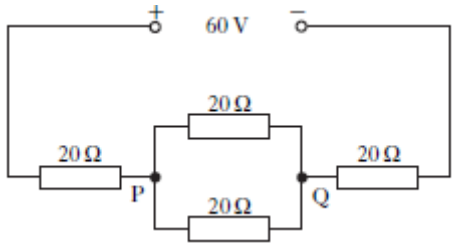
Higher Homework One – Part A

1. Four resistors, each of resistance 20Ω, are connected to a 60V supply as shown.



a) Calculate the total resistance of the circuit.

(4)

b) Calculate the current drawn from the supply.

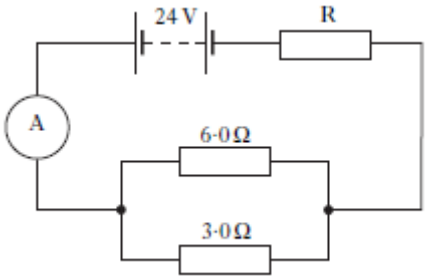
(3)

c) Calculate the p.d. between P and Q.

(3)

Higher Homework One - Part B

1. The following circuit is set up.



The reading on the ammeter is 2.0A

a) Calculate the total resistance of the parallel section of the circuit.

(3)

b) Calculate the p.d. across the parallel section of the circuit.

(3)

c) State the p.d. across the resistor R.

(1)

d) Calculate the resistance of R.

(3)

Higher Homework Two

1. If an electric fire uses 0.6MJ of energy in a time of 5minutes, calculate the power output of the fire.

(3)

2. If a filament lamp of power rating 60W is used for 2hrs30minutes, how much electrical energy will have been supplied?

(3)

3. A toaster connected to the mains supply draws a current of 5A. Calculate the power of the toaster.

(3)

4. A 240Ω resistor is connected to a power output of 0.6W. How much current will flow through the resistor?

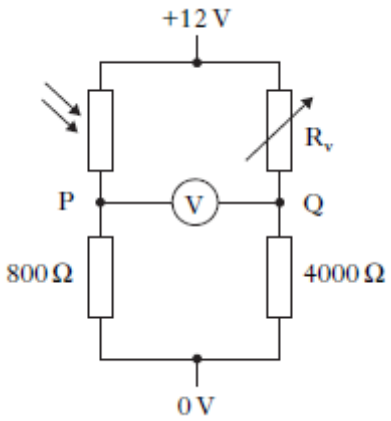
(3)

5. A 4kΩ resistor is connected to a power output of 40W. What is the potential difference across the resistor?

(3)

Higher Homework Three

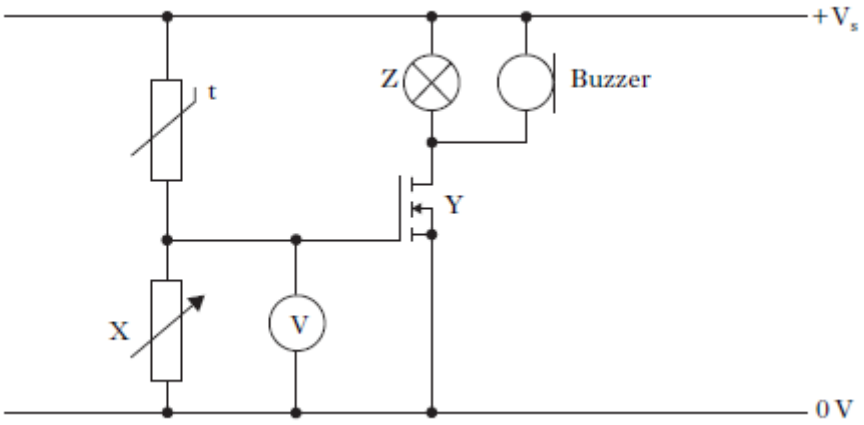
1. A light sensor consists of an LDR connected in a Wheatstone bridge as shown.



If the variable resistor, R_v, is set to 6000Ω and the LDR has a resistance of 1600Ω, what is the p.d. across the 800Ω resistor?

(3)

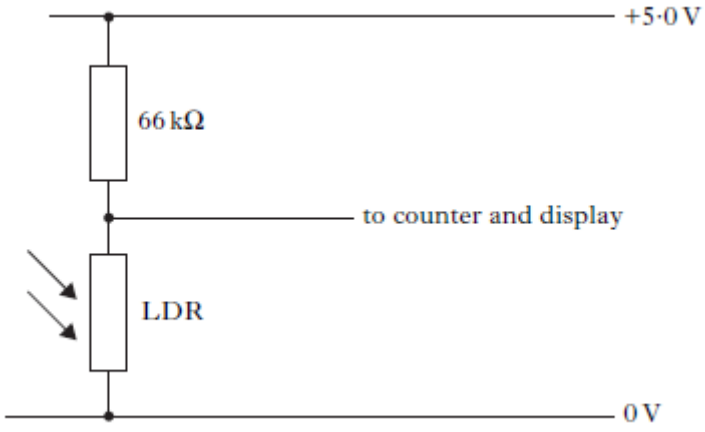
2. Part of an electronic circuit that controls temperature is shown below.



The supply voltage, V_s, to the circuit is 12V.
When the thermistor has a resistance of 3kΩ and the variable resistor is set to 15kΩ, what is the reading on the voltmeter?

(3)

3. Part of an electronic circuit is shown below.



The resistance of the LDR for different conditions is shown in the table.

Condition	Resistance of LDR (kΩ)
covered	22
uncovered	2

Calculate the p.d. across the LDR when it is covered.

(4)

Higher Homework Four

1. A CRO has it's time-base control turned off and is connected to two different power supplies. The traces obtained are shown below.

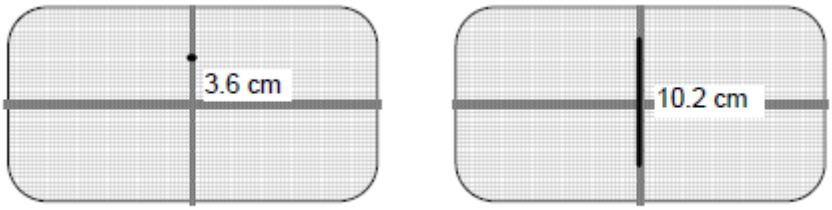
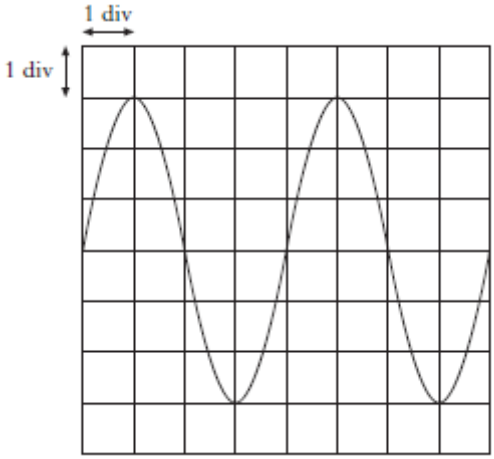


Diagram 1 Diagram 2

Explain which diagram - 1 or 2 – was obtained from an a.c. power supply?

(2)

2. A signal from a power supply is to be displayed on an oscilloscope. With the time-base control set to 0.01s/div and the Y-gain set to 4.0V/div the following trace is obtained.



a) What is the peak voltage for the signal?

(2)

b) Calculate the V_{rms} for the power supply.

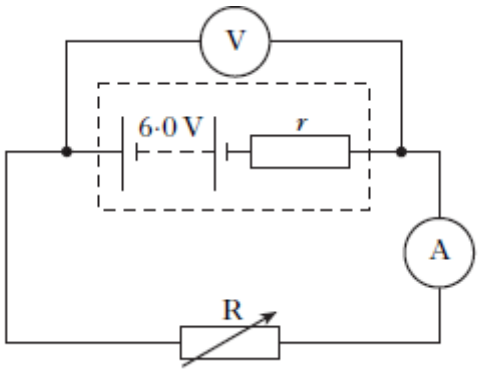
(3)

c) Calculate the frequency of the signal from the power supply.

(3)

Higher Homework Five

A battery of e.m.f. 6.0V and internal resistance, r, is connected to a variable resistor, R, as shown below.



a) What is meant by an e.m.f. of 6.0V?

(1)

b) When the variable resistor is set to 1.5Ω, the reading on the ammeter is 3.0A. Under these conditions:

i) What is the terminal potential difference of the circuit?

(3)

ii) What is the value of the lost volts in the circuit?

(1)

c) What is the internal resistance of the battery?

(3)

d) Would the value of the variable resistor have to increase or decrease to allow maximum power transfer in this circuit? You must justify your answer.

(2)

Higher Homework Six

1. What is meant by the expression "a capacitance of 5μF"?

(1)

2. A 230V dc supply, a 47μF capacitor, a switch and a resistor are connected in a series circuit.

a) Draw this circuit – assume the switch is open and the capacitor is uncharged.

(2)

b) Sketch a graph of charge vs. potential difference for the circuit from when the switch is closed until the capacitor is fully charged. (No numerical values needed)

(1)

c) What is the potential difference across the capacitor when it is fully charged?

(1)

d) Calculate the energy stored in the capacitor when it is fully charged?

(3)

Higher Homework Six(continued)

3. Draw and clearly label the graphs which illustrate the following:
a) Current vs time during the charging of a capacitor.
b) Current vs time during the discharging of a capacitor.
c) Current vs frequency in a capacitive circuit.
d) Current vs frequency in a resistive circuit.
e) Voltage vs time during the charging of a capacitor.
f) Voltage vs time during the discharging of a capacitor.

(6)

4. A 200μF capacitor is charged until the voltage across its plates is 50V.
a) How much charge has been stored during the charging process?

(3)

b) The capacitor can be discharged in 2.5ms. What is the average current during discharge?

(3)

Higher Homework Seven

1. Draw an energy band diagram for each of the following, clearly labelling the conduction band and the valence band in each diagram.
a) An insulator
b) A semiconductor
c) A conductor

(3)

2. What is doping? Your answer may use diagrams and should include the following – impurity, n-type and p-type.

(3)

3. a) Is the diode in the following circuit forward biased or reverse biased?

(1)

b) Explain what happens to the electrons, holes and the depletion layer in the above diode. Your answer should also include the terms conduction band and valence band.

(3)