*Name :*_____

Target grade: _____

Design & Technology Department

GCSE Electronic Products

Revision Exercises

Part 1

Topics:

Power Supplies
Voltage Regulators
Thyristors
Astable & Monostable Circuits
Comparators

Mr.Clarvis

Cells

Label each of the cells with the appropriate size name choosing from (C,D,AAA,AA):

Describe the difference between a cell and a battery:

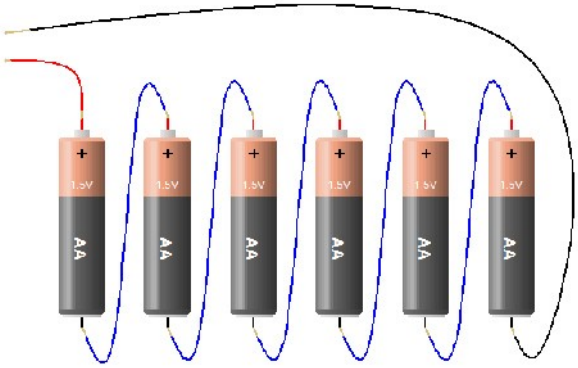
_____

_____

_____

Batteries

Draw the circuit diagram for the circuit shown on the right.



What is the voltage produced by this circuit?_____

Describe three advantages of using rechargeable batteries over conventional batteries:

_____

_____

_____

_____

_____

Describe three advantages and three disadvantages of solar panels:

_____

_____

_____

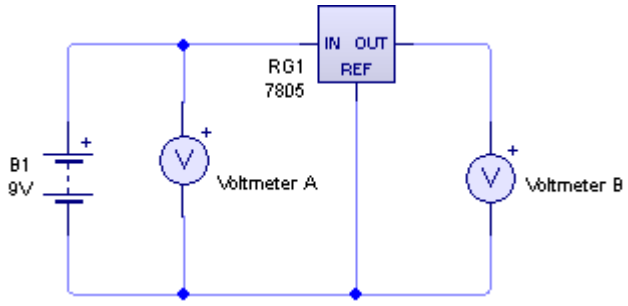
_____

_____

Draw the circuit symbol for the component shown here:

Circuit no.1: Voltage Regulator

Tip: The 7805 can be found under "power supplies" & the voltmeters can be found under "virtual instruments".



What is the voltage on the input of the voltage regulator?:_____

What is the voltage on the output of the voltage regulator?:_____

Describe what you think the voltage regulator is doing:_____

_____

_____

_____

Describe a situation when you might need this circuit:_____

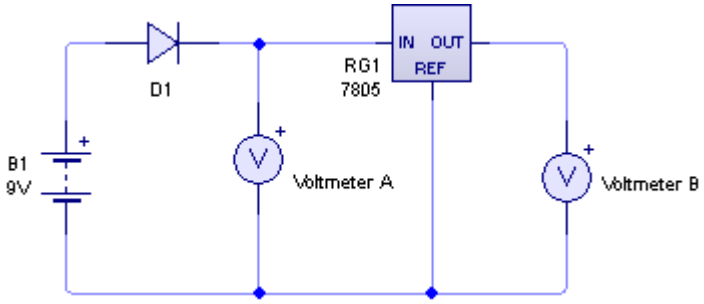
_____

_____

_____

Circuit no.2: Diodes

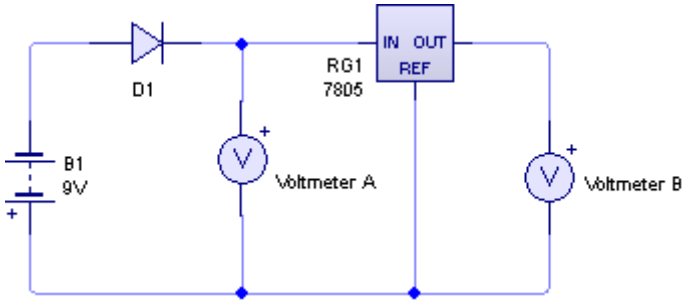
Now add a diode to the circuit



What is the input voltage on the input of the voltage regulator?_____

What is the output voltage on the input of the voltage regulator?_____

Now switch the polarity of the battery round



What is the input voltage on the input of the voltage regulator?_____

What is the output voltage on the input of the voltage regulator?_____

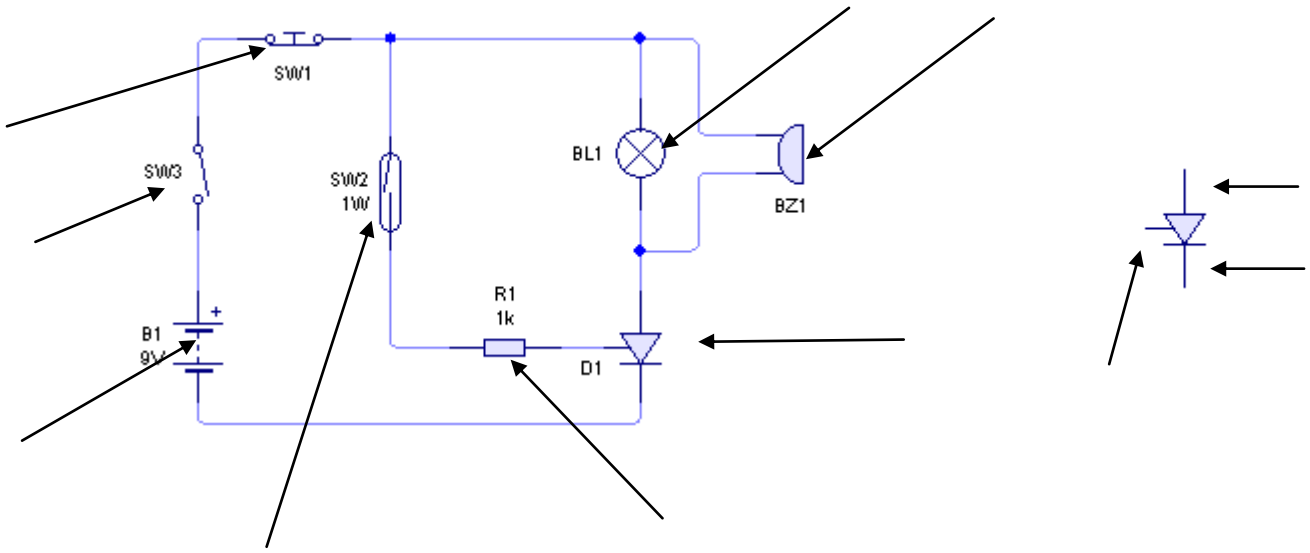
From your experiment above, describe what the diode is doing and why it can be added to any circuit in a similar way:

_____

_____

Circuit no.3: Thyristors

Label each of the components on the circuit diagram:



Describe what happens when you first turn on the circuit (by closing switch 3):

Describe what happens when you move a magnet over the reed switch (switch 2):

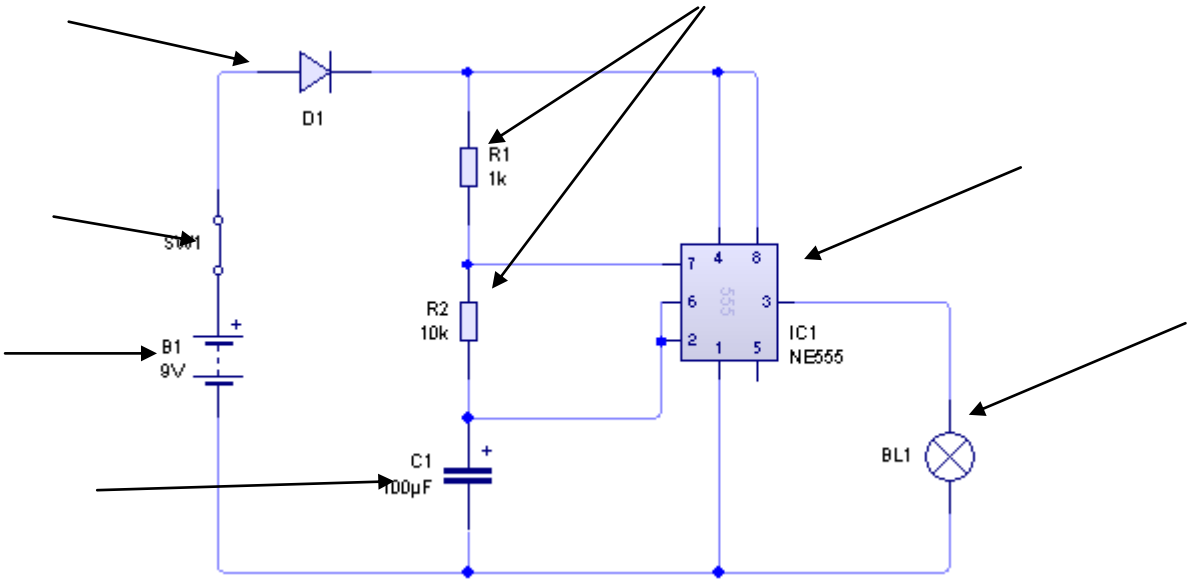
Describe what happens when you press switch 1:

Describe what action would have a similar effect to pressing switch 1:

Circuit no.4: Astable Circuit

Take care to make sure that all of the resistor and capacitor values are set correctly

Label each of the components on the circuit diagram:



Describe why the circuit has the diode included:

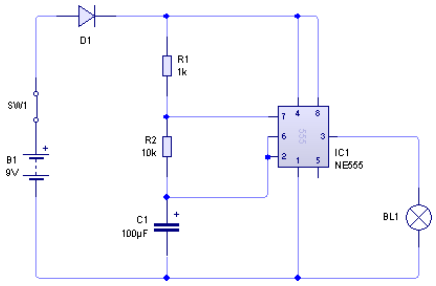
Describe what happens when the circuit is switched on:

Change the capacitor value to 200uF, and describe what effect this has on the output. Explain why this happens:

Change the capacitor value to 50uF, and describe what effect this has on the output. Explain why this happens:

Astable Circuits Continued

For each of the component value sets calculate the output frequency using the formula shown. You will need a scientific calculator. Use the space provided and remember to show your workings.



$$F = \frac{1.44}{(R1 + 2 \times R2) \times C}$$

Question 1
R1 = 1K
R2 = 10K
C1 = 1uF

Question 2
R1 = 100R
R2 = 30R
C1 = 10uF

Question 3
R1 = 100K
R2 = 220K
C1 = 47uF

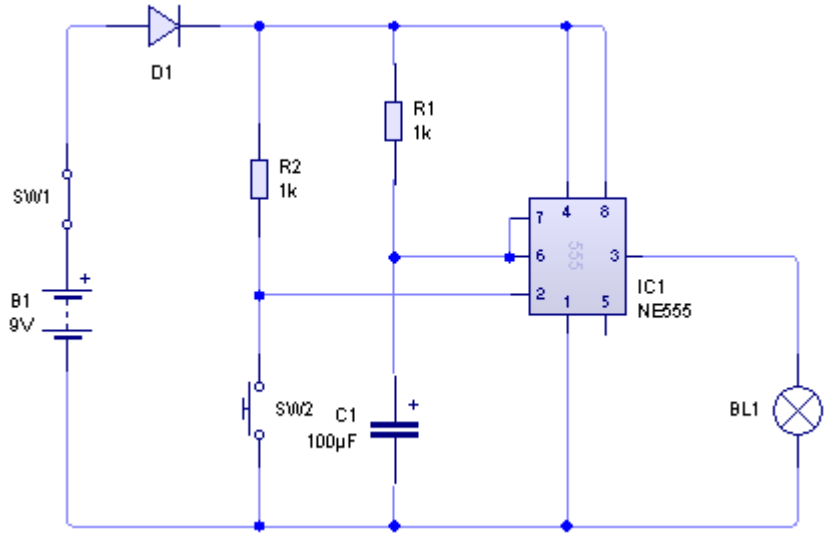
Question 4
R1 = 47K
R2 = 56K
C1 = 2u2

Question 5
R1 = 12K
R2 = 147K
C1 = 18uF

Circuit no.5: Monostable Circuit

Take care to make sure that all of the resistor and capacitor values are set correctly

Label each of the components on the circuit diagram:



Describe what happens when the circuit is first switched on:

_____

_____

_____

What is the voltage on pin2 when the circuit is first switched on?_____

What is the voltage on pins 6 and 7 when the circuit is first switched on?

What is the voltage on pin2 when the switch 2 is pressed?_____

Describe what happens to the voltage on pins 6 and 7 once switch 2 has been pressed?

_____

_____

_____

Describe what happens to the output once the output has been pressed:

_____

_____

_____

_____

_____

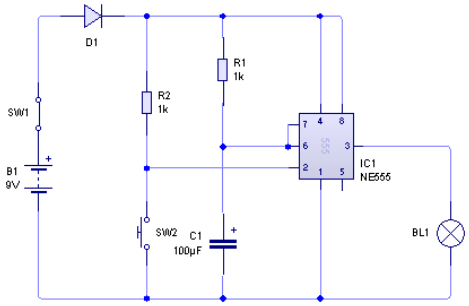
_____

_____

_____

Monostable Circuits Continued

For each of the component value sets calculate the time the output is switched on once the circuit has been triggered. Remember to show your workings.



$$T = 1.1 \times R1 \times C1$$

Question 1
R1 = 1K
C1 = 1uF

Question 2
R1 = 100R
C1 = 10uF

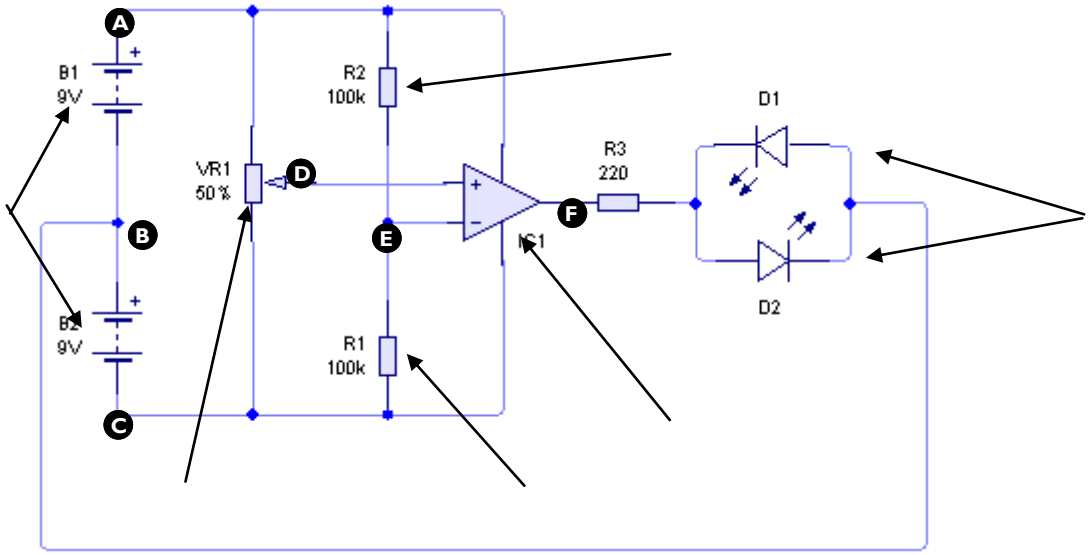
Question 3
R1 = 100K
C1 = 47uF

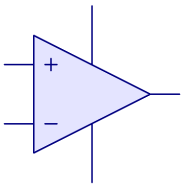
Question 4
R1 = 47K
C1 = 2u2

Question 5
R1 = 12K
C1 = 18uF

Circuit no.6: Comparator Circuits

Label each of the components on the circuit diagram, build the circuit and complete the tables for the different potentiometer settings.





Set the potentiometer to **0%**

Test Point	Voltage
A	
B	
C	
D *Non-inverting input*	
E *Inverting input*	
F *Output*	
Which LED is lit?	

Set the potentiometer to **25%**

Test Point	Voltage
A	
B	
C	
D *Non-inverting input*	
E *Inverting input*	
F *Output*	
Which LED is lit?	

Set the potentiometer to **80%**

Test Point	Voltage
A	
B	
C	
D *Non-inverting input*	
E *Inverting input*	
F *Output*	
Which LED is lit?	

Describe what you notice when voltage D (non-inverting input) is greater than voltage E (inverting input):

_____

_____

_____

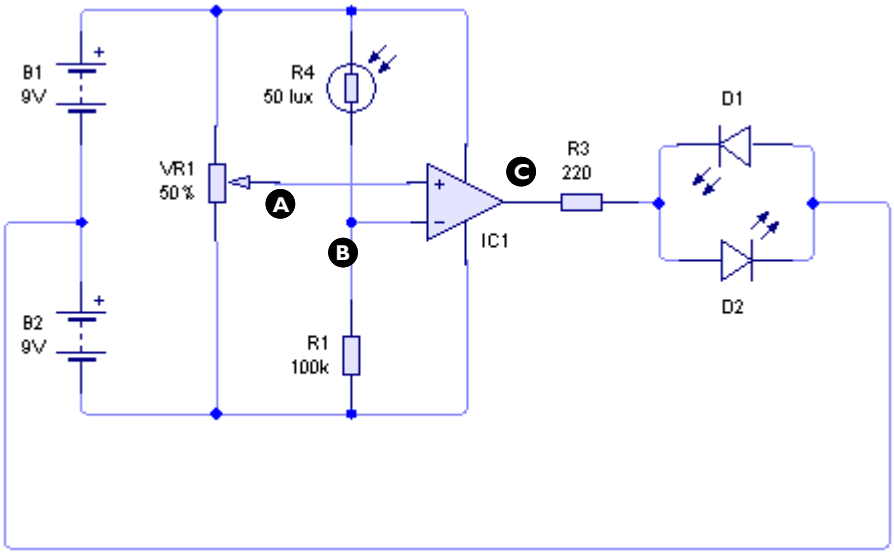
Describe what you notice when voltage E (inverting input) is greater than voltage D (non-inverting input:

_____

_____

Circuit no.7: Adding an LDR to a comparator circuit

Modify your circuit to include an LDR as shown below. Set the potentiometer to the 50% position. Measure the voltage at each point



Set LDR to maximum brightness

Test Point	Voltage
A *Non-inverting input*	
B *Inverting input*	
C *Output*	
Which LED is lit?	

Set the LDR to minimum brightness

Test Point	Voltage
A *Non-inverting input*	
B *Inverting input*	
C *Output*	
Which LED is lit?	

When the LDR brightness is set to maximum what is its resistance? _____

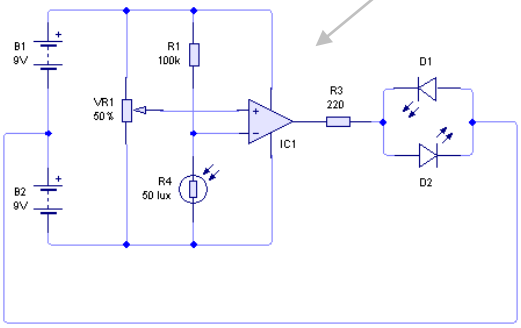
When the LDR brightness is set to minimum what is its resistance? _____

Now swap the position of the LDR and R1 as shown below and describe what you notice:

_____

_____

_____



Describe what you could do to your original circuit to make it work like the circuit shown to the left and why:

_____

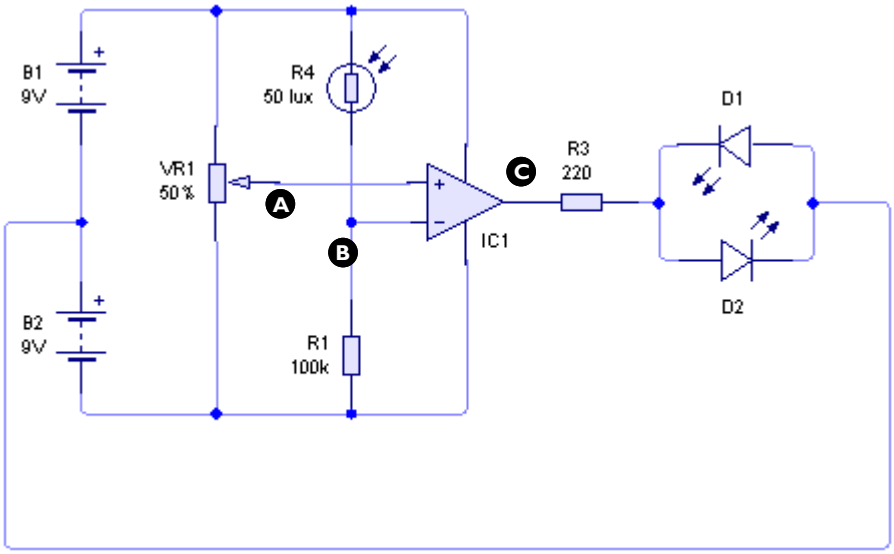
_____

_____

_____

Circuit no.7: Adding an LDR to a comparator circuit

Modify your circuit to include an LDR as shown below. Set the potentiometer to the ***50% position.*** Measure the voltage at each point



Set LDR to maximum brightness

Test Point	Voltage
A *Non-inverting input*	
B *Inverting input*	
C *Output*	
Which LED is lit?	

Set the LDR to minimum brightness

Test Point	Voltage
A *Non-inverting input*	
B *Inverting input*	
C *Output*	
Which LED is lit?	

When the LDR brightness is set to maximum what is its resistance? _____

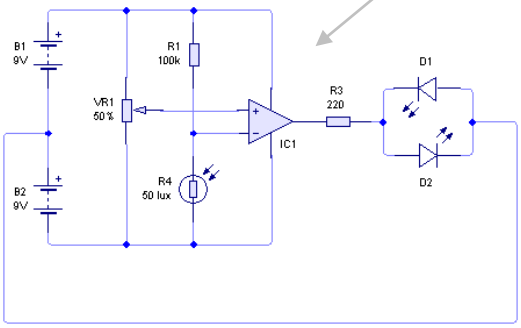
When the LDR brightness is set to minimum what is its resistance? _____

Now swap the position of the LDR and R1 as shown below and describe what you notice:

_____

_____

_____



Describe what you could do to your original circuit to make it work like the circuit shown to the left and why:

_____

_____

_____

_____