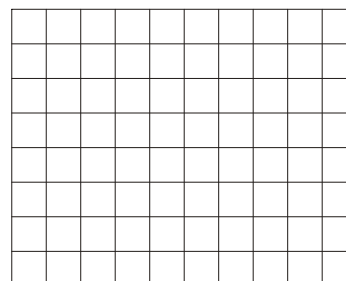


- (b) The settings on the oscilloscope are:

timebase: $250 \mu\text{s}$ per division,

voltage sensitivity: 5.0 V per division.

Draw on a grid like the one on the right, which represents the screen of the oscilloscope, the trace that would be seen.



(4)

(Total 6 marks)