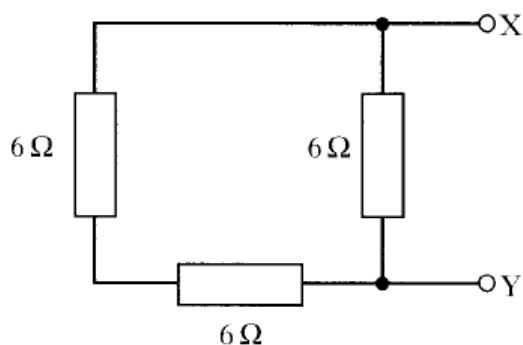


## Exercise 11 – AC, Current , Voltage, Power and Resistance

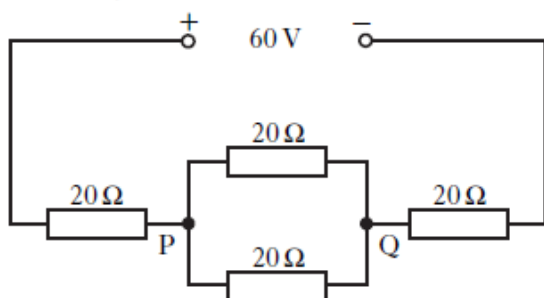
### Past Paper Homework Exercise

1. Three resistors are connected as shown.



The total resistance between X and Y is

- A  $2\ \Omega$
  - B  $4\ \Omega$
  - C  $6\ \Omega$
  - D  $9\ \Omega$
  - E  $18\ \Omega$ .
2. Four resistors, each of resistance  $20\ \Omega$ , are connected to a  $60\ \text{V}$  supply of negligible internal resistance, as shown.

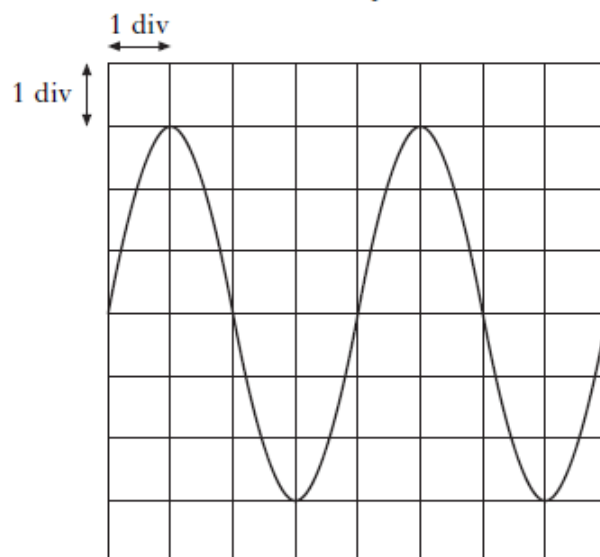


The potential difference across PQ is

- A  $12\ \text{V}$
- B  $15\ \text{V}$
- C  $20\ \text{V}$
- D  $24\ \text{V}$
- E  $30\ \text{V}$ .

3. A signal from a power supply is displayed on an oscilloscope.

The trace on the oscilloscope is shown.

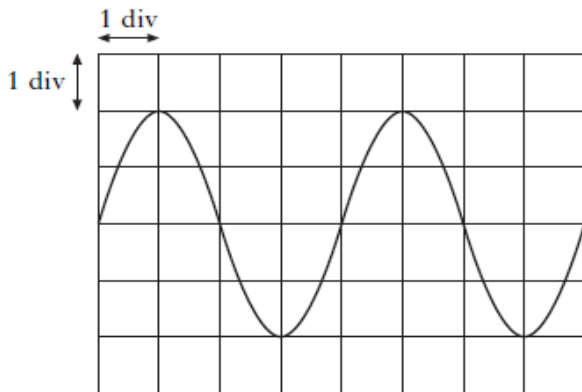


The time-base is set at  $0.01\ \text{s/div}$  and the Y-gain is set at  $4.0\ \text{V/div}$ .

Which row in the table shows the r.m.s. voltage and the frequency of the signal?

	<i>r.m.s. voltage/V</i>	<i>frequency/Hz</i>
A	8.5	25
B	12	25
C	24	25
D	8.5	50
E	12	50

4. 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.

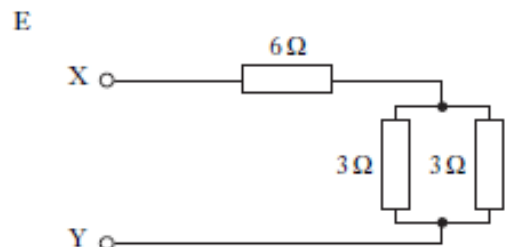
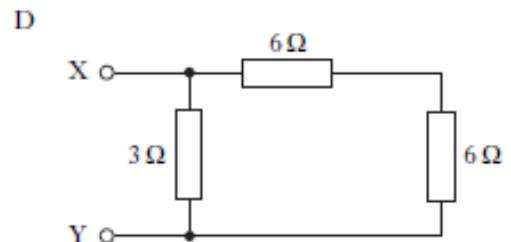
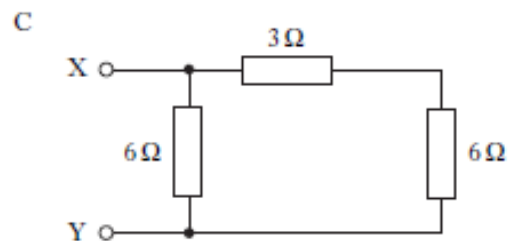
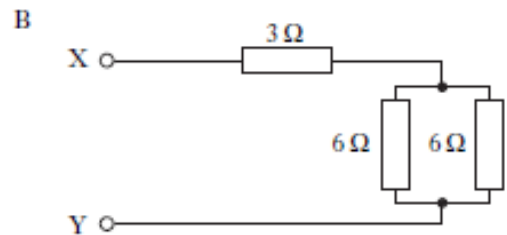
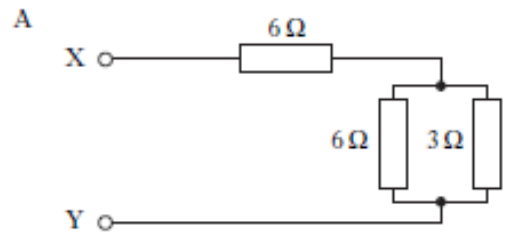
Which row in the table gives the peak voltage and the frequency of the signal?

	Peak voltage/V	Frequency/Hz
A	7.1	20
B	14	50
C	20	20
D	20	50
E	40	50

5. 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.

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



7. 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.

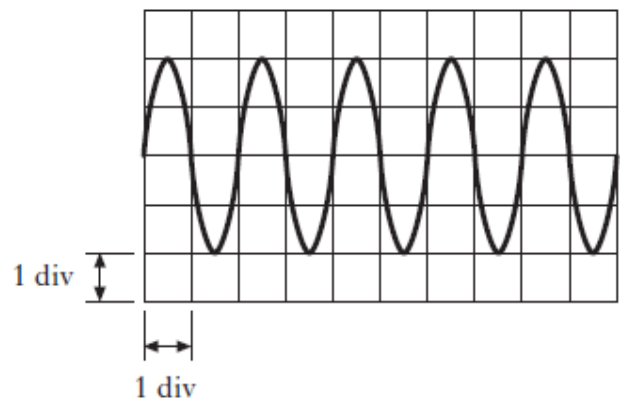
8. An a.c. supply with an output voltage of  $6.0\text{ V}$  r.m.s. is connected to a  $3.0\ \Omega$  resistor.



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	$\frac{6}{\sqrt{2}}$	$\frac{2}{\sqrt{2}}$
E	6	$2\sqrt{2}$

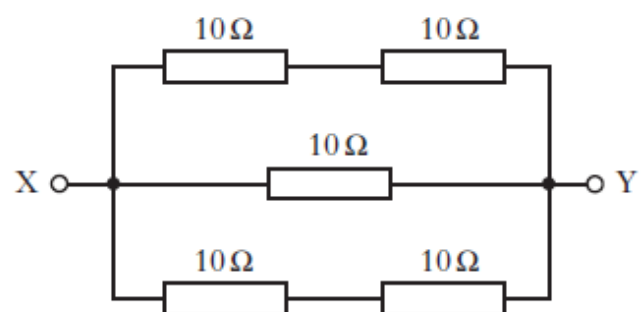
9. The output of a  $50\text{ Hz}$  a.c. supply is connected to the input of an oscilloscope. The trace produced on the screen of the oscilloscope is shown.



The time-base control of the oscilloscope is set at

- A  $1\text{ ms/div}$
- B  $10\text{ ms/div}$
- C  $20\text{ ms/div}$
- D  $100\text{ ms/div}$
- E  $200\text{ ms/div}$ .

10. The diagram shows part of an electrical circuit.

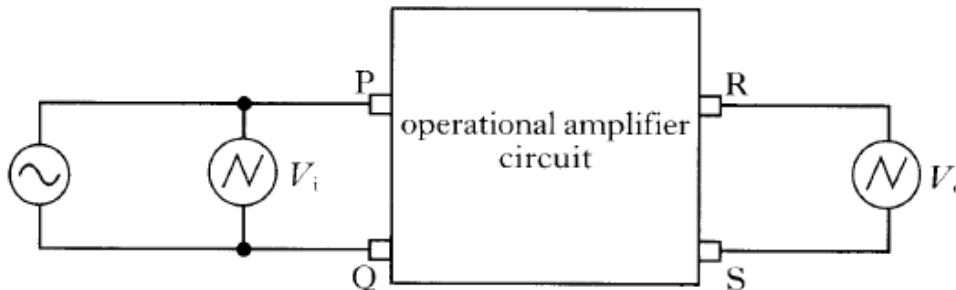


What is the resistance between X and Y?

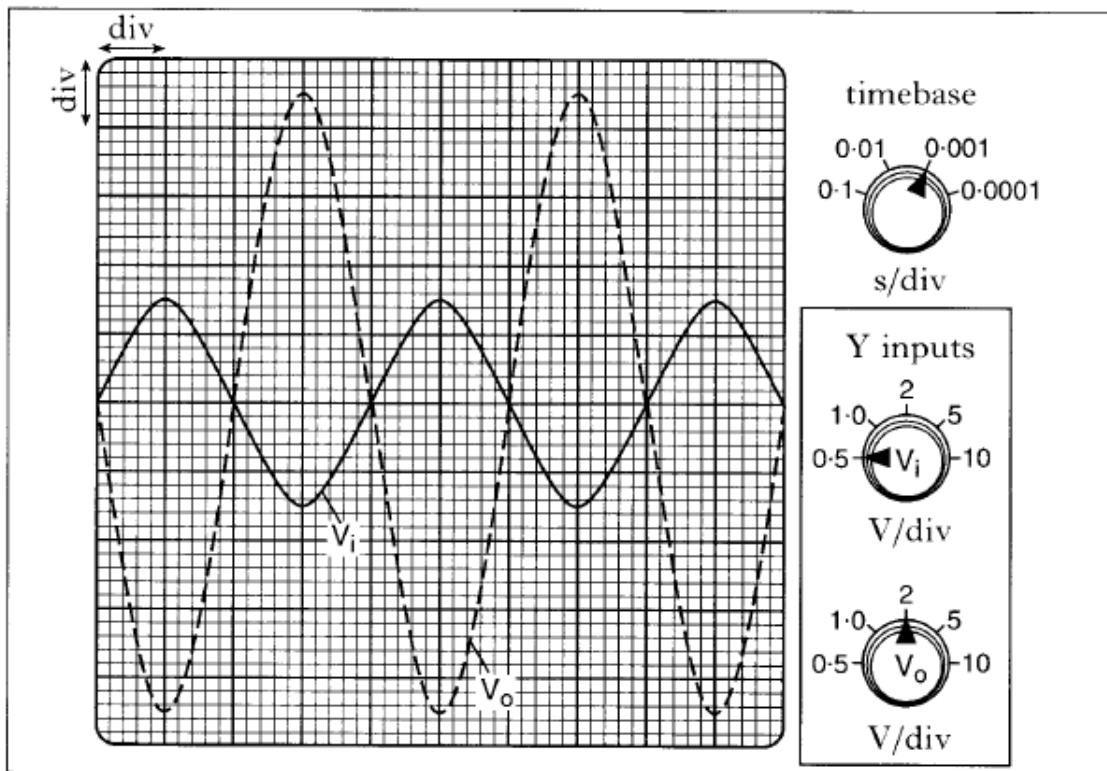
- A  $0.2\ \Omega$
- B  $5\ \Omega$
- C  $10\ \Omega$
- D  $20\ \Omega$
- E  $50\ \Omega$

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.

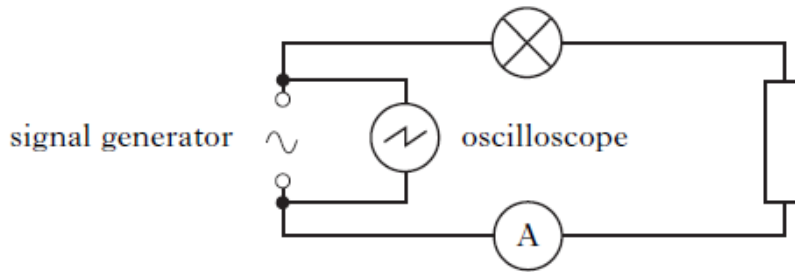


(a) The oscilloscope control settings and the two traces displayed on its screen are shown in the diagram.

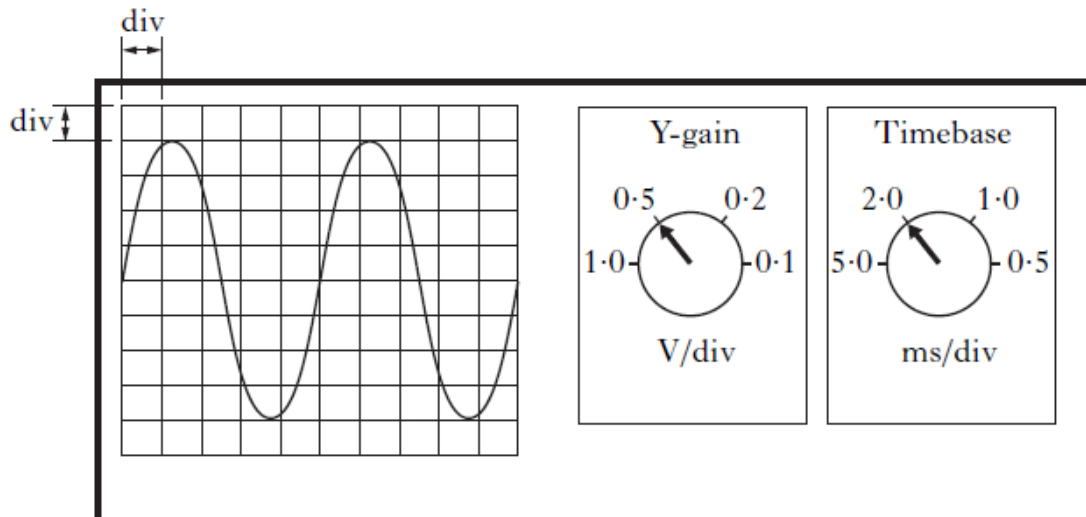


- (i) Calculate the frequency of the a.c. supply. 2
- (ii) Calculate the voltage gain of the amplifier circuit. 2
- (iii) Calculate the r.m.s. value of the output voltage of the amplifier circuit. 2

12. A signal generator is connected to a lamp, a resistor and an ammeter in series. An oscilloscope is connected across the output terminals of the signal generator.

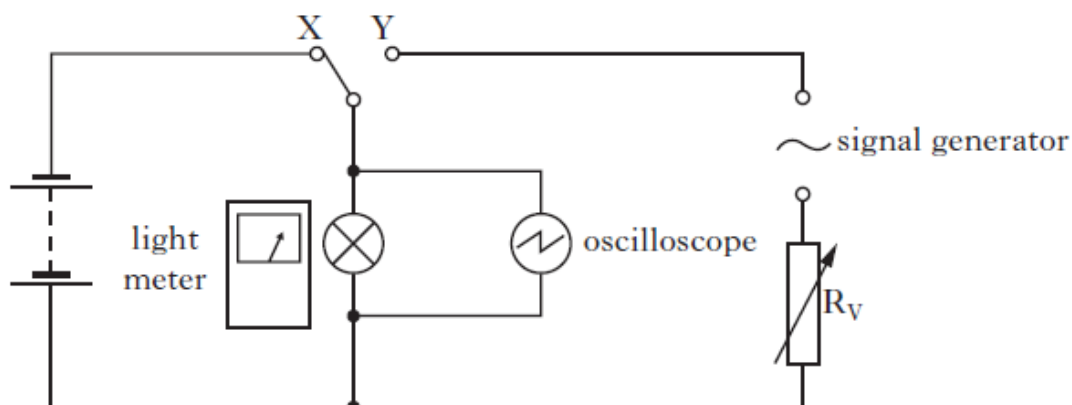


The oscilloscope control settings and the trace displayed on its screen are shown.



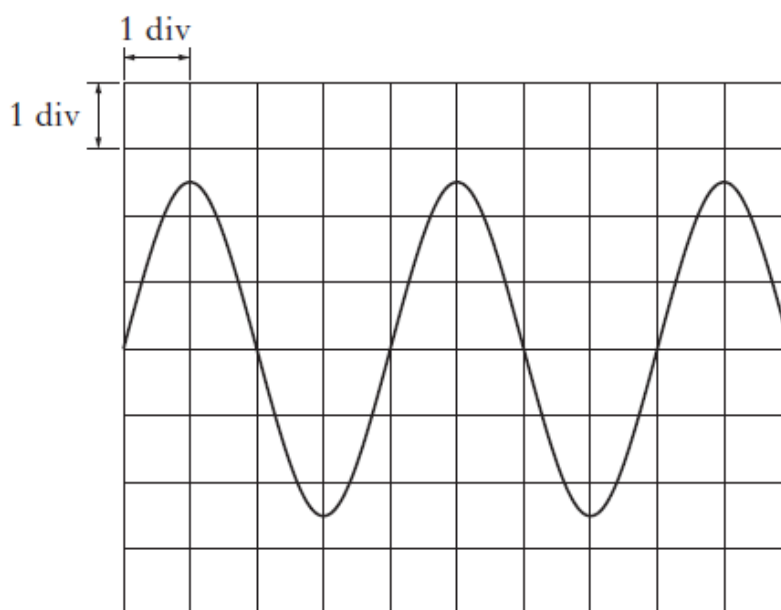
- (a) For this signal calculate:
- the peak voltage;
  - the frequency.

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



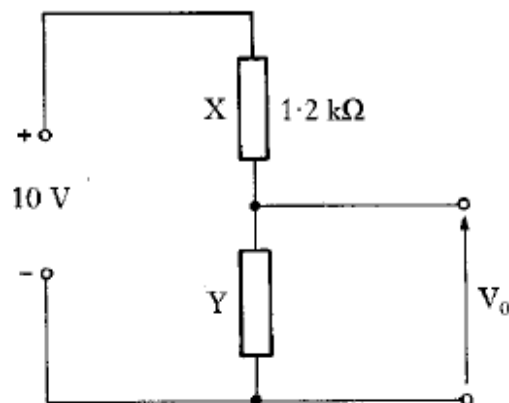
The switch is connected to X and the voltage across the lamp is 2.30 V. The reading on the light meter is recorded.

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.

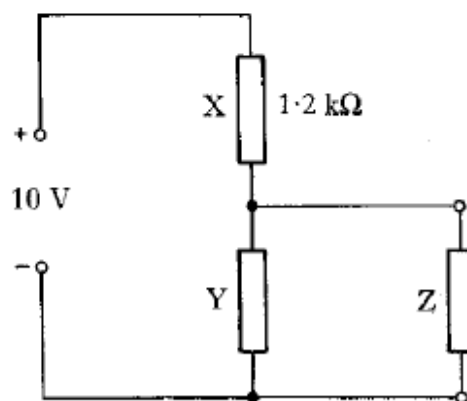


- (a) The timebase setting is 0.01 s/div.  
 Calculate the frequency of the output voltage of the signal generator. 2
- (b) Calculate the peak value of the voltage displayed on the oscilloscope. 2

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  $1.2 \text{ k}\Omega$  and the output voltage required is  $6.0 \text{ V}$ .  
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  $6.0 \text{ V}$ .

- (iii) Calculate the voltage across resistor Z when its resistance is  $4.7 \text{ k}\Omega$ .

6

30 marks