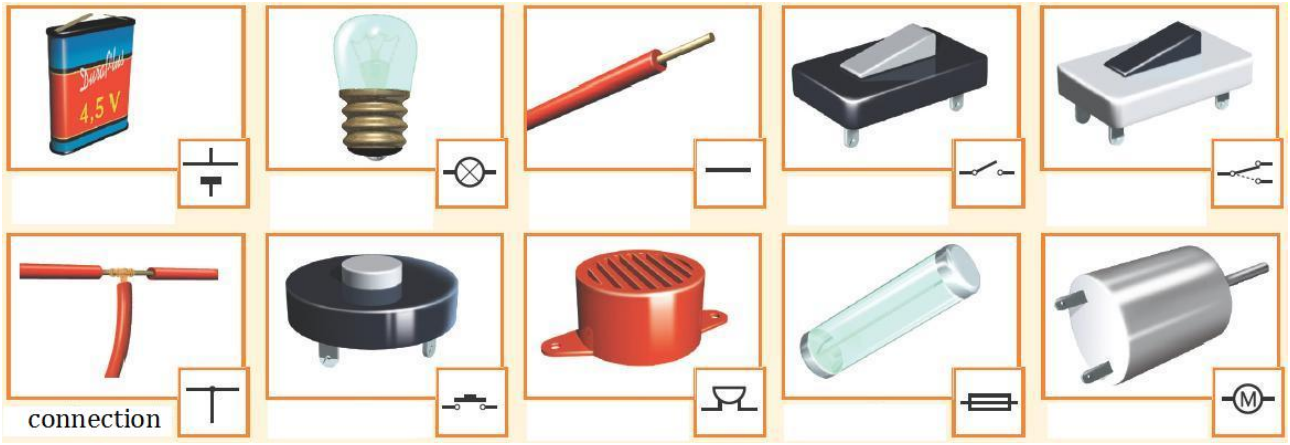
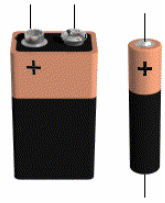
(U1) ELECTROMECHANICS CLASS ACTIVITIES

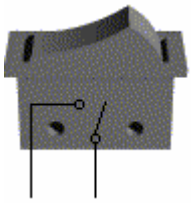
1 NAME AND SURNAMES:					Group:
2 NAME AND SURNAMES:					
Day/Date	**Signatures**		**Day/Date**	**Signatures**	
1/	**Name1:**	**Name2:**	2/	**Name1:**	**Name2:**
3/	**Name1:**	**Name2:**	4/	**Name1:**	**Name2:**

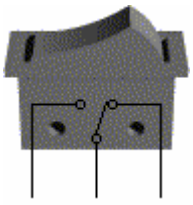
Electricity: Revision1

1. Electrical symbols. Write down the name of the electrical components below:

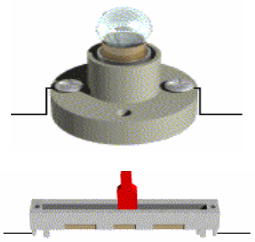




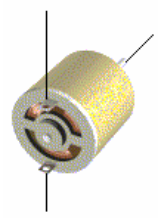


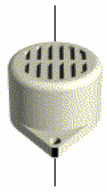


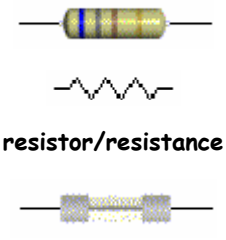
two- way switch



variable resistor (potentiometer)



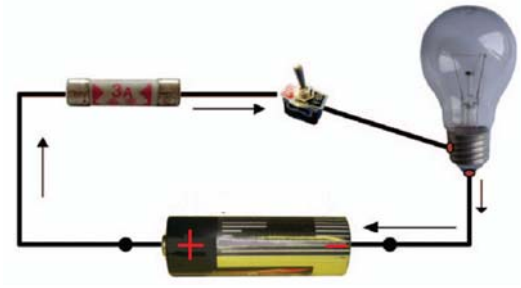




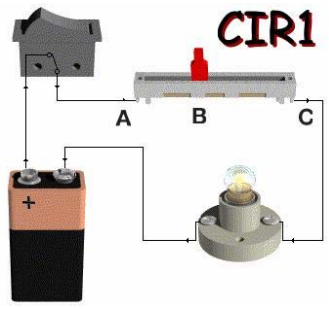
resistor/resistance

fuse

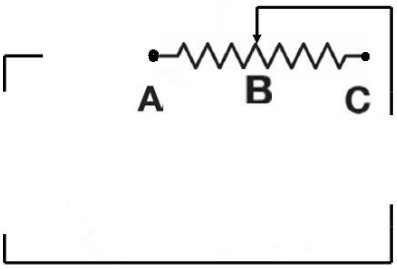
2. Label the electric circuit below with these words: protection device, control device, load device, power supply, conductor, current, positive terminal, negative terminal. Draw its circuit diagram (with symbols)

ELECTRIC CIRCUIT	CIRCUIT DIAGRAM
	

3. Circuit **CIR1** shows the electric circuit of a **halogen lamp**. Now you are asked:



CIRCUIT DIAGRAM CIR1



- To list the 5 components the circuit contains:
- To draw the circuit diagram, tracing an arrow to show the direction of the current.
- To explain how it works using this **list of words**: open, current, light, closed, positive, off, lights, increases, decreases, negative.
- **Explanation**: when the switch is _____ (OFF position) there is not _____ through the circuit (the lamp does not_____ up). After flipping the switch to the ON position (the switch is_____), the current generated by the battery comes out of the _____ terminal of the battery and passes through the switch and the potentiometer.

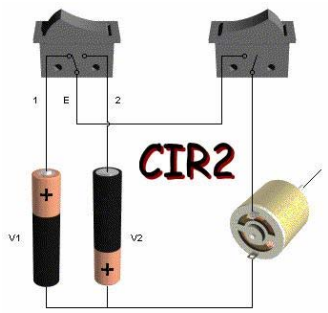
➢ If the slider (the potentiometer sliding contact) is at **position A**, the potentiometer does not give any resistance (no opposition) and the _____ through the circuit is at its maximum, that is to say, the lamp _____ up at maximum intensity (maximum brightness).

➢ If the slider is at **position C**, the resistance is at its maximum and the lamp will be _ (or lighting up at minimum intensity). As we move the slider from A to C, the resistance of the potentiometer _____ from 0 to maximum, the current _____ and the light of the lamp gets dimmer. The current comes back to the battery through its _____ terminal.

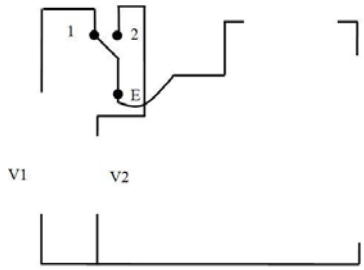
Electricity: Revision2

4. For circuit **CIR2** you are asked:

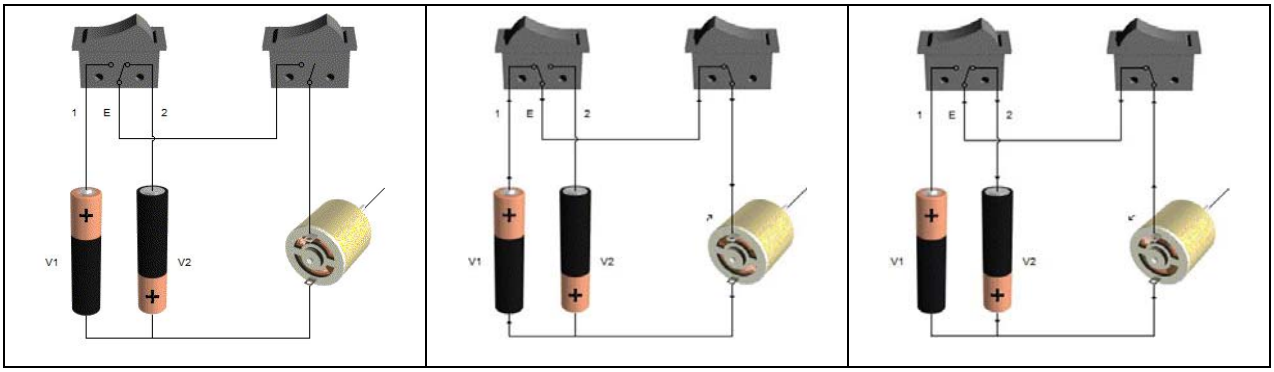
- To draw its circuit diagram.



CIRCUIT DIAGRAM CIR2



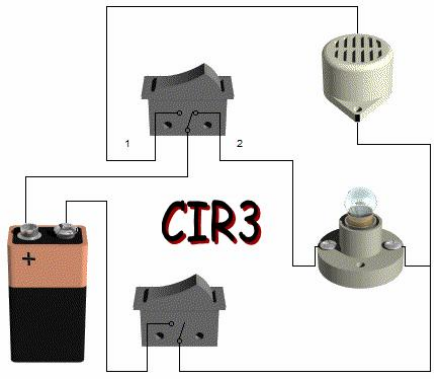
- To draw, using arrows (➔), the path through which the current passes (in case the current flows) from the positive terminal of the battery to its negative terminal. Indicate also the direction of rotation of the motor (clockwise ↻ or anti clockwise ↺):



- To explain how it works: In order to make the current flow we have to close the _____ switch and, when flipping the _____ switch to position 1, the motor spins _____ ; when flipping the two-way switch to position 2, the motor spins_____.

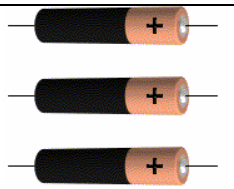
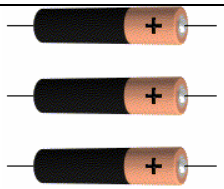
5. Circuit **CIR3** is an alarm circuit. The owner uses this circuit to select a light alarm (a lamp) or a sound alarm (a buzzer). For this circuit you are asked:

- To label the six components the circuit contains and complete the table below:



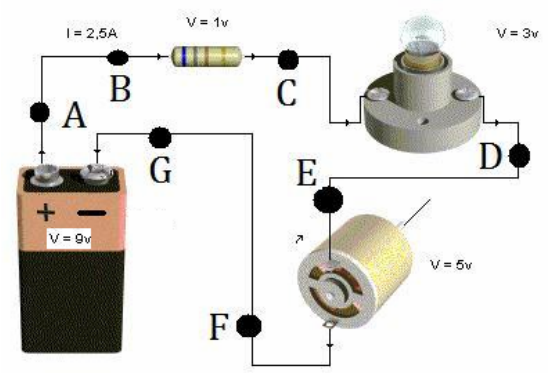
1-way switch	2-way switch	Lamp	Buzzer
open	position 2	it does not light up	it does not ring
			it rings
		it lights up	
	position 1		it does not ring

6. Connect three cells in series (circuit1), 3 in parallel (circuit2) and three lamps in a compound circuit3 (do not forget to mark the two terminals of the connection):

SERIES CIRCUIT1	PARALLEL CIRCUIT2	COMPOUND CIRCUIT3
		

7. **Series Circuit 1**. Write the name of the 3 electrical magnitudes and their units of measurement:

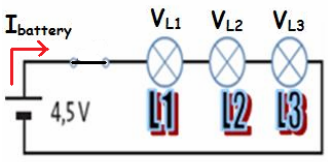
- Write the voltage (with units) the points A, B… have in the series circuit below



- Label (in the picture) the 5 components of the circuit:
- List the components that consume electrical energy:
- Current supplied by the battery:
- Current through the resistor:
- Current through the lamp:
- Current through the motor:
- Is the current the same?
- Type of connection:
- Voltage supplied by the battery (Va-Vg):
- Va: Vb:
- Voltage drop across the resistor (Vb-Vc):
- Voltage drop across the lamp (Vc-Vd):
- Voltage drop across the motor (Ve-Vf):
- Vf: Vg:

8. **Series Circuit 2**. Look at the data given in the series circuit below and find (calculate) the missing ones (don't forget to write the units); the switch is closed:

SERIES CIRCUIT



KNOWN

- **V_{L1}= ¿?**
- **V_{L2}= 1,5 V**
- **V_{L3}= 2 V**
- **$I_{battery}$= 12 A**

UNKNOWN (CALCULATIONS):

Current through L1:

Current through L3:

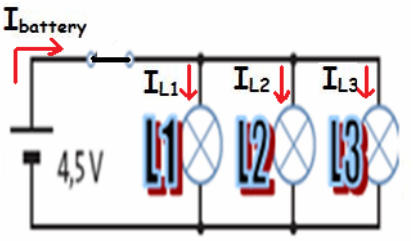
Voltage supplied by the battery:

Voltage drop across L1:

	Voltage	Current	Resistance
Series	Resistors must "share" total voltage available	Current is the _____ everywhere in the circuit	Resistance increases as you add resistors in series

9. Look at the data given in the parallel circuit below and find (calculate) the missing ones (don't forget to write the units); the switch is closed:

PARALLEL CIRCUIT



KNOWN

- **I_{L1}= ¿?**
- **I_{L2}= 3 A**
- **I_{L3}= 4 A**
- **$I_{battery}$= 12 A**

UNKNOWN (CALCULATIONS):

Current through L1:

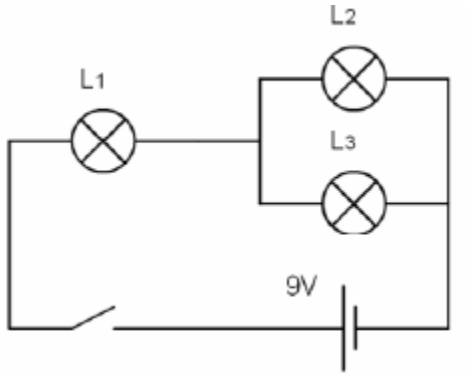
Voltage supplied by the battery:

Voltage drop across L1:

Voltage drop across L3:

	Voltage	Current	Resistance
Parallel	Each branch sees the full _____ available	Branch current can vary within the same circuit; add up brancl_____to get total current	Resistance decreases as you add resistors in parallel, because current increases

10. Look at the data given in the compound circuit below and find (calculate) the missing ones (don't forget to write the units); the switch is closed:



$I_{battery}$ = 12 A **IL2= 5 A** **VL2= 6 V**

Current through L1:

Current through L3 (calculations):

Voltage supplied by the battery:

Voltage drop across L1:

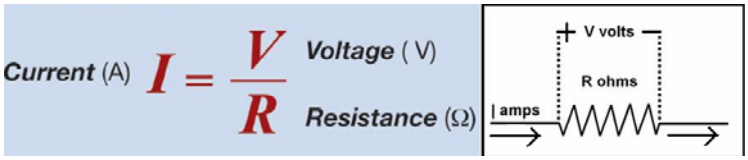
Voltage drop across L3:

Electricity: Revision3

Voltage		Current		Resistance	

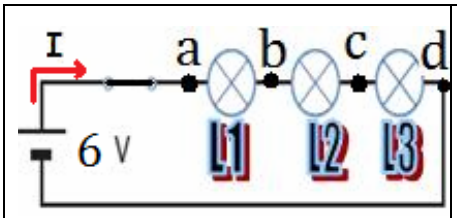
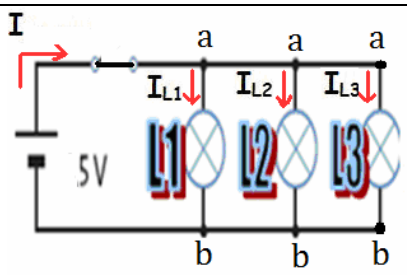
Day/Date	Signatures		Day/Date	Signatures	
5/	**Name1:**	**Name2:**	6/	**Name1:**	**Name2:**

11. Complete the table below with electrical quantities (magnitudes) and units:



MAGNITUDE	UNIT	MAGNITUDE	UNIT	MAGNITUDE	UNIT
V:		I:		R:	

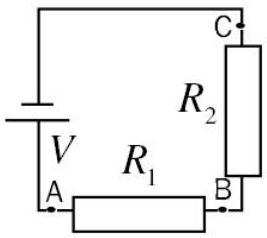
12. **Ohm's Law**. Calculate the **resistance** of each lamp (R_{L1}, R_{L2}, R_{L3}) and the total circuit resistance (R_T) in the circuits below.

	• V_{ab}= Va-Vb = 1 V • V_{bc}= Vb-Vc = 2 V • V_{cd}= Vc-Vd = 3 V • $I_{battery}$= 0,1 A	$R_t = R_1 + R_2 + R_3$
	• I_{L1}= 0,5 A • I_{L2}= 0,2 A • I_{L3}= 1 A	$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

13. In the circuit below, you are asked:

a) To do the calculations in this piece of paper

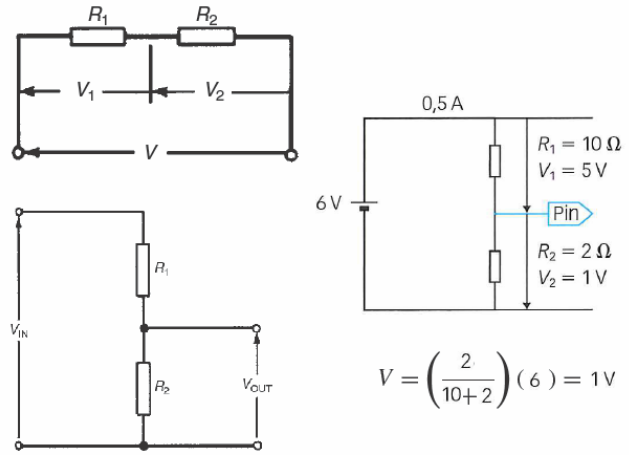
b) To simulate the circuit using Crocodile

	$V_{battery} = 20V$ $R_2 = 6\Omega$ $R_1 = 4\Omega$	a) Calculate the total resistance b) Draw the current (direction) c) Calculate the current d) Calculate the following voltage drops: V_{AB}, V_{BC},V_{CA} e) Draw the voltage drops (V_{AB}, V_{BC} and V_{CA})

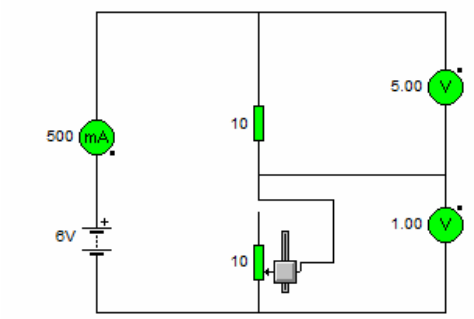
Calculations:

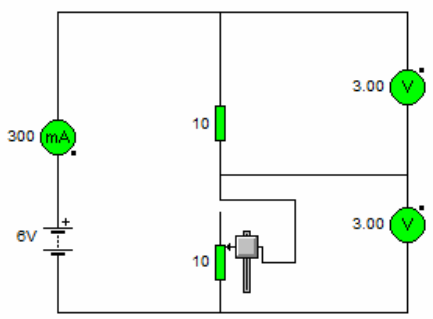
Electricity: Voltage Divider

14. **Voltage (potential) dividers.**



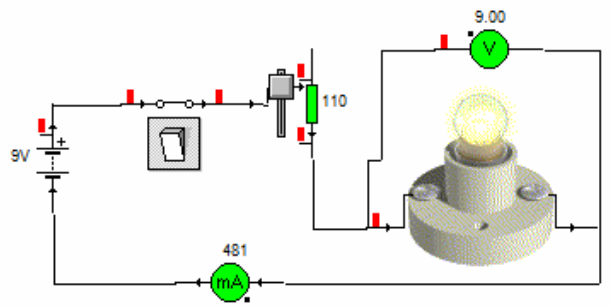
a) Create the circuit above with crocodile (place a 10 Ω potentiometer instead of R2) and check if the previous results are right.

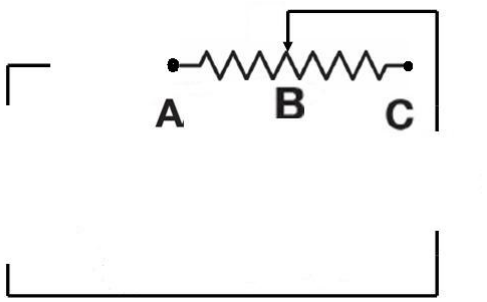




b) Calculate the potentiometer resistance in the two above situations:

15. Example of regulation in an electric circuit. Complete, in the circuit below, its circuit diagram (including an ammeter and a voltmeter). Draw and simulate the circuit with Crocodile.

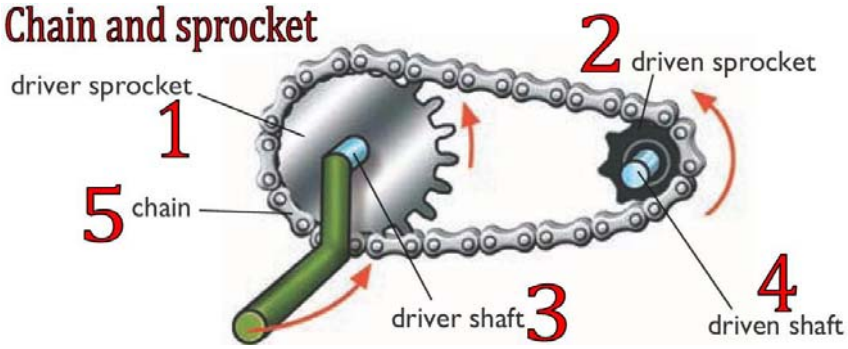




Day/Date	Signatures		Day/Date	Signatures	
7/	Name1:	Name2:	8/	Name1:	Name2:

Mechanisms

16. What is a **mechanism**? Read the text below and fill in the blanks with the following words: transmit, mechanism, motions, rotary, input, shaft, rigid, driver, convert, rotate, sprockets, shafts, assembling, reducer, chain, driven, linear motion, perform.



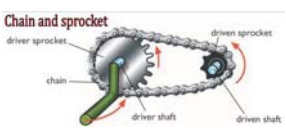
⊙ A _____ is an arrangement of connected parts (set of _____ components) working together and that are designed to _____ a particular function in order to _____ and _____ forces and_____.

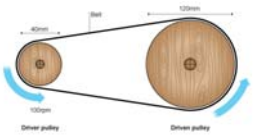
⊙ Mechanisms are constructed by _____ several mechanical elements so that the output of one is the _____ of the next. Some mechanisms are designed to control or make motions easier (facilitate). For example, if we want a wheel to _____ slowly and we have a motor that rotates very fast, what we need is a speed _____ mechanism.

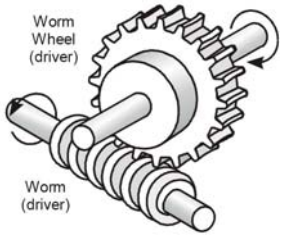
⊙ The rigid elements of the chain and sprocket system in the diagram above are: two toothed wheels called_____, a transmission element called a _____ and a pedal attached to the driver_____. When we pedal the bike we are producing a _____ motion.

⊙ Sprocket 1 is the _____ element (input). Sprocket 2 is the _____ wheel (output). Elements 3 and 4 are the _____ (axles) of each wheel. Element 5 (the _____) connects (it meshes with the teeth of the two wheels) the input with the output. The type of motion of the chain is the _____.

17. Identify the following 4 mechanisms (worm and gear, pulley and belt, gears).



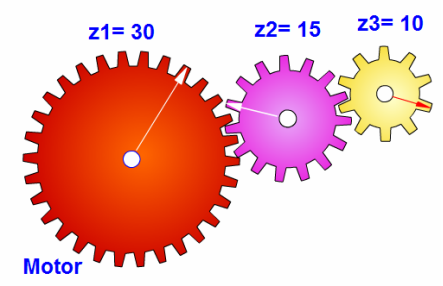


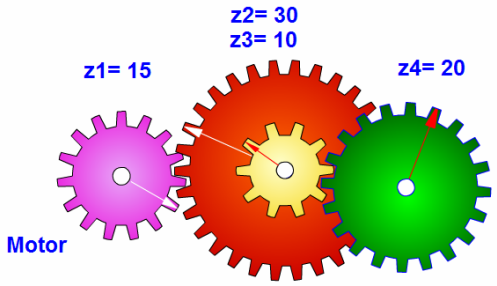


18. **Virtual Classroom Activities**. Go to our virtual classroom (TPRPT_eng) and complete activities (u1_ICT_Computer Room) 8 to 16. Remember you have to complete each activity in a new window and score at least 75%.

08		09		10		11	
12		13		14		15&16	

19. Gear Trains (calculations). Calculate the speed of rotation of wheels z1, z2, z3 and z4 having into account that the motor rotates at 4500 rpm.





Day/Date	Signatures		Day/Date	Signatures	
9/	Name1:	Name2:	10/	Name1:	Name2:

Electric Machines

20. **Alternating Current (AC) versus Direct Current (DC)**. Identify the most important instantaneous values in the picture below: