# Exercise 11 – AC, Current , Voltage, Power and Resistance

Past Paper Homework Exercise

1. The potential difference between two points is

   A   the work done in moving one electron between the two points

   B   the voltage between the two points when there is a current of one ampere

   C   the work done in moving one coulomb of charge between the two points

   D   the kinetic energy gained by an electron as it moves between the two points

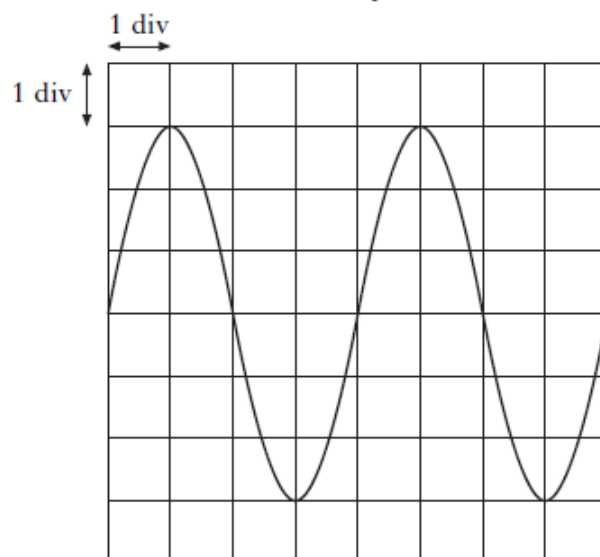   E   the work done in moving any charge between the two points.

2. In the diagrams below, each resistor has a resistance of $1 \cdot 0$ ohm.

   Select the combination which has the **least** value of effective resistance between the terminals X and Y.
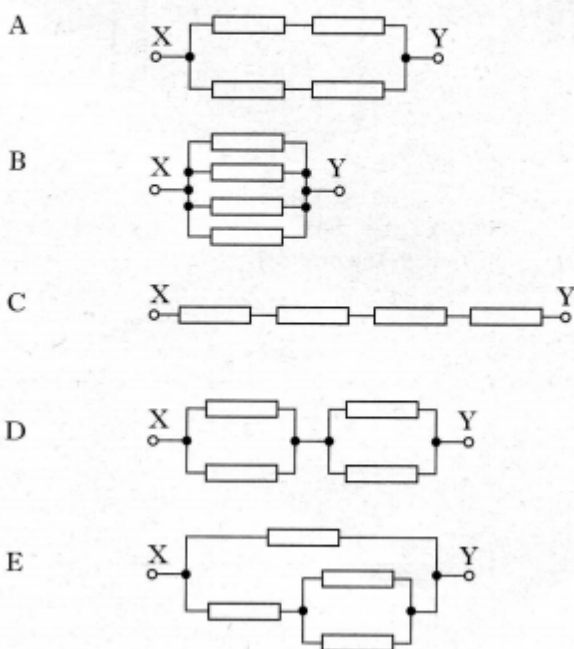
3. A signal from a power supply is displayed on an oscilloscope.

   The trace on the oscilloscope is shown.

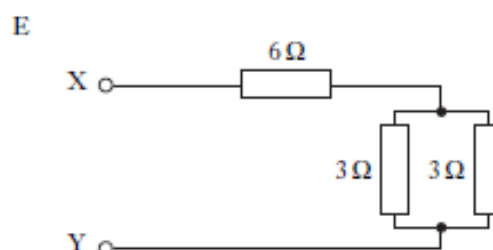   The time-base is set at $0 \cdot 01$ s/div and the Y-gain is set at $4 \cdot 0$ V/div.
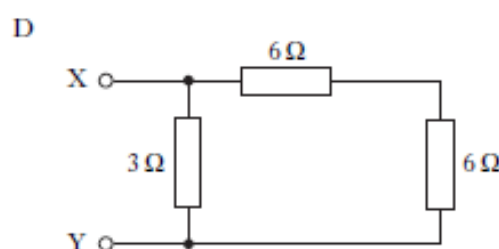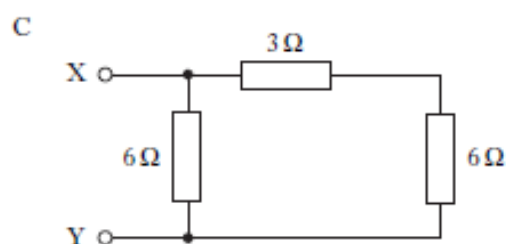
   Which row in the table shows the r.m.s. voltage and the frequency of the signal?

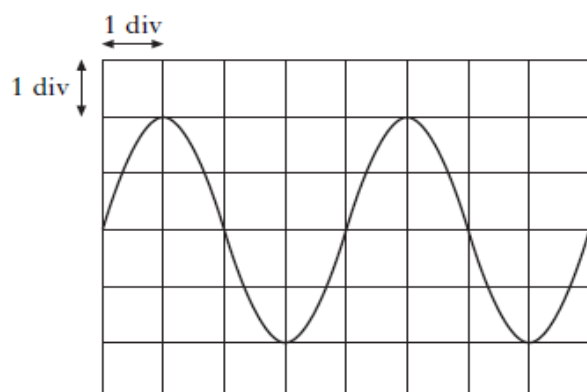 | | r.m.s. voltage/V | frequency/Hz |
   |---|---|---|
   | A | 8·5 | 25 |
   | B | 12 | 25 |
   | C | 24 | 25 |
   | D | 8·5 | 50 |
   | E | 12 | 50 |

4. One volt is equivalent to one

    A   farad per coulomb

    B   ampere per ohm

    C   joule per ampere

    D   joule per ohm

    E   joule per coulomb.

**5.** The diagram shows the trace on an oscilloscope when an alternating voltage is applied to its input.

The timebase is set at 5 ms/div and the Y-gain is set at 10 V/div.

Which row in the table gives the peak voltage and the frequency of the signal?

	Peak voltage/V	Frequency/Hz
A	7·1	20
B	14	50
C	20	20
D	20	50
E	40	50

6. Which of the following combinations of resistors has the greatest resistance between X and Y?

7. The output of a 50 Hz a.c. supply is connected to the input of an oscilloscope. The trace produced on the screen of the oscilloscope is shown.

1 div

1 div
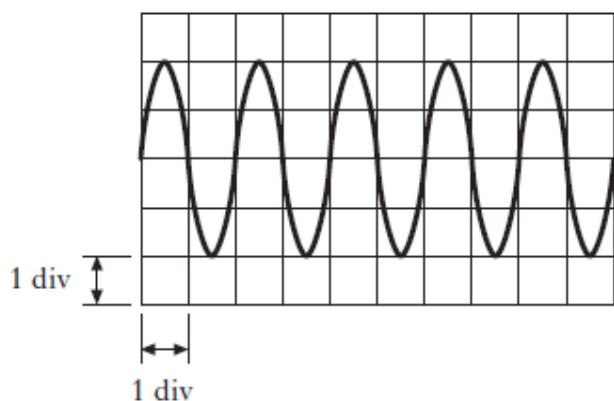
The time-base control of the oscilloscope is set at
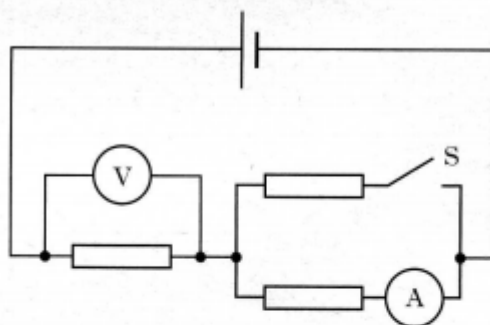
A   1 ms/div

B   10 ms/div

C   20 ms/div

D   100 ms/div

E   200 ms/div.

8. In the following circuit the current from the battery is 3 A.
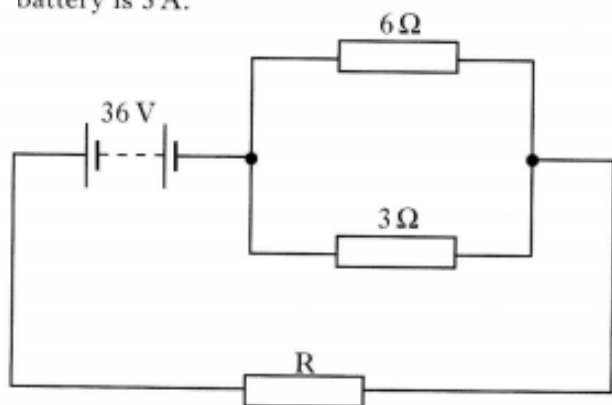
Assuming that the battery has negligible internal resistance, the resistance of resistor R is

A   3 Ω

B   4 Ω

C   10 Ω

D   12 Ω

E   18 Ω.

9. In the following circuit, the supply has negligible internal resistance.
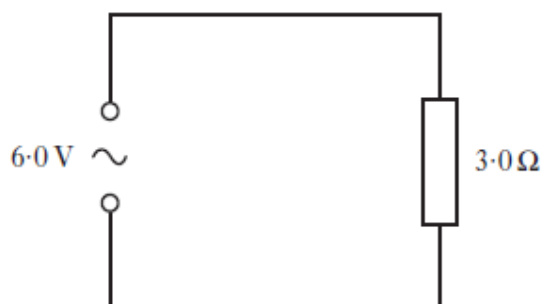

Switch S is now closed.

Which row in the table shows the effect on the ammeter and voltmeter readings?

	Ammeter reading	Voltmeter reading
A	increases	increases
B	increases	decreases
C	decreases	decreases
D	decreases	increases
E	decreases	remains the same

**10.** An a.c. supply with an output voltage of 6·0 V r.m.s. is connected to a 3·0 Ω resistor.

Which row in the table shows the peak voltage across the resistor and the peak current in the circuit?

|	Peak voltage/V	Peak current/A
A	$6\sqrt{2}$	$2\sqrt{2}$
B	$6\sqrt{2}$	2
C	6	2
D	$\dfrac{6}{\sqrt{2}}$	$\dfrac{2}{\sqrt{2}}$
E	6	$2\sqrt{2}$

11. A double beam oscilloscope has two inputs which allows two signals to be viewed on the screen at the same time.

A double beam oscilloscope is connected to the input terminals **P** and **Q** and the output terminals **R** and **S** of a box containing an operational amplifier circuit.

The operational amplifier is operating in the inverting mode.
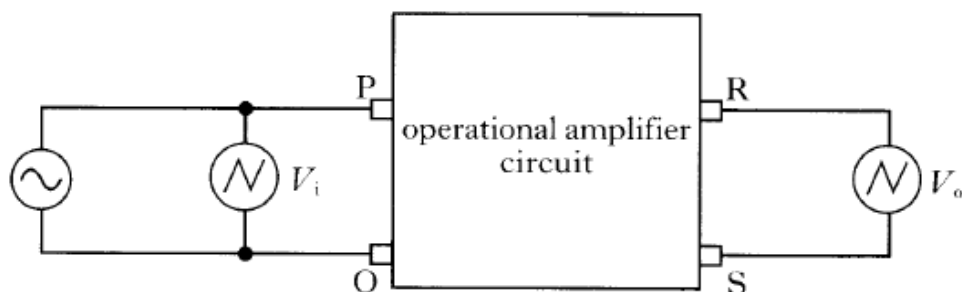
(a) The oscilloscope control settings and the two traces displayed on its screen are shown in the diagram.
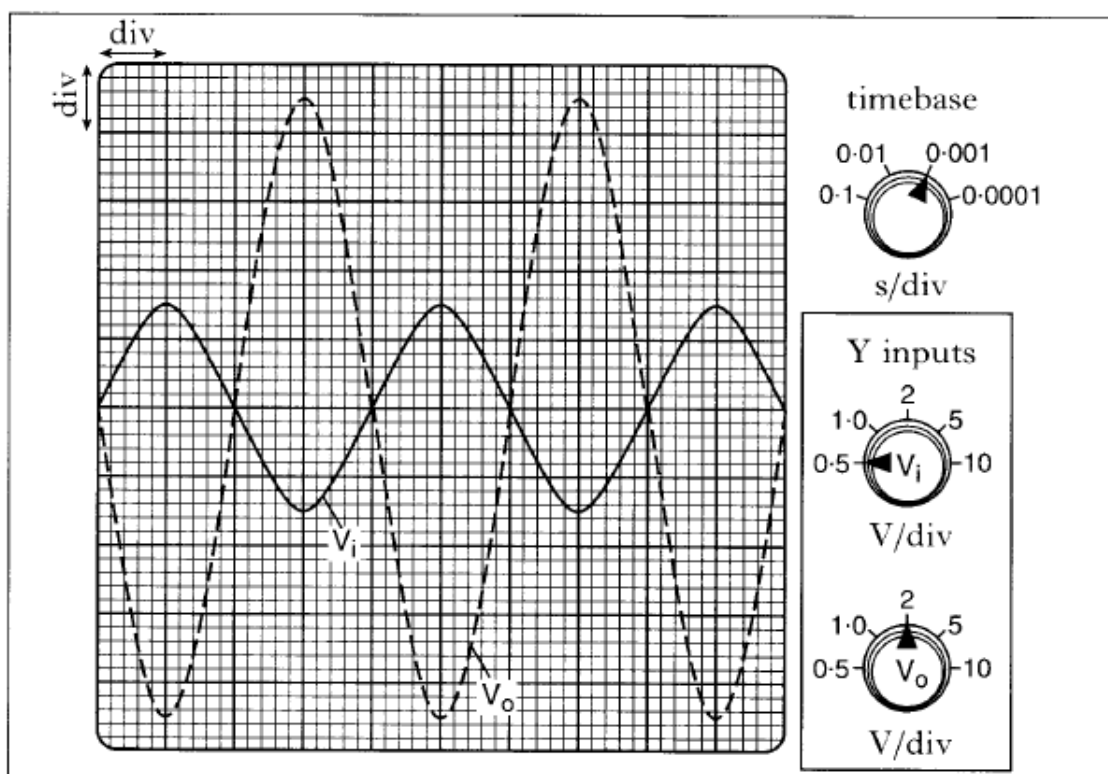
(i) Calculate the frequency of the a.c. supply. 3

(ii) Calculate the r.m.s. value of the output voltage of the amplifier circuit. 4

12. A circuit is set up as shown below. The amplitude of the output voltage of the a.c. supply is kept constant.
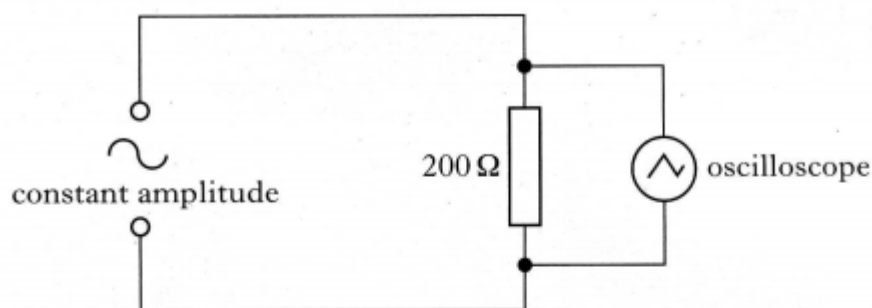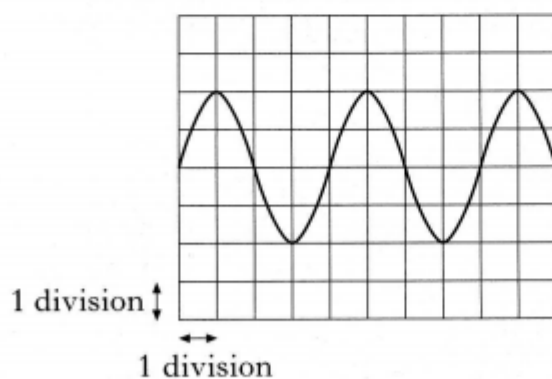

The settings of the controls on the oscilloscope are as follows:

y-gain setting   = 5 V/division
time-base setting = 2·5 ms/division

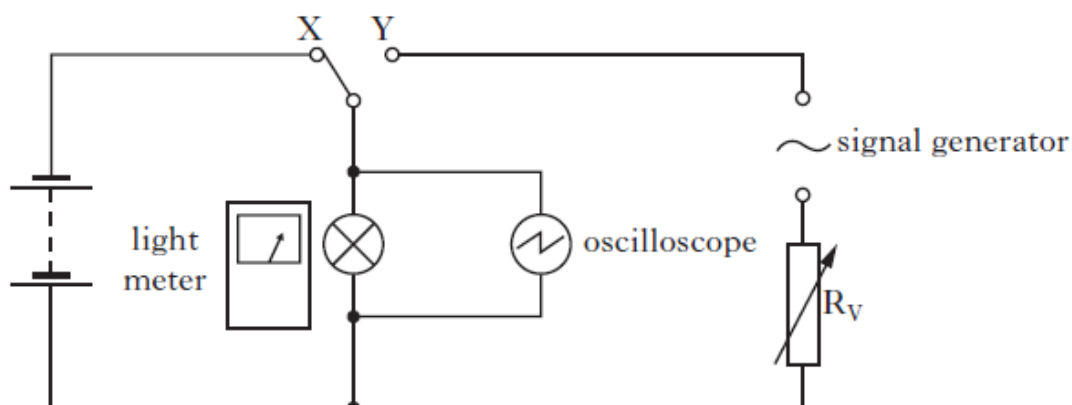The following trace is displayed on the oscilloscope screen.

1 division ↕

1 division

(a)   (i)   Calculate the frequency of the output from the a.c. supply.   3

      (ii)   Calculate the **r.m.s. current** in the $200\,\Omega$ resistor.   5

13. The circuit shown is used to compare the voltage from a battery and the voltage produced by a signal generator.

The switch is connected to X and the voltage across the lamp is 2·30 V. The reading on the light meter is recorded.

The switch is now connected to Y. The resistance of R_V is adjusted until the light meter reading is the same as before. The trace on the oscilloscope screen is shown.
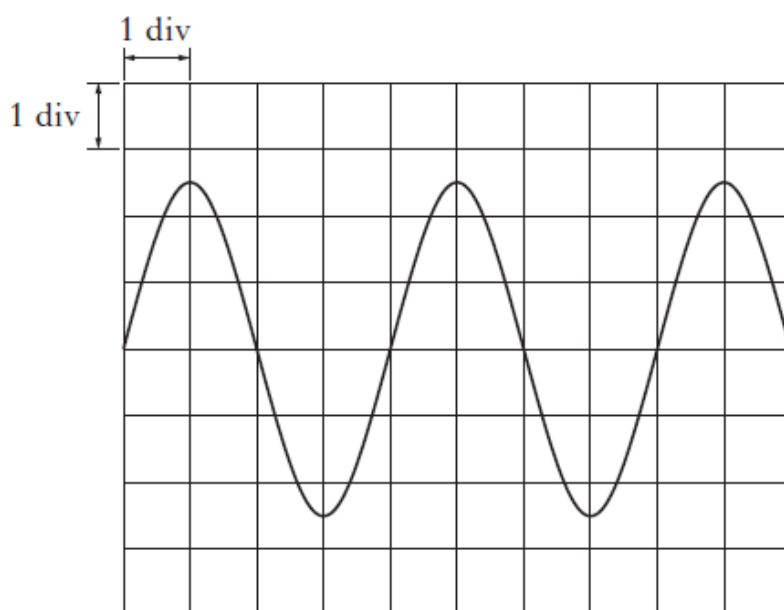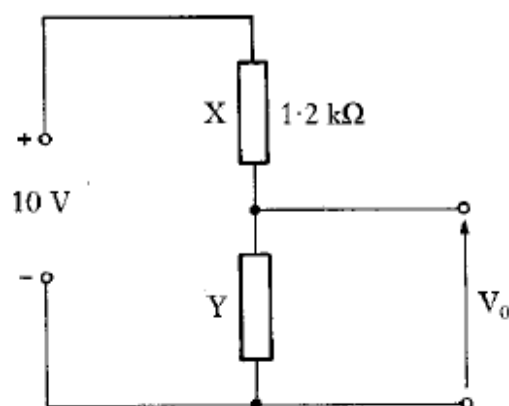

(a) The timebase setting is 0·01 s/div.

   Calculate the frequency of the output voltage of the signal generator.   3

(b) Calculate the peak value of the voltage displayed on the oscilloscope.   3
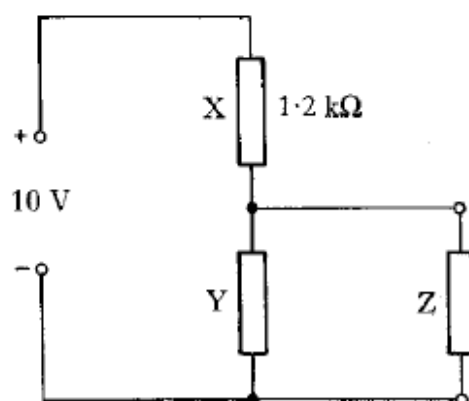
14. (a) A potential divider is used to provide an output voltage V_0 from a 10 V supply as shown below. The supply has negligible internal resistance.

(i) The resistance of resistor X is 1·2 kΩ and the output voltage required is 6·0 V.   3

Calculate the resistance of resistor Y.

(ii) A load resistor Z is now connected across the output as shown below.

Explain why the voltage across Z is less than 6·0 V.   2

(iii) Calculate the voltage across resistor Z when its resistance is 4·7 kΩ.   4

40 marks