



A Model for Electric Current and Voltage in Circuits



1. Use the word bank to help you complete the following information.

Word Bank

power releases particle potential energy model pumped gravitational flow energy current

A water _____ is very useful when trying to understand how electric _____ (I) and voltage (V) behave in circuits. The first diagram below shows water being _____ from level C to Level A and then being allowed to fall back to level C via Level B.

The energy from a motor is used to drive a pump which lifts the water. Each litre of water gains the same amount of _____ potential energy in rising from level C to level A.

Each litre of water that falls from level A to level B *releases the same amount of _____.

Each litre of water that falls from level B to level C* _____ the same amount of energy.

*Gravitational energy is released as kinetic energy, sound energy and some heat energy.

Observations:

- 1: The total energy given to each litre of water by the pump. = The energy released by each litre of water between level A and B. + The energy released by each litre of water between level B and C.
- 2: The total amount of water pouring through circle X. = The total amount of water pouring through circle Y. (The water only has one path to take.)

The water model above can be likened to the _____ supply and two **different** lamps in the diagram below:

The mains wall socket gives energy to the power supply which it uses to separate + and - charge onto the terminals. Each *charged _____ gets the same amount of energy. This results in a voltage gain V_{PS} across the power supply terminals. (PS = power supply)

The *charged particles each release the same amount of _____ as they flow through the **large** lamp. This results in a voltage drop V_{AB} across the lamp.

The *charged particles each release the same amount of energy as they _____ through the **small** lamp. This results in a voltage drop V_{BC} across the lamp.

*Since the circuit consists of metal conductors, the moving charged particles will be **electrons**.

Observations:

- 1: $V_{PS} = V_{AB} + V_{BC}$
- 2: $I_X = I_Y$ (The current only has one path to take.)

2. Use the word bank to help you complete the following information.

Word Bank

falls both splits same kinetic terminals same

The next diagram shows water again being pumped from level C to the top at Level A and then being allowed to fall back to level C via Level B. There is a difference this time as the flow _____ at level B before falling down to the bottom at level C.

The energy from a motor is used to drive a pump which lifts the water. Each litre of water gains the _____ amount of gravitational potential energy in rising from level C to level A.

Each litre of water that falls from level A to level B *****releases the same amount of energy.

Each litre of water that _____ from level B to level C *****releases the same amount of energy.

*****Gravitational potential energy is released as _____ energy, sound energy and some heat energy.

Observations:

- 1: The total energy given to each litre of water by the pump. = The energy released by each litre of water between level A and B. + The energy released by each litre of water between level B and C.
- 2: The total amount of water pouring through circle X. = The total amount of water pouring through circle Y. + The total amount of water pouring through circle Z.

The water model above can be likened to the power supply and three **different** lamps in the diagram below:

The mains wall socket gives energy to the power supply which it uses to separate + and - charge onto the _____.

Each *****charged particle gets the same amount of energy. This results in a voltage gain V_{PS} across the power supply terminals. (PS = power supply)

The *****charged particles each release the _____ amount of energy as they flow through the large lamp. This results in a voltage V_{AB} across the lamp.

The *****charged particles each release the same amount of energy as they flow through the **parallel** lamps. This results in a voltage V_{BC} across _____ lamps.

*****Since the circuit consists of metal conductors, the moving charged particles will be **electrons**.

Observations:

- 1: $V_{PS} = V_{AB} + V_{BC}$
- 2: $I_x = I_y + I_z$