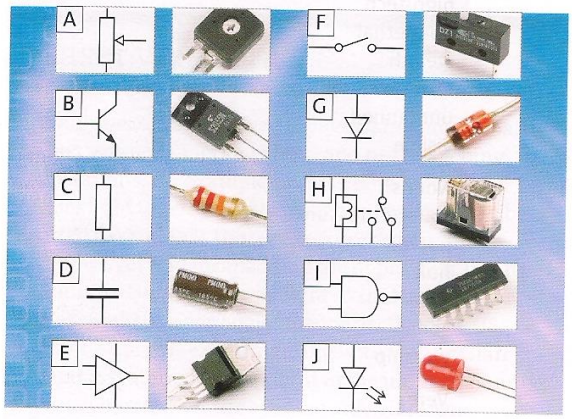
IFTS 14 – ROBOTICA - INGLES TECNICO II - TASK 2

Switch on

Match 1–10 with the circuit symbol diagrams A–J.

1 amplifier
2 capacitor
3 diode
4 resistor
5 light-emitting diode
6 NAND logic gate
7 relay
8 npn transistor
9 switch (single-pole, single-throw)
10 potentiometer (pot)



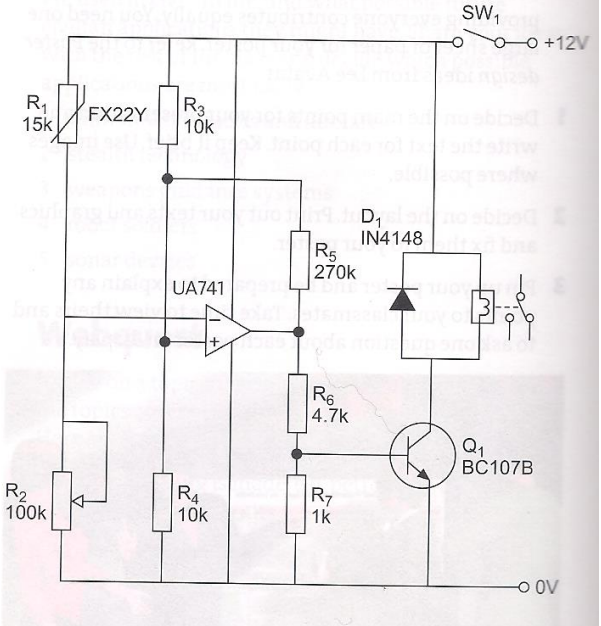
Reading

Electronic alarm circuits

1 Work in pairs. Make a list of electronic alarms in column A. Note what triggers the alarm in column B. Two examples are completed for you.

A	B
Alarm	Trigger
motorcycle anti-theft	*moving the motorcycle*
fridge door	*leaving the fridge door open*

2 Study this circuit. Make a component list with the numbers, names, and values of each component. Say what the circuit is used for.



Component	Type	Value/reference number
R1		
R2		
R3		
R4		
R5		
R6		
R7		
D1		
Q1		
SW1		
	operational amplifier	UA741

3 Now read the description of how the device works. Then put the events in the correct sequence. The first and last events are entered for you.

a The relay is activated. _____
b Current flows through the collector-emitter circuit. _____
c The voltage in the base-emitter circuit rises above 0.7 volts. _____
d The resistance of R1 rises. _____
e The warning device is switched on. *7*
f The temperature falls. *1*
g Small differences in voltage are amplified by the amplifier. _____

A circuit diagram

The diagram shows a simple frost alarm. It can be used to warn drivers that roads may be icy or to warn gardeners and fruit farmers to protect their crops. It can also be used to switch on heaters. It is triggered by a fall in temperature. When the temperature falls to 0°C or any temperature selected, the alarm operates.

The principal component is the thermistor, R1. As the temperature falls, the resistance of R1 rises. At 25°C it has a resistance of 15 kΩ. At 0°C the resistance is 45 kΩ. The 100 kΩ potentiometer, R2, can be adjusted to allow the circuit to trigger at other temperatures.

The higher the resistance of R1, the smaller the voltage flowing to the amplifier, UA741. This is a very sensitive amplifier which amplifies small differences in voltage. The output from the amplifier is fed to the base of the transistor, BC107B. This acts like a switch. When the voltage in the base-emitter circuit rises above 0.7 volts, current flows through the collector-emitter circuit, activating the relay. The diode, D1, across the relay prevents sparking. R5 helps to ensure the relay changes smoothly when the trigger temperature is reached. The relay can trigger a warning device such as a buzzer or light, or switch on a heater.

Language spot

Complex sentence review

- We can use complex sentences of two or more clauses to describe how a series of events relate to each other.
- Study these ways of forming complex sentences:
- Using time clauses to link actions

1 ***When the temperature falls**, the alarm is switched on.*
2 *A capacitor charges **until it is full**.*
3 ***As the capacitor charges**, the voltage rises.*

- Using *if*-clauses to link a cause and effect

4 ***If excess current is passed**, the transistor will overheat.*

- Using relative clauses to make definitions

5 *Diodes are electronic devices **which allow current to pass in one direction only**.*

- Using relative clauses to add information. We use commas to show this is extra but not essential information.

6 *Diodes, **which are made of silicon or germanium**, have many uses in electronics.*

- We can replace *which* or *who* in a relative clause followed by a Continuous or Simple verb with an active participle, the *-ing* part of the verb.

7 *This completes a circuit, **which generates a series of pulses**.*

OR

8 *This completes a circuit, **generating a series of pulses**.*

Now note how we can link these events in the frost alarm circuit.

1 *The temperature falls to zero.*
2 *The transistor is switched on.*
3 *This activates the relay.*

1+2 *When the temperature falls to zero, the transistor is switched on.*
2+3 *The transistor is switched on, which activates the relay.*
1+2+3 *When the temperature falls to zero, the transistor is switched on, which activates the relay.*

OR

1+2+3 *When the temperature falls to zero, the transistor is switched on, activating the relay.*

There are several structures we can use in order to link ideas within a sentence.

when, as, until

We use these time expressions to show clearly the order in which different events happened. The part of the sentence that begins with the time expression is called the time clause.

when

We use *when* to refer to actions that happen at almost the same time. One action is an immediate consequence of another. Note that when the time clause comes first, it must be followed by a comma.

***When** the voltage rises, the relay is activated.*

We can change the two parts of the sentence around, but *when* must always come before the first action in the sequence of events.

*The relay is activated **when the voltage rises**.*

When the time clause comes later in the sentence, we do not use a comma to separate the two clauses.

as

We use *as* to talk about two actions that happen at the same time. The position of the time clause can change, in the same way as for *when*.

***As** the temperature falls, the resistance of R1 rises.*
*The resistance of R1 rises **as** the temperature falls.*

until

We use the preposition of time *until* to mean 'up to a certain point'.

*The relay doesn't operate **until** the trigger temperature is reached.*

if-clause

We can also use an *if*-clause to link cause and effect.

The *if*-clause normally comes first, but it can come after the main clause. In which case, there is no comma.

The transistor will overheat if excess current is passed.

Relative clauses

In relative clauses, we use the relative pronouns *who* when the subject is a person, or *which* when the subject is an object.

We can use a relative clause in two ways:

- to make a definition (defining relative clause)

*This is the battery **which** provides a high current.* (= there are other batteries, but this one provides a high current)

*He is the person at Bell Laboratories **who** pioneered the new technique.* (= there were several people at Bell Laboratories, but he pioneered the new technique)

- to add information (non-defining relative clause)

*This is a new type of battery, **which** can provide a higher current than standard ones.*
*That is Mr Hodgson, **who** pioneered the new technique.*

Note that in this type of relative clause we use a comma before *who* or *which*.

-ing form

When we talk about a process that causes, prevents, or permits another action, we can use the *-ing* form to replace *which* and the verb that follows it. Compare:

*This completes a circuit, **which generates** a series of pulses.* (non-defining relative clause)
*This completes a circuit, **generating** a series of pulses.*

1 Make sentences by matching the information in columns A–C and then linking it together using a relative clause with *which* or *who*.

EXAMPLE
Silicon, which comes from sand, is an important component of some semiconductors.

	A	B	C
	Subject	**Additional information**	**Important information**
	Silicon	It is short for binary digit.	He was one of three inventors of the transistor.
1	Digital electronics	He worked at Bell Laboratories	They are remembered in the basic units of electricity.
2	Walter Brattain	This means light-emitting diodes.	They are used in watches and many electronic displays.
3	A bit	It is used in everything from watches to computers.	They can provide a higher current than other batteries.
4	Lithium batteries	They were pioneers in the study of electricity.	It is an important component of some semiconductors.
5	LEDs	It comes from sand.	It is concerned with electrical systems made up of a series of switches.
6	Ohm, Volta, and Ampère	They are often used in cameras.	It is a single unit of information.

2 Link each pair of events to make one complex sentence. Use the clue in brackets to help you.

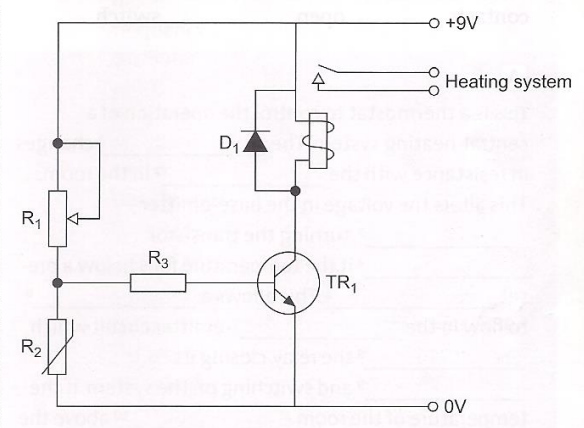
1 A milliammeter is a device. It measures very small currents. (relative clause)
2 A residual current device trips. An excess current passes through a circuit. (time)
3 Light strikes the solar cell. This generates a voltage. (relative clause)
4 An electrolytic capacitor is connected wrongly. The capacitor will be damaged. (condition)
5 You touch memory chips. Make sure you are earthed. (time)
6 D-type connectors come in a variety of sizes. D-type connectors are widely used for linking devices to computers. (relative clause)
7 A relay is an electro-mechanical switch. It uses an electromagnet. (relative clause)
8 The input signal to an inverter is 1. The output signal will be 0. (condition)
9 A signal is detected. It is amplified. (time)
10 A logic probe is a test instrument. It provides an easy way of checking simple logic circuits. (relative clause)

Problem-solving

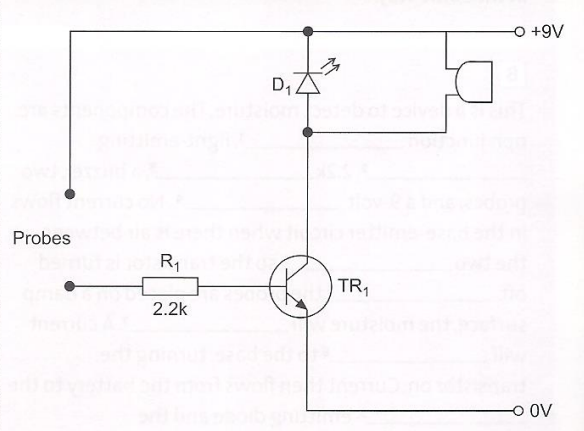
1 Work in groups, A and B. Study one of these circuits, A or B. Decide what the circuit is for and prepare a detailed explanation of how it works.

2 Work in pairs with someone from the other group and explain to them how your circuit works. Be prepared to answer any questions your partner may have.

A



B



3 Complete the explanations of circuits A and B using the words below. You will not need to use all the words.

activates	current	probes
battery	diode	relay
bell	emitter	resistor
buzzer	falls	rises
capacitor	flow	temperature
chip	if	thermistor
circuit	light	transistor
collector	off	value
conduct	on	sound
contacts	open	switch

A

This is a thermostat to control the operation of a central-heating system. The _____[1] changes in resistance with the _____[2] in the room. This alters the voltage in the base-emitter _____[3], turning the transistor _____[4] if the temperature falls below a pre-set _____[5]. This allows a _____[6] to flow in the _____[7]-emitter circuit which _____[8] the relay, closing its _____[9] and switching on the system. If the temperature of the room _____[10] above the pre-set value, the thermistor will _____[11] the transistor and the heating system _____[12] in the same way.

B

This is a device to detect moisture. The components are: npn junction _____[1], light-emitting _____[2], 2.2k_____[3], a buzzer, two probes, and a 9-volt _____[4]. No current flows in the base-emitter circuit when there is air between the two _____[5], so the transistor is turned off. _____[6] the probes are placed on a damp surface, the moisture will _____[7]. A current will _____[8] to the base, turning the transistor on. Current then flows from the battery to the _____[9]-emitting diode and the _____[10], giving both visible and audible warning.