SUBELEMENT T5

Electrical Principles

[4 Exam Questions]

T5A01
ELECTRICAL CURRENT IS MEASURED IN WHICH OF THE FOLLOWING UNITS?

A. Volts

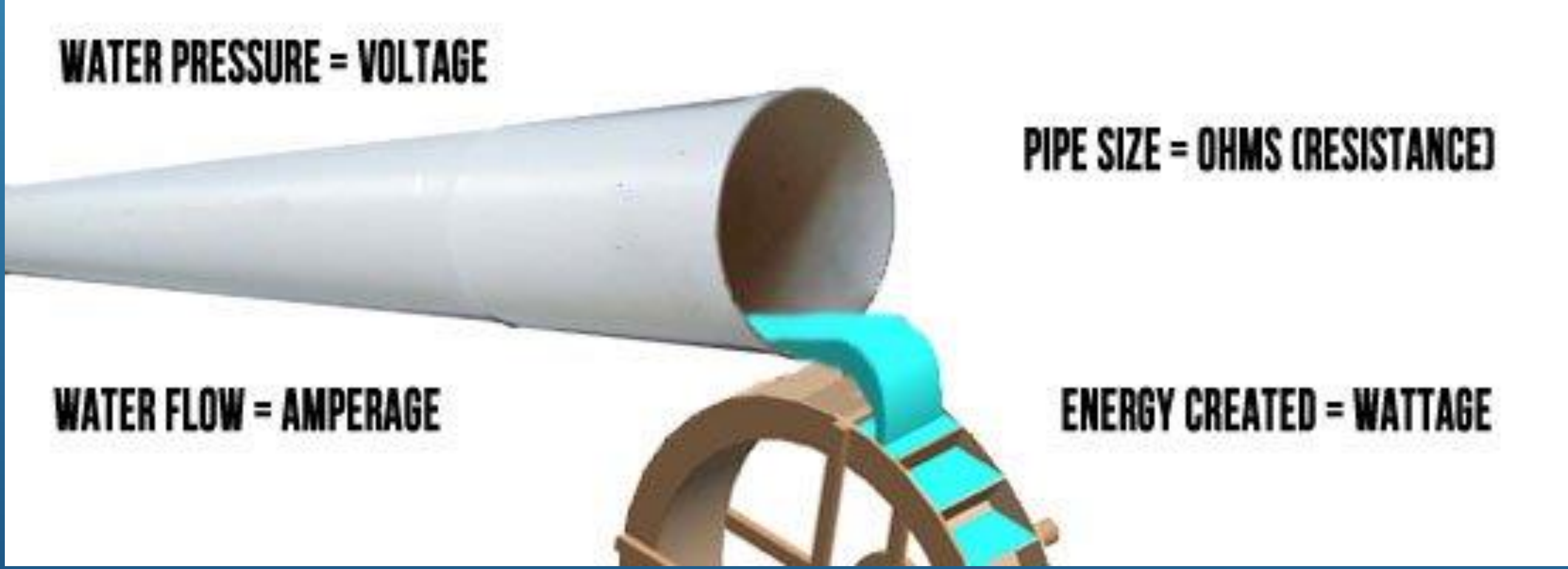
B. Watts

C. Ohms

D. Amperes

PREPPERNET

VOLTS ***- ELECTROMOTIVE FORCE (EMF), OR POTENTIAL.***
OHMS ***- RESISTANCE***
WATTS ***- POWER***
AMPERES ***- CURRENT***



PREPPERNET

T5A02
ELECTRICAL POWER IS MEASURED IN WHICH OF THE FOLLOWING UNITS?

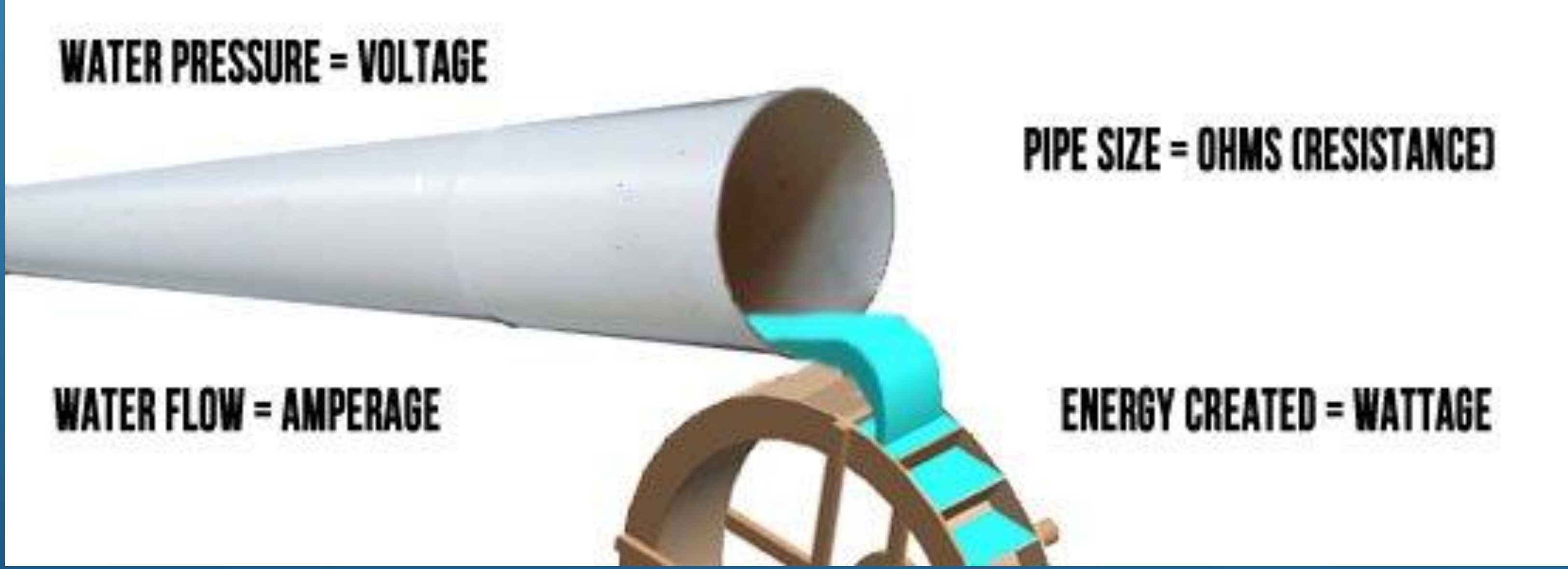
A. Volts

B. Watts

C. Ohms

D. Amperes

<u>VOLTS</u> - ELECTROMOTIVE FORCE (EMF), OR POTENTIAL.
<u>OHMS</u> - RESISTANCE
<u>WATTS</u> - POWER
<u>AMPERES</u> - CURRENT



PREPPERNET

T5A03
WHAT IS THE NAME FOR THE FLOW OF ELECTRONS IN AN ELECTRIC CIRCUIT?

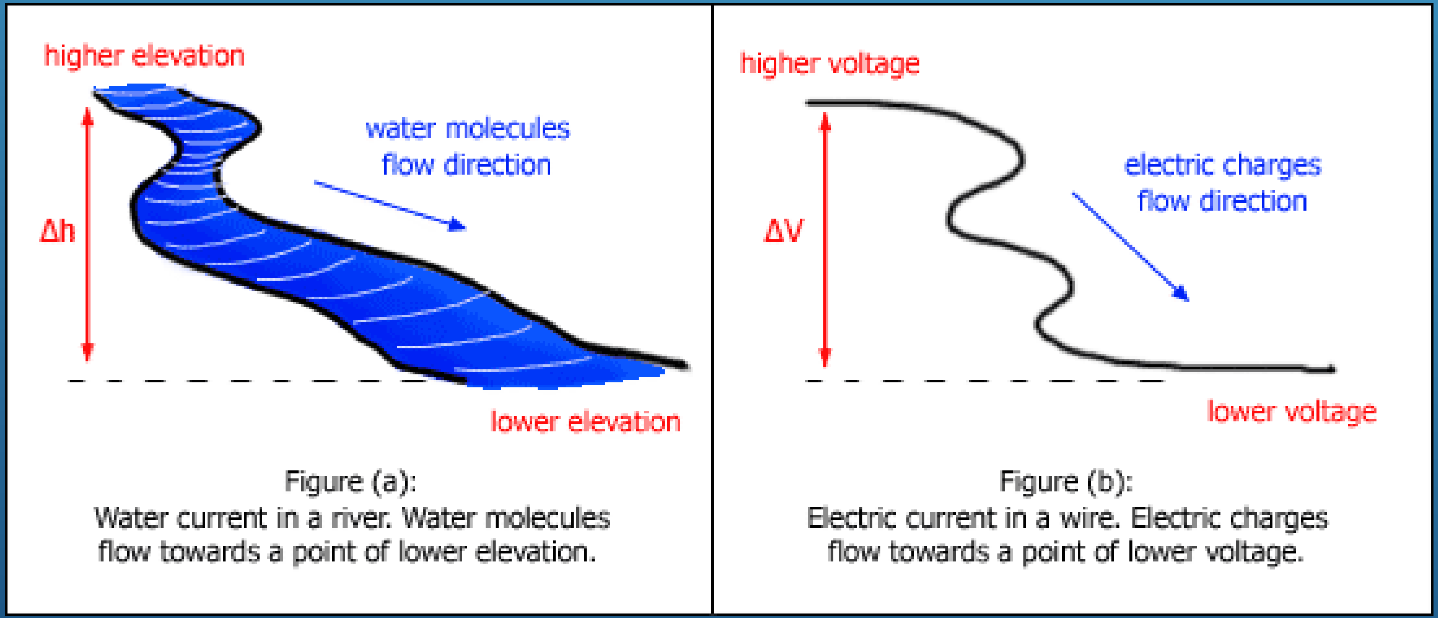
A. Voltage

B. Resistance

C. Capacitance

D. Current

THINK OF THIS IN TERMS OF WATER;
WHAT DO YOU CALL THE FLOW OF WATER?
CURRENT



T5A04
WHAT IS THE NAME FOR A CURRENT THAT FLOWS ONLY IN ONE DIRECTION?

A. Alternating current

B. Direct current

C. Normal current

D. Smooth current

Current that flows only in one direction is found primarily in circuits that use batteries as a power source; Cars, handheld devices, etc. There is a positive and a negative. This is referred to as *Direct Current*, or *DC*.

Compare that with the electricity and current in your house, which alternates directions -- *Alternating Current*. There is a "Hot" and a "Neutral", but Neutral is essentially just the ground that the electricity can flow to; the current alternates in a sine wave from negative to positive.

PREPPERNET

T5A05
WHAT IS THE ELECTRICAL TERM FOR THE ELECTROMOTIVE FORCE (EMF) THAT CAUSES ELECTRON FLOW?

A. Voltage

B. Ampere-hours

C. Capacitance

D. Inductance

PREPPERNET

Hard to add to what is already in this question, except possibly to explain what the incorrect questions actually mean.

Voltage, of course, is the electrical term for the Electromotive force that causes electron flow.

Capacitance refers to the ability to store energy in a capacitor, which will then oppose a change in voltage.

Inductance refers to the ability to store energy in a coil of wire, which will then oppose a change in current.

Ampere-hours is a term used to indicate the capacity of a battery -- a 50 ampere-hour battery should be able to provide 1 amp for 50 hours, or 50 amps for 1 hour.

Obviously, none of these other answers could refer to EMF.

PREPPERNET

T5A06
HOW MUCH VOLTAGE DOES A MOBILE TRANSCEIVER TYPICALLY REQUIRE?

A. About 12 volts

B. About 30 volts

C. About 120 volts

D. About 240 volts

PREPPERNET

Car batteries are about 12 volts (technically they are closer to 13.8 volts), and since mobile transceivers are most commonly used in a car they are designed to run at about that.

This is really convenient, because that means that if you get batteries for running your radio you can charge them by running your car.

PREPPERNET

T5A07
WHICH OF THE FOLLOWING IS A GOOD ELECTRICAL CONDUCTOR?

A. Glass

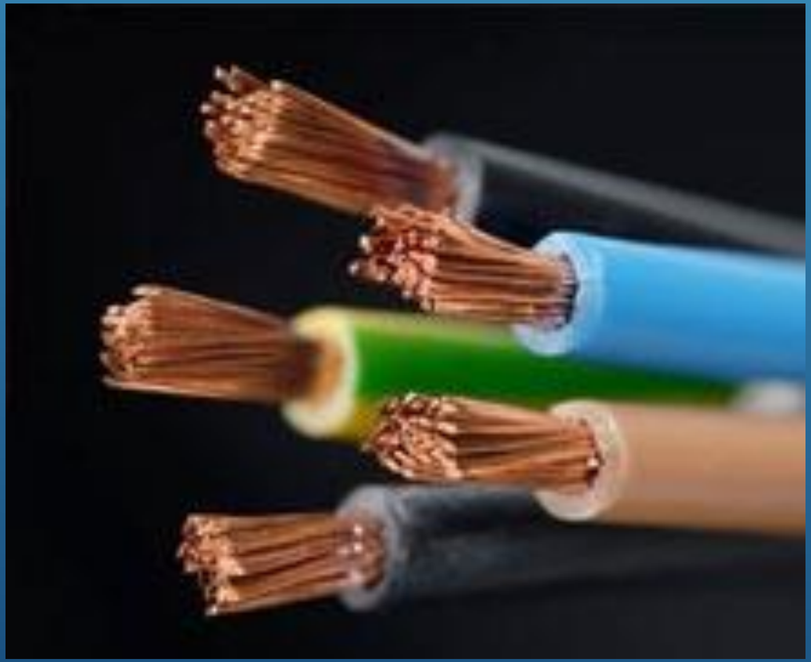
B. Wood

C. Copper

D. Rubber

As a general rule of thumb, metal tends to be a good conductor. Water can be (though technically it's the minerals in the water that makes it a good conductor -- salt water is a really good conductor, whereas distilled water is a fair insulator).

Most other things, and definitely glass, wood, and rubber, are insulators -- meaning that they don't conduct electricity.

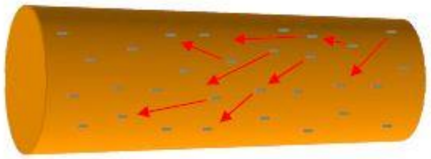


PREPPERNET

Conductors and Insulators

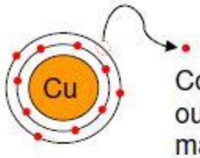
In a conductor, electric current can flow freely, in an insulator it cannot. Simply stated, most metals are good electrical conductors, most nonmetals are not. Metals are also generally good heat conductors while nonmetals are not.

Cross-section of copper wire



Neighboring electrons are repulsed by the motion of electrons, creating a chain reaction that propagates through the material at nearly the speed of light.

Copper's valence electrons move freely throughout the solid copper metal



Copper and other metals have a weak hold on their outer or "valence" electrons. Atoms of insulating materials have a tight grip on their outer electrons.

Conductors – Copper, Silver, Gold, Aluminum, Platinum, Steel, …

Insulators – Glass, Wood, Rubber, Air, Plastic …

Note: Salt water is a conductor, and so are you!

T5A08
WHICH OF THE FOLLOWING IS A GOOD ELECTRICAL INSULATOR?

A. Copper

B. Glass

C. Aluminum

D. Mercury

Most metals are good conductors; all of them conduct electricity to some extent. A conductor is something that electricity can flow through. An insulator is the opposite -- something that electricity either doesn't flow through or doesn't flow through very well.

- *if it's looking for a "conductor" look for something metallic;*
- *if it's looking for a "insulator", look for something non-metallic.*

In this case, glass is the only item listed that isn't a metal, so it's the insulator.

PREPPERNET

T5A09
WHAT IS THE NAME FOR A CURRENT THAT REVERSES DIRECTION ON A REGULAR BASIS?

A. Alternating current

B. Direct current

C. Circular current

D. Vertical current

There are two types of current that you need to worry about. The kind in your house is called Alternating Current, because the current alternates (reverses) direction over time (60 times per second in the US, or 60 Hz; that's 60 times that it goes from positive to negative and back).

The RMS (Root Mean Square) voltage of AC in the US is 110 volts, and we use that because it can be sent over longer distances with less loss than the other type, Direct Current.

The most common use of Direct Current, which always goes the same direction, is circuits powered by a battery, such as a car. Battery systems vary in voltage, but most often in Ham Radio (and in cars) they are 12 volts.

The other two options listed here are just to throw you off.

PREPPERNET

T5A10
WHICH TERM DESCRIBES THE RATE AT WHICH ELECTRICAL ENERGY IS USED?

A. Resistance

B. Current

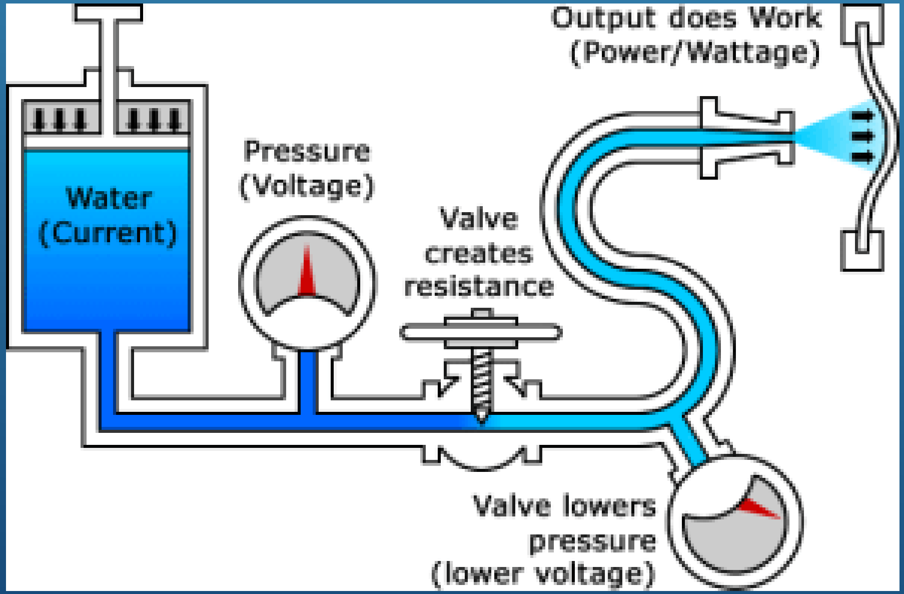
C. Power

D. Voltage

PREPPERNET

Power is the product of the electric current at a specified amount of electromotive force. If you use a water analogy, Current could be seen as the diameter of the hose, where voltage is the amount of force available to push it through. Power would be the actual amount of water that gets through the pipe. If you want more water to go through the pipe, you can either apply more force (voltage) or make the pipe bigger (current).

Resistance is the opposition to the current flow, so it definitely could not be considered a viable answer.



PREPPERNET

T5A11
WHAT IS THE UNIT OF ELECTROMOTIVE FORCE?

A. The volt

B. The watt

C. The ampere

D. The ohm

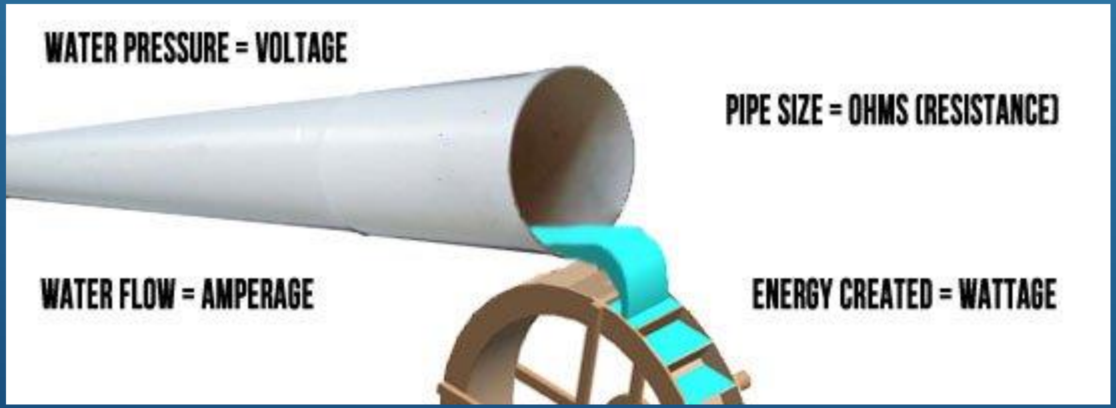
One way to think about electricity in general is the comparison to a water pipe.

__Volts__ = The pressure (e.g. how much "force" does the river have). Also known as the electromotive force. How much the electron wants to move in the wire.

__Amps__ = how much water is actually flowing through the pipe. Number of electrons moving at once.

*__Watts__ = The total amount of usable water energy the pipe contains. Volts * amps = watts*

Thus, as long as you know any two of these items (Amps, Volts, of Watts), you can figure out the third.



PREPPERNET

T5A12
WHAT DESCRIBES THE NUMBER OF TIMES PER SECOND THAT AN ALTERNATING CURRENT MAKES A COMPLETE CYCLE?

A. Pulse rate

B. Speed

C. Wavelength

D. Frequency

Just remember, the "Frequency" determines how "frequently" the current reverses direction.

Another way to remember is to analyze unit of each term:

- *Pulse rate (beat per second)*
- *Speed (meter per second)*
- *Wavelength (meter)*
- *Frequency (time per second, or Hz)*

PREPPERNET

T5A13
IN WHICH TYPE OF CIRCUIT IS CURRENT THE SAME THROUGH ALL COMPONENTS?

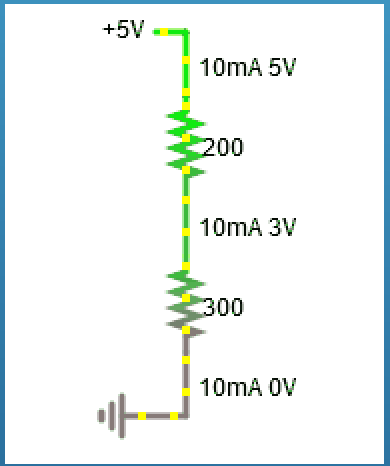
A. Series

B. Parallel

C. Resonant

D. Branch

In series current is the same through all components.



The voltage is not the same everywhere in this series <u>but the current is</u>!

Easy way to remember the difference between series and parallel, is parallel is like train tracks they run side by side. Series is like a movie series, one episode after another.

T5A14
IN WHICH TYPE OF CIRCUIT IS VOLTAGE THE SAME ACROSS ALL COMPONENTS?

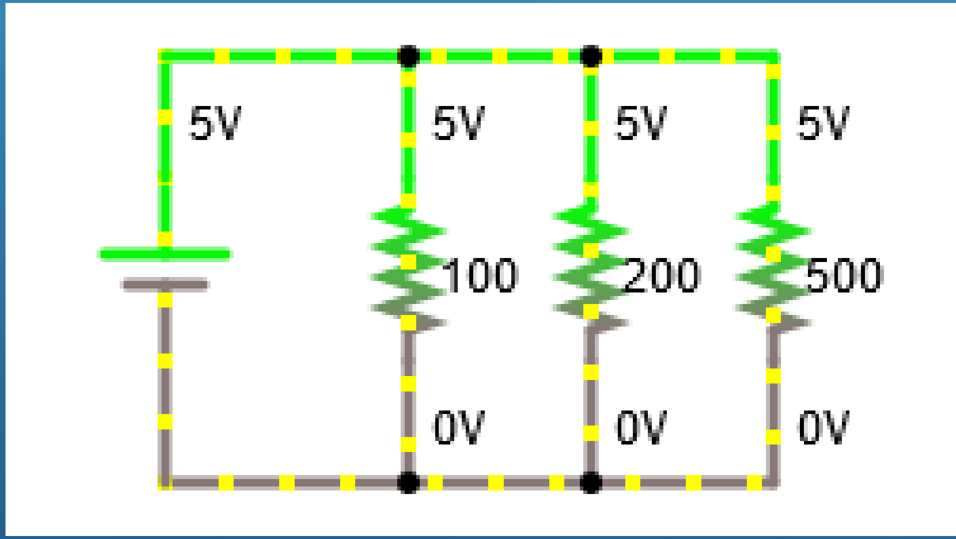
A. Series

B. Parallel

C. Resonant

D. Branch

Notice the green is the same across all components. There is full source voltage on one side and no voltage on the other, but voltage is the same across all components because they're in parallel.



T5B01
HOW MANY MILLIAMPERES IS 1.5 AMPERES?

A. 15 milliamperes

B. 150 milliamperes

C. 1500 milliamperes

D. 15,000 milliamperes

The prefix "milli" means "one thousandth", so move the decimal to the right 3 places (or multiply by 1000) to go from amperes to milliamperes.

$$1.5 \times 1000 = 1{,}500$$

A quick way to check each answer is to remember that to convert milliamps to amps, just change the comma to a decimal point. 1,500mA=1.500A

- Extensive table to right
- Most useful prefixes are:
  - Mega = 1,000,000
  - Kilo = 1,000
  - Milli = 1/1,000
  - Micro = 1/1,000,000
  - Pico = 1/1,000,000,000,000 (one trillionth)

Table 2-1
International System of Units (SI)—Metric Units

Prefix	*Symbol*	*Multiplication Factor*
Tera	T	10^{12} = 1,000,000,000,000
Giga	G	10^{9} = 1,000,000,000
Mega	M	10^{6} = 1,000,000
Kilo	k	10^{3} = 1000
Hecto	h	10^{2} = 100
Deca	da	10^{1} = 10
Deci	d	10^{-1} = 0.1
Centi	c	10^{-2} = 0.01
Milli	m	10^{-3} = 0.001
Micro	μ	10^{-6} = 0.000001
Nano	n	10^{-9} = 0.000000001
Pico	p	10^{-12} = 0.000000000001

T5B02
WHAT IS ANOTHER WAY TO SPECIFY A RADIO SIGNAL FREQUENCY OF 1,500,000 HERTZ?

A. 1500 kHz

B. 1500 MHz

C. 15 GHz

D. 150 kHz

PREPPERNET

Pay attention when you get these questions; approximately 30% of applicants who saw this question over a 2 year period answered 1500 MHz instead of 1500 kHz, and I'm pretty sure that they actually did know how to do the conversion. It would of course be 1.5 MHz, but it is certainly not 1500 MHz.

1,000 Hz=1 kHz
1,500,000 Hz1 kHz =1500 kHz

T5B03
HOW MANY VOLTS ARE EQUAL TO ONE KILOVOLT?

A. One one-thousandth of a volt

B. One hundred volts

C. One thousand volts

D. One million volts

The prefix "<u>kilo</u>", commonly used in all metric forms of measurement, means "thousand". Thus, a "kilovolt" is a thousand volts.

Metric Conversion

King	Henry	Died	Unusually	Drinking	Chocolate	Milk
Kilo 10 x 10 x 10 x LARGER than a unit 1 kilo = 1,000 units	Hecto 10 x 10 x LARGER than a unit 1 hecto = 100 units	Deca 10 x LARGER than a unit 1 deca = 10 units	* Unit * ***Meter*** *(length)* ***Liter*** *(liquid volume)* ***Gram*** *(mass/weight)* **1 unit**	Deci 10 x SMALLER than a unit 10 deci = 1 unit	Centi 10 x 10 x SMALLER than a unit 100 centi = 1 unit	Milli 10 x 10 x 10 x SMALLER than a unit 1,000 milli = 1 unit
km = kilometer kL = kiloliter kg = kilogram	hm = hectometer hL = hectoliter hg = hectogram	dam = decameter daL = decaliter dag = decagram	m = meter L = liter g = gram	dm = decimeter dL = deciliter dg = decigram	cm = centimeter cL = centiliter cg = centigram	mm = millimeter mL = milliliter mg = milligram
Example: 5 kilo	50 hecto	500 deca	5,000 units	50,000 deci	500,000 centi	5,000,000 milli

← DIVIDE numbers by 10 if you are getting bigger (same as moving decimal point one space to the left)

MULTIPLY numbers by 10 if you are getting smaller (same as moving decimal point one space to the right) →

T5B04
HOW MANY VOLTS ARE EQUAL TO ONE MICROVOLT?

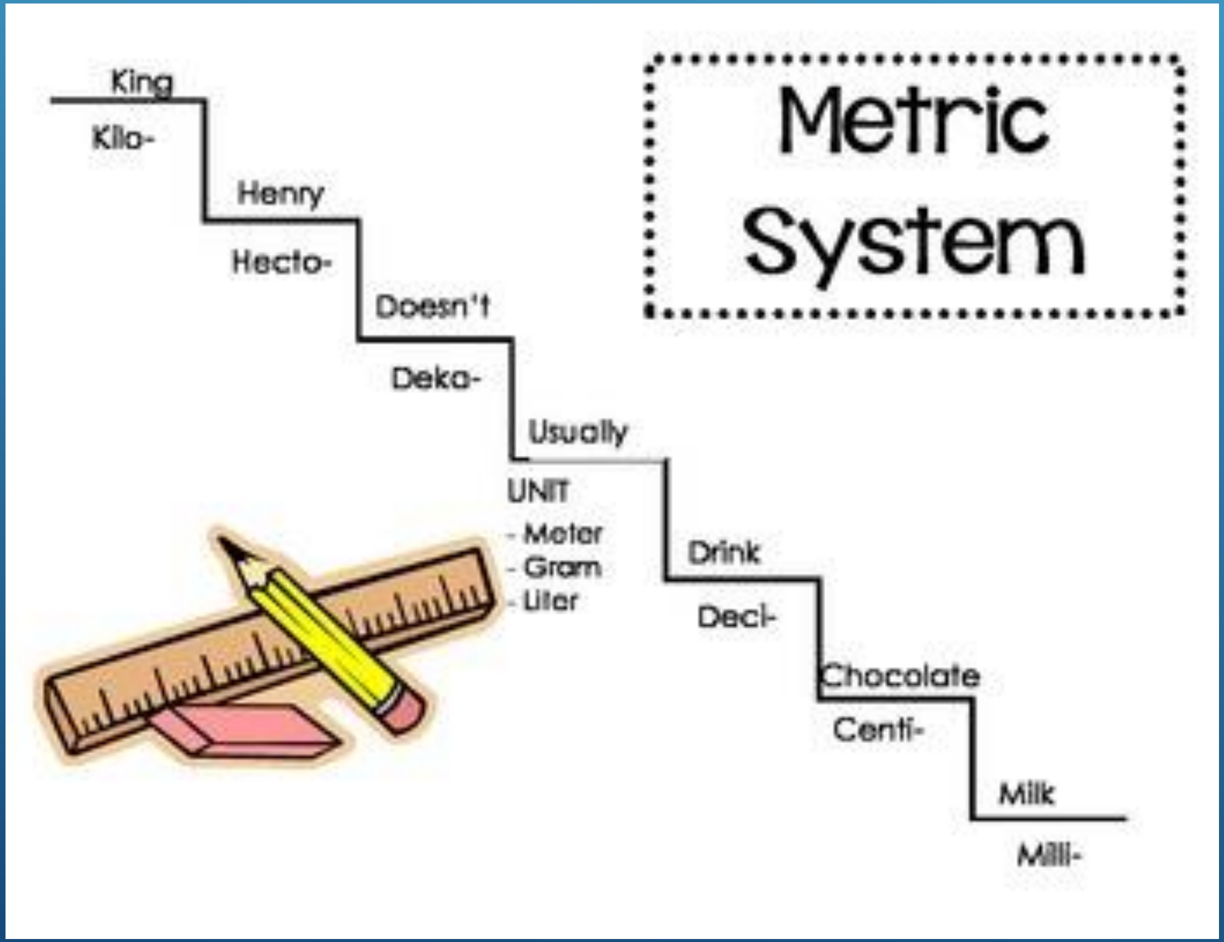
A. One one-millionth of a volt

B. One million volts

C. One thousand kilovolts

D. One one-thousandth of a volt

"<u>micro</u>" is a prefix in the metric system meaning "one-millionth". Thus, a microvolt is one millionth $\frac{1}{1,000,000}$ of a volt



T5B05
WHICH OF THE FOLLOWING IS EQUAL TO 500 MILLIWATTS?

A. 0.02 watts

B. 0.5 watts

C. 5 watts

D. 50 watts

PREPPERNET

1000 milliwatts = 1 watt (remember that there are 10 mm in 1 cm and 100 cm in a meter; or 1000 millimeters in a meter)

1000 milliwatts = 1 watt

$$\frac{500}{1000} = 0.5 \text{ watts}$$

PREPPERNET

T5B06
IF AN AMMETER CALIBRATED IN AMPERES IS USED TO MEASURE A 3000-MILLIAMPERE CURRENT, WHAT READING WOULD IT SHOW?

A. 0.003 amperes

B. 0.3 amperes

C. 3 amperes

D. 3,000,000 amperes

Remember your standard metrics; the ammeter is reading amperes, so 1000 milliamperes is 1ampere, and 3000 milliamperes is 3 amperes.

Milliamp (milliampere) = $\frac{1}{1{,}000}$ of amp (ampere)

System of Metric Units

Tera	T	10^{12}	1,000,000,000,000
Giga	G	10^{9}	1,000,000,000
Mega	M	10^{6}	1,000,000
Kilo	k	10^{3}	1,000
Basic Unit		10^{0}	1
Milli	m	10^{-3}	0.001
Micro	μ	10^{-6}	0.000001
Nano	n	10^{-9}	0.000000001
Pico	p	10^{-12}	0.000000000001

T5B07
IF A FREQUENCY DISPLAY CALIBRATED IN MEGAHERTZ SHOWS A READING OF 3.525 MHZ, WHAT WOULD IT SHOW IF IT WERE CALIBRATED IN KILOHERTZ?

A. 0.003525 kHz

B. 35.25 kHz

C. 3525 kHz

D. 3,525,000 kHz

PREPPERNET

MHz is 1,000 times more than kHz or…

1 MHz=1,000 kHz

M is Mega = 10^6

k is Kilo = 10^3

Therefore: $\frac{3.525\ MHz\ x\ 1000\ kHz}{1\ MHz}$ ***= 3525 kHz***

Since we are multiplying by 1, we do not change the value of what is represented.

PREPPERNET

T5B08
HOW MANY MICROFARADS ARE EQUAL TO 1,000,000 PICOFARADS?

A. 0.001 microfarads

B. 1 microfarad

C. 1000 microfarads

D. 1,000,000,000 microfarads

PREPPERNET

Remember the order of your metric units!

1 farad = 1,000 millifarads (mF)

1 millifarad = 1,000 microfarads (μF)

1 microfarad = 1,000 nanofarads (nF)

1 nanofarad = 1,000 picofarads (pF)

Therefore 1,000,000 picofarads = 1,000 nanofarads = 1 microfarad

Or group using decimals: 1,000,000pF×.000000000001F/pF pF cancels out and you get .000001F=1μF

And if you're feeling scientific use exponents: 106pF = 106×10−12F = 106−12F = 10−6F=1μF

Metric Conversion

King	Henry	Died	Unusually	Drinking	Chocolate	Milk
Kilo 10 x 10 x 10 x LARGER than a unit 1 kilo = 1,000 units	Hecto 10 x 10 x LARGER than a unit 1 hecto = 100 units	Deca 10 x LARGER than a unit 1 deca = 10 units	* Unit * ***Meter*** *(length)* ***Liter*** *(liquid volume)* ***Gram*** *(mass/weight)* **1 unit**	Deci 10 x SMALLER than a unit 10 deci = 1 unit	Centi 10 x 10 x SMALLER than a unit 100 centi = 1 unit	Milli 10 x 10 x 10 x SMALLER than a unit 1,000 milli = 1 unit
km = kilometer kL = kiloliter kg = kilogram	hm = hectometer hL = hectoliter hg = hectogram	dam = decameter daL = decaliter dag = decagram	m = meter L = liter g = gram	dm = decimeter dL = deciliter dg = decigram	cm = centimeter cL = centiliter cg = centigram	mm = millimeter mL = milliliter mg = milligram
Example: 5 kilo	50 hecto	500 deca	5,000 units	50,000 deci	500,000 centi	5,000,000 milli

DIVIDE numbers by 10 if you are getting bigger (same as moving decimal point one space to the left)

MULTIPLY numbers by 10 if you are getting smaller (same as moving decimal point one space to the right)

T5B09

WHAT IS THE APPROXIMATE AMOUNT OF CHANGE, MEASURED IN DECIBELS (DB), OF A POWER INCREASE FROM 5 WATTS TO 10 WATTS?

A. 2 dB

B. 3 dB

C. 5 dB

D. 10 dB

PREPPERNET

When dealing with decibels, every 3dB of gain doubles the power, and every 3dB of loss halves it. So, 5 watts to 10 watts is twice the power, so it is 3dB. 5 watts to 20 watts would be four times the power, or 2×2×P (where P is power), or 6dB. 9dB would be 40 watts, 12dB would be 80 watts, etc.

Similarly, −3dB would be 2.5 watts, since −3dB is half the power, and −6dB would be half of that, −9dB half of that, etc.

PREPPERNET

T5B10
WHAT IS THE APPROXIMATE AMOUNT OF CHANGE, MEASURED IN DECIBELS (DB), OF A POWER DECREASE FROM 12 WATTS TO 3 WATTS?

A. -1 dB

B. -3 dB

C. -6 dB

D. -9 dB

PREPPERNET

When dealing with decibels, every 3dB of gain doubles the power, and every 3dB of loss halves it. So, 5 watts to 10 watts is twice the power, so it is 3dB. 5 watts to 20 watts would be four times the power, or 2×2×P (where P is power), or 6dB. 9dB would be 40 watts, 12dB would be 80 watts, etc.

Similarly, −3dB would be 2.5 watts, since −3dB is half the power, and −6dB would be half of that, −9dB half of that, etc.

Decibels

- The decibel (dB) is used to compare two power levels using a logarithmic scale
- Calculating in decibels (dB) is the same as using logarithms
  - Adding/subtracting logarithms of numbers is equivalent to multiplying or dividing by the numbers
- A ratio of 2:1 is a difference of 3 dB
- A ratio of 10:1 is a difference of 10 dB
- Examples:
  - 3 dB + 3 dB = 6dB is the same as 2 x 2 or 4:1
  - 3 dB + 10 dB = 13 dB is the same as 2 x 10 or 20:1
  - 10 dB + 10 dB + 10 dB = 30 dB is the same as 10 x 10 x 10 or 1000:1

T5B11
WHAT IS THE AMOUNT OF CHANGE, MEASURED IN DECIBELS (DB), OF A POWER INCREASE FROM 20 WATTS TO 200 WATTS?

A. 10 dB

B. 12 dB

C. 18 dB

D. 28 dB

PREPPERNET

Every 3dB of gain doubles the power

Every −3dB of gain (or 3dB of loss) halves it.

So, looking at this, 3dB of gain would be 20×2=40.

6dB would be 20×2∗2=80.

9dB would be 20×2×2×2=160

12dB would be 20×2×2×2×2=320, which is too high,

so you know it isn't 12 but it's more than 9; it must be 10

PREPPERNET

T5B12
WHICH OF THE FOLLOWING FREQUENCIES IS EQUAL TO 28,400 KHZ?

A. 28.400 MHz

B. 2.800 MHz

C. 284.00 MHz

D. 28.400 kHz

To convert kHz to Mhz, move the decimal point three positions to the left.

With 28,400 KHz the decimal point is assumed to be all the way to the right of 28400.

So to begin with, we have 28400. kHz (I took out the comma and put in the trailing decimal point to make it easier to see what's going on).

So moving the decimal point three positions to the left, it ends up between the 28 and the 400, so 28.400 MHz.

T5B13
IF A FREQUENCY DISPLAY SHOWS A READING OF 2425 MHZ, WHAT FREQUENCY IS THAT IN GHZ?

A. 0.002425 GHz

B. 24.25 GHz

C. 2.425 GHz

D. 2425 GHz

To convert from MHz to GHz, move the decimal point three positions to the left.

Starting with 2425.0 MHz, move the decimal point three positions to the left, ending up between the 2 and 425, so 2.425 GHz.

T5C01
WHAT IS THE ABILITY TO STORE ENERGY IN AN ELECTRIC FIELD CALLED?

A. Inductance

B. Resistance

C. Tolerance

D. Capacitance

A capacitor is a passive component that consists of at least one pair of conductors separated by a dielectric (an insulator). When voltage is applied to the capacitor (creating a difference in potential between the two) it creates an electric field across the dielectric which stores energy.

The easiest way for me to remember these is that an inductor, being a coil of wire, is used to create an electromagnet (you can make an electromagnet by wrapping a coil of insulated wire around a nail, for example), and so an inductor stores energy in a magnetic field. The capacitor stores energy in an electric field.

What is the ability to store energy in a MAGNETIC field called? Inductance

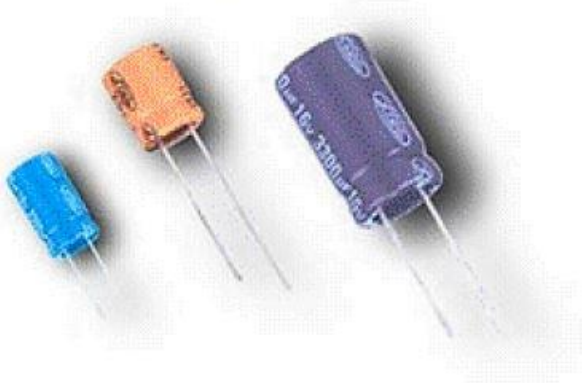
What is the ability to store energy in an ELECTRIC field called? Capacitance

Capacitors

Capacitor

Air Variable Capacitor

Ceramic capacitors (cheap)



Electrolytic capacitors (polarized, high capacity)

Capacitors are conductive plates separated by an insulator and stores energy in an electric field (electrostatically)

T5C02
WHAT IS THE BASIC UNIT OF CAPACITANCE?

A. The farad

B. The ohm

C. The volt

D. The henry

The basic unit of capacitance, the Farad, is named for the physicist Michael Faraday.

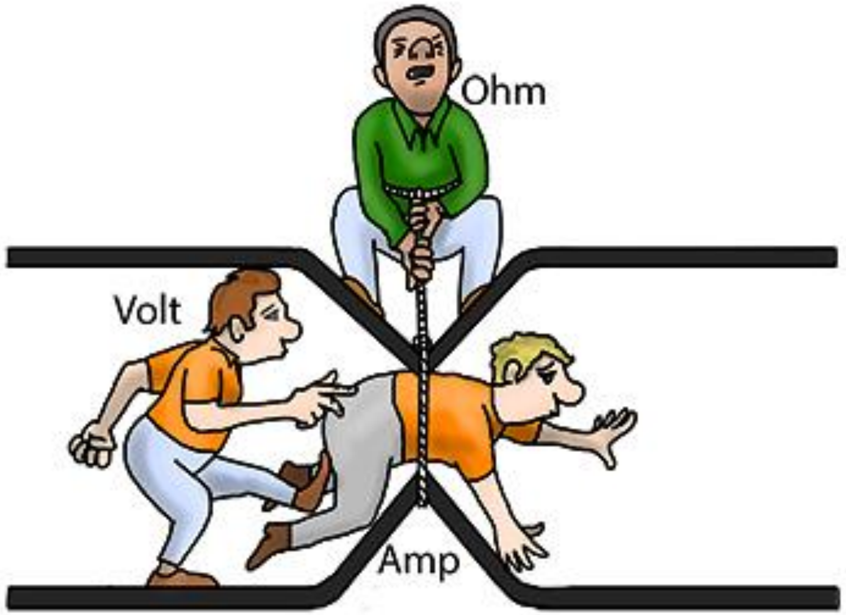
The other units listed here are:

Volt - basic unit of voltage

Ohm - basic unit of resistance

Henry - basic unit of inductance

PREPPERNET



Quantity	Symbol	Unit of Measurement	Unit Abbreviation
Current	I	Ampere (Amp)	A
Voltage	V or E	Volt	V
Resistance	R	Ohm	Ω

PREPPERNET

T5C03
WHAT IS THE ABILITY TO STORE ENERGY IN A MAGNETIC FIELD CALLED?

A. Admittance

B. Capacitance

C. Resistance

D. Inductance

An inductor is a coil of wire, usually around a non-ferrite (nonmagnetic) core.

The basic unit of inductance is the henry.

Whenever you make a coil of wire, it creates a magnetic field; think of an electromagnet, which is basically an inductor with a ferrite core. The ability to store energy in such a field is Inductance. So remember -- inductance creates a magnetic field.

Capacitance has a very similar (and in fact opposite) effect to an inductor and creates an electric field.

PREPPERNET

Inductors

Inductors are generally coils of wire that store energy in a magnetic field

T5C04
WHAT IS THE BASIC UNIT OF INDUCTANCE?

A. The coulomb

B. The farad

C. The henry

D. The ohm

PREPPERNET

An inductor is a passive electrical component that stores energy in a magnetic field; its unit is the henry, which is named for Joseph Henry.

The other (incorrect) answers here are:

Coulomb - unit of electric charge

Farad - unit of capacitance

Ohm - unit of resistance

PREPPERNET

Another quick memory tool is to remember Henry the Duck…

PREPPERNET

T5C05
WHAT IS THE UNIT OF FREQUENCY?

A. Hertz

B. Henry

C. Farad

D. Tesla

Hertz is the standard unit for frequency, as used in the SI unit system.

It is defined as the number of cycles per second of something periodic.

For example a clock ticks at 1Hz. The wall outlet AC is set to 60Hz.

The unit is named after Heinrich Hertz.

The other (incorrect) answers here are:

Farad - unit of capacitance

Henry - unit of inductance

Tesla - unit of magnetic field strength.

PREPPERNET

T5C06
WHAT DOES THE ABBREVIATION “RF” REFER TO?

A. Radio frequency signals of all types

B. The resonant frequency of a tuned circuit

C. The real frequency transmitted as opposed to the apparent frequency

D. Reflective force in antenna transmission lines

PREPPERNET

RF is "Radio Frequency"

it's not reflected force or any of these other choices.

Just learn this one.

T5C07
A RADIO WAVE IS MADE UP OF WHAT TYPE OF ENERGY?

A. Pressure

B. Electromagnetic

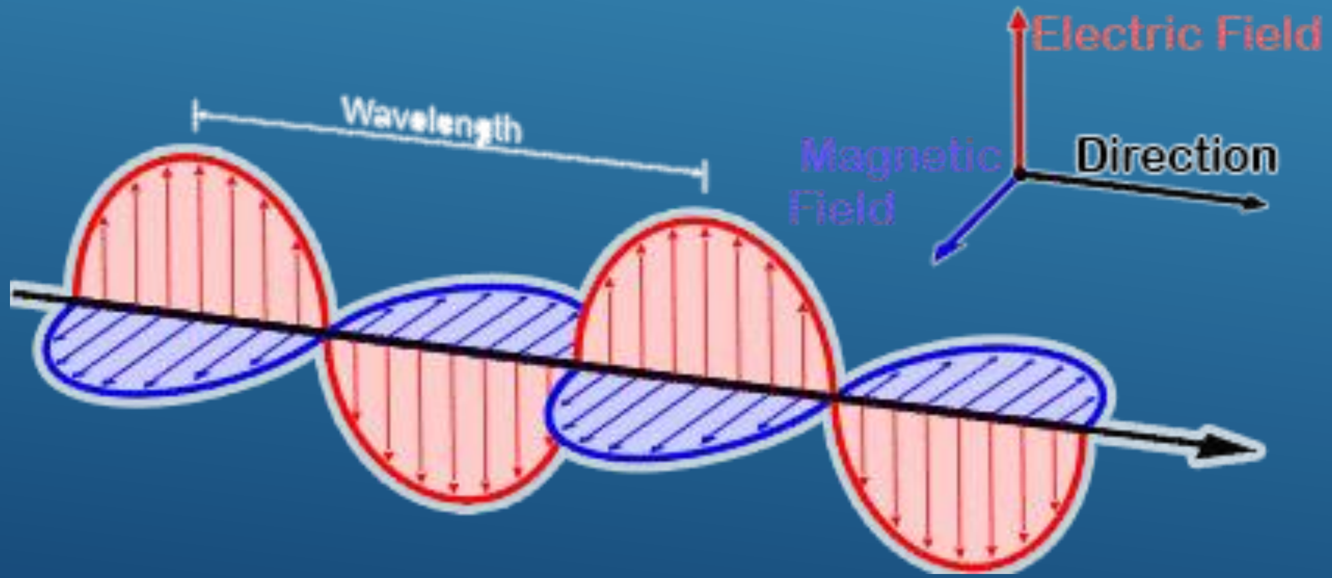
C. Gravity

D. Thermal

Radio waves are a type of electromagnetic (EM) radiation with wavelengths in the electromagnetic spectrum longer than infrared light.

Radio waves have frequencies as high as 300 GHz to as low as 3 kHz, though some definitions describe waves above 1 or 3 GHz as microwaves, or include waves of any lower frequency.

EM waves are made up of magnetic field and electric field oscillations in phase with each other, but their direction is perpendicular.



PREPPERNET

T5C08
WHAT IS THE FORMULA USED TO CALCULATE ELECTRICAL POWER IN A DC CIRCUIT?

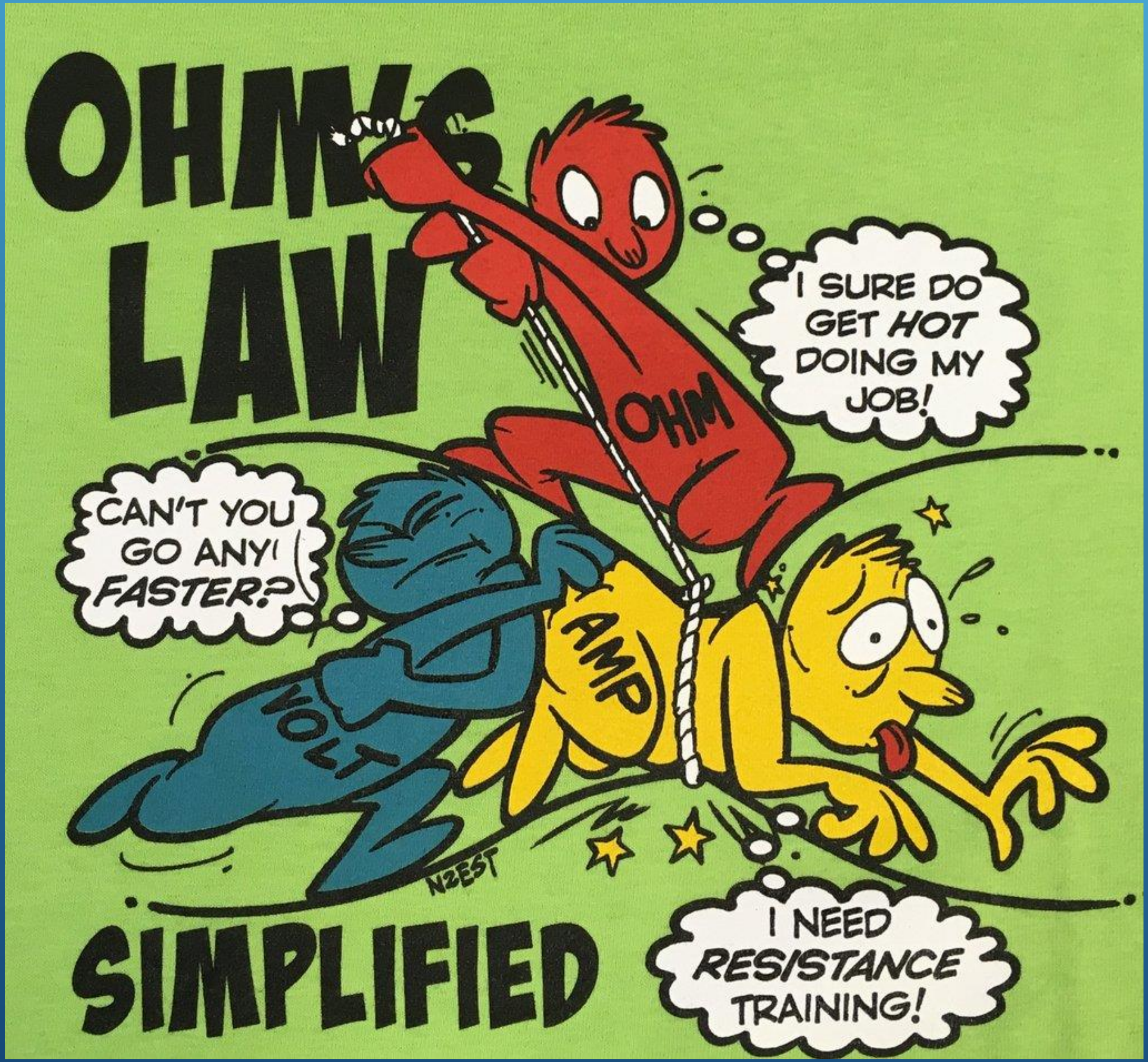
A. Power (P) equals voltage (E) multiplied by current (I)

B. Power (P) equals voltage (E) divided by current (I)

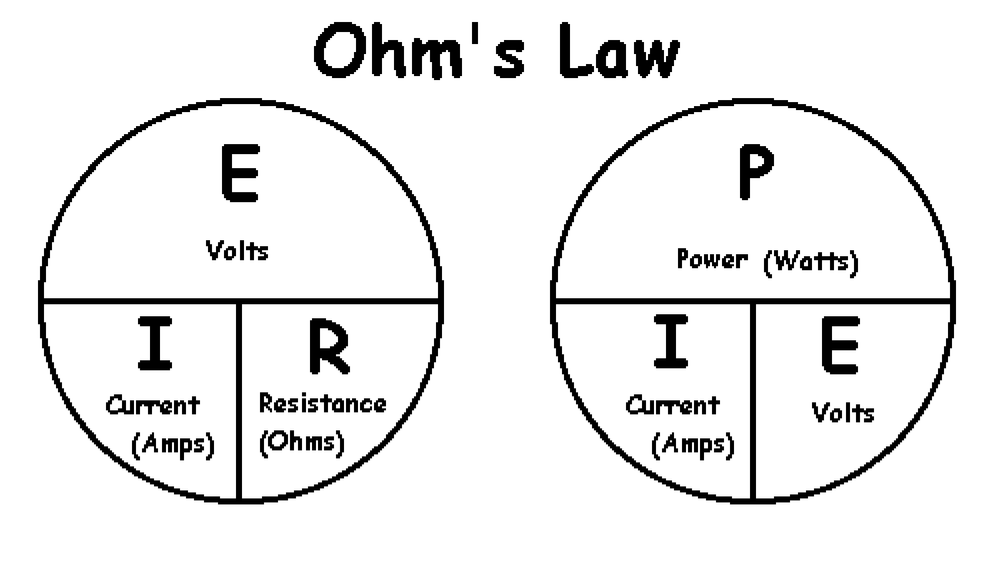
C. Power (P) equals voltage (E) minus current (I)

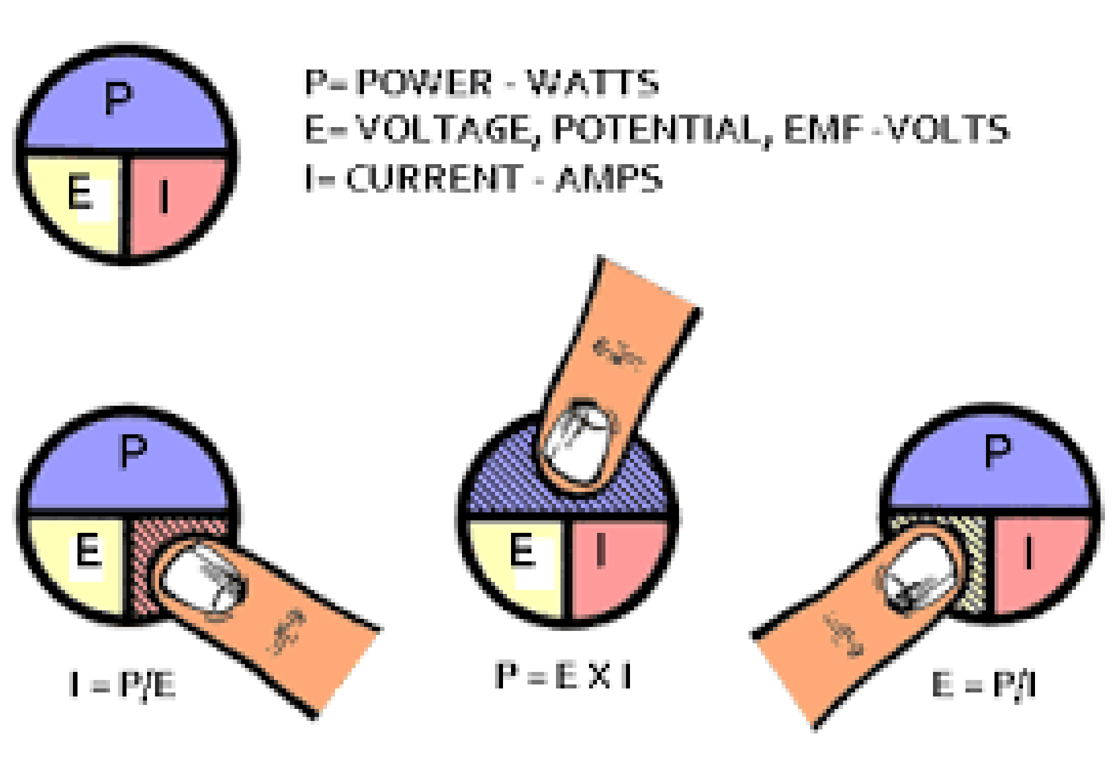
D. Power (P) equals voltage (E) plus current (I)

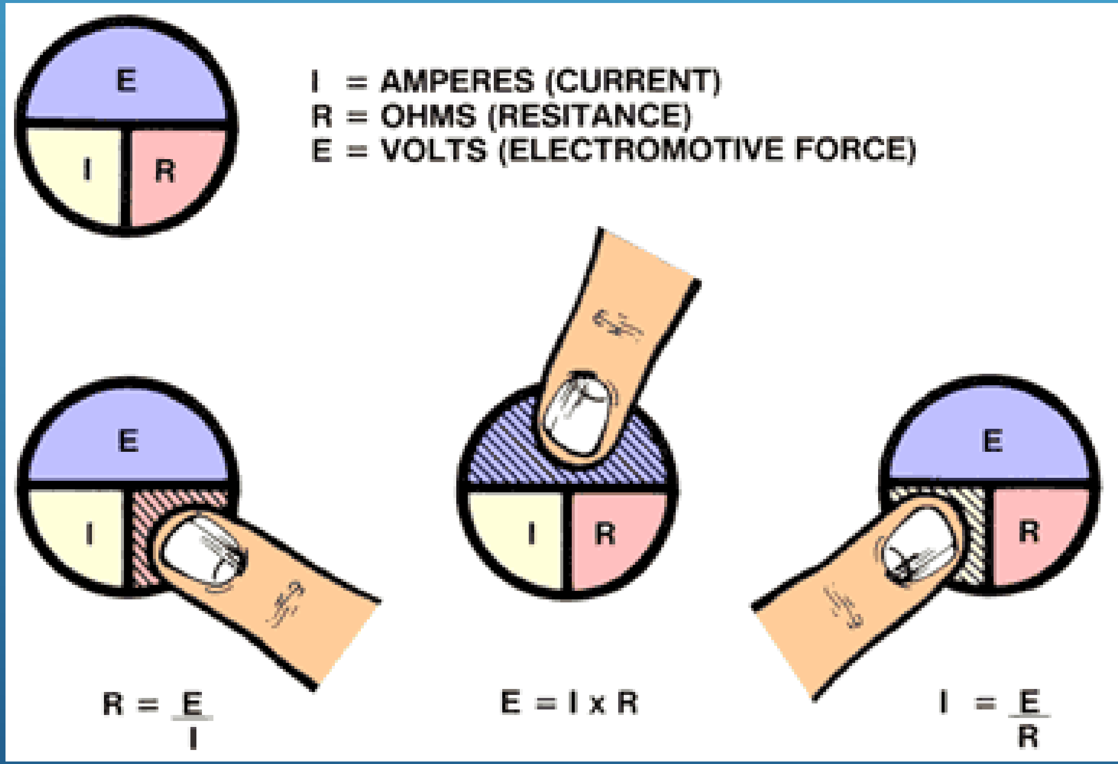
PREPPERNET


OHM'S LAW
I SURE DO GET HOT DOING MY JOB!
OHM
CAN'T YOU GO ANY FASTER?
AMP
VOLT
NZEST
SIMPLIFIED
I NEED RESISTANCE TRAINING!

PREPPERNET


Ohm's Law
E
Volts
I
Current
(Amps)
R
Resistance
(Ohms)
P
Power (Watts)
I
Current
(Amps)
E
Volts


P
E
I
P= POWER - WATTS
E= VOLTAGE, POTENTIAL, EMF -VOLTS
I= CURRENT - AMPS
I = P/E
P = E X I
E = P/I


E
I
R
I = AMPERES (CURRENT)
R = OHMS (RESITANCE)
E = VOLTS (ELECTROMOTIVE FORCE)
R = E/I
E = I x R
I = E/R

PREPPERNET

T5C09
HOW MUCH POWER IS BEING USED IN A CIRCUIT WHEN THE APPLIED VOLTAGE IS 13.8 VOLTS DC AND THE CURRENT IS 10 AMPERES?

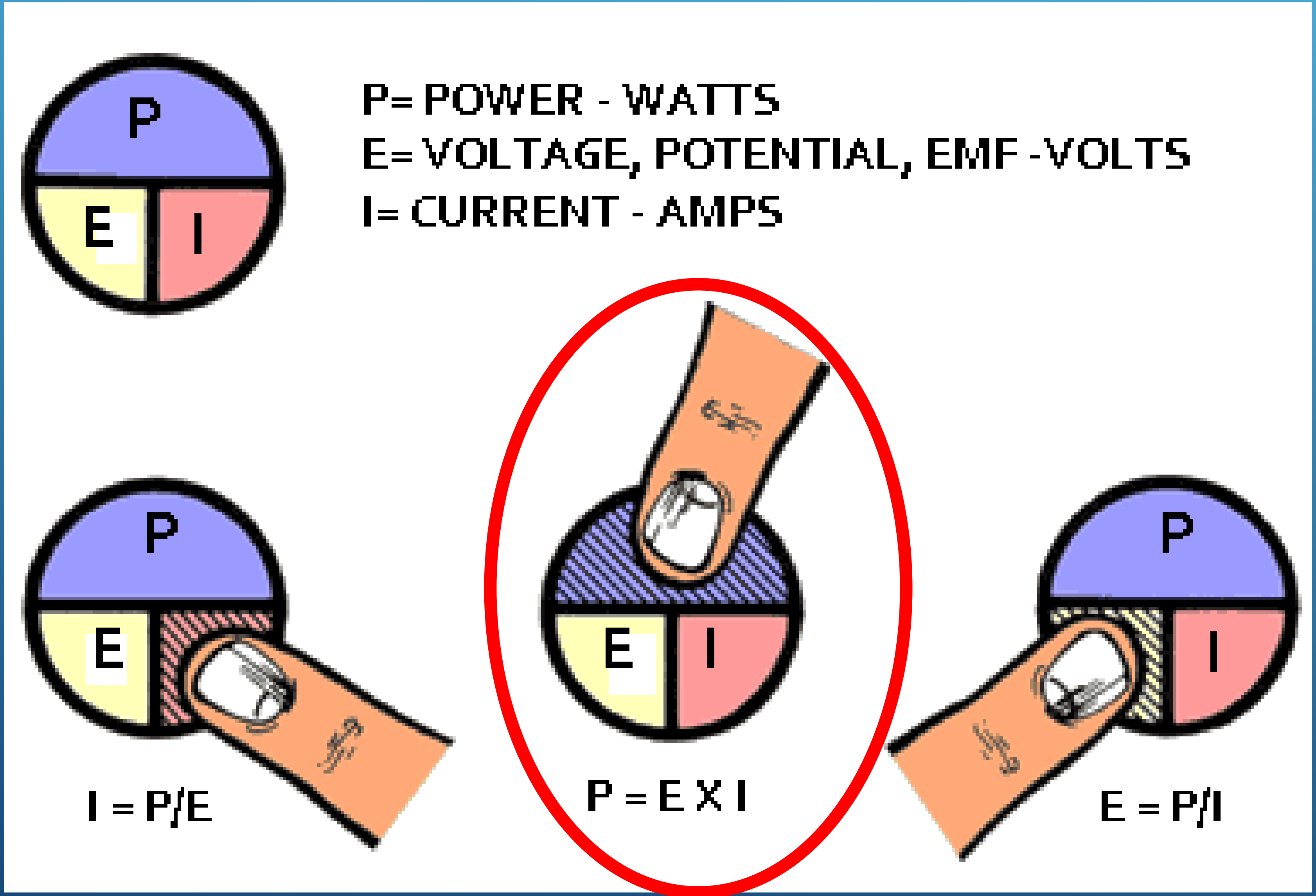
A. 138 watts

B. 0.7 watts

C. 23.8 watts

D. 3.8 watts

PREPPERNET



P = E X I

WATTS = VOLTS X AMPS

P (WATTS) = 13.8V X 10A

P = 138 W

PREPPERNET

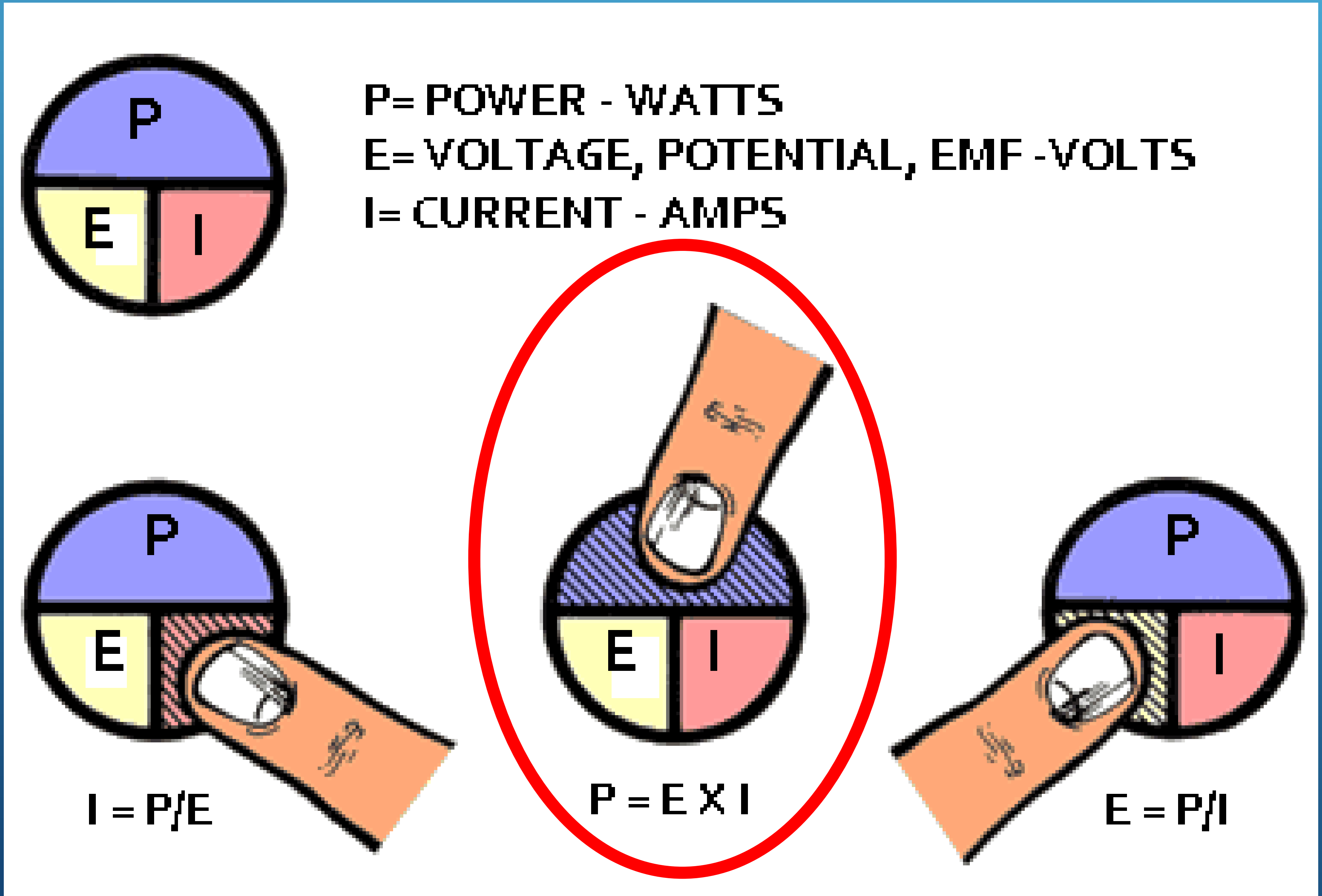
T5C10
HOW MUCH POWER IS BEING USED IN A CIRCUIT WHEN THE APPLIED VOLTAGE IS 12 VOLTS DC AND THE CURRENT IS 2.5 AMPERES?

A. 4.8 watts

B. 30 watts

C. 14.5 watts

D. 0.208 watts



P = E X I

WATTS = VOLTS X AMPS

P (WATTS) = 12V X 2.5A

P = 30 W

PREPPERNET

T5C11
HOW MANY AMPERES ARE FLOWING IN A CIRCUIT WHEN THE APPLIED VOLTAGE IS 12 VOLTS DC AND THE LOAD IS 120 WATTS?

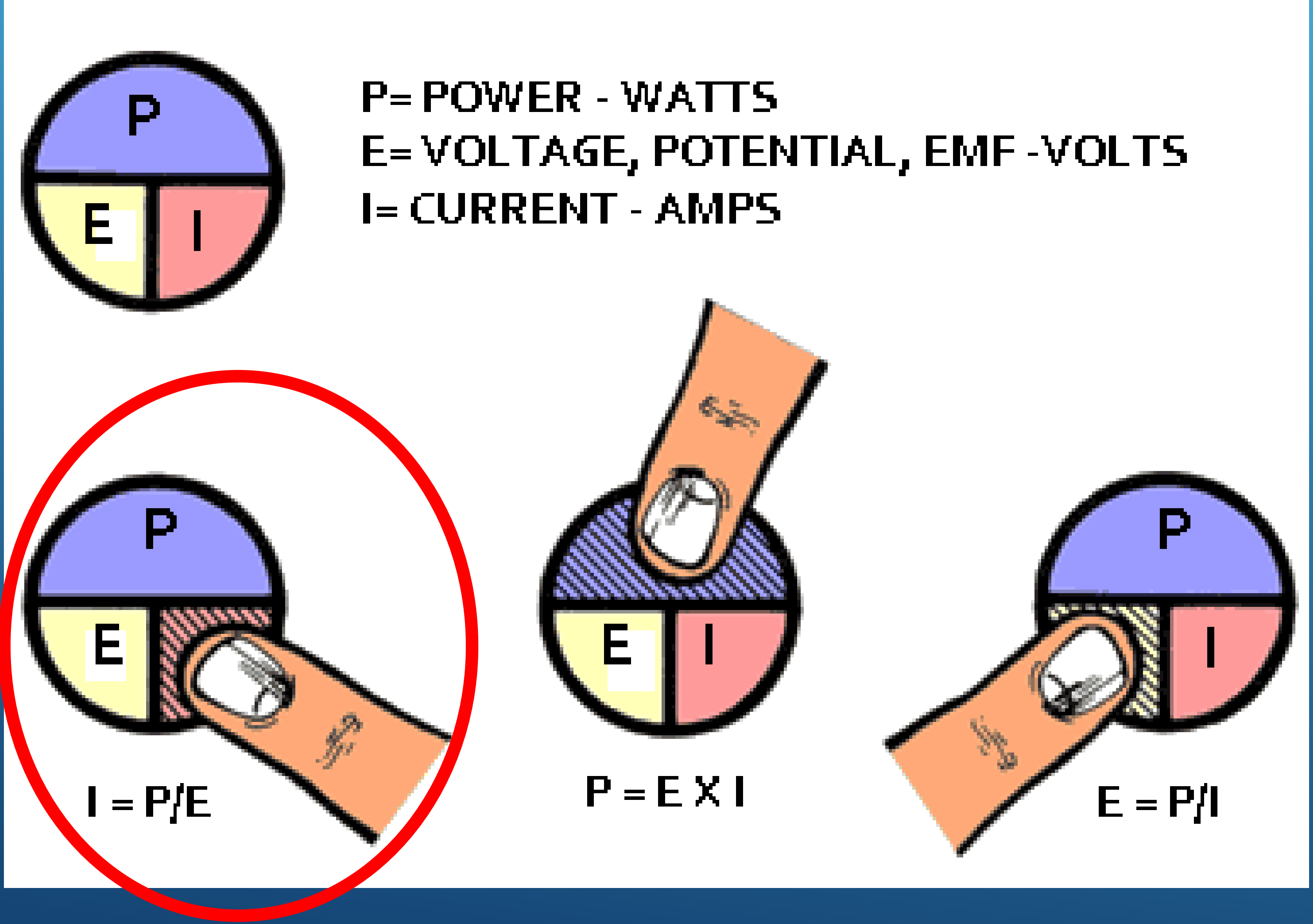
A. 0.1 amperes

B. 10 amperes

C. 12 amperes

D. 132 amperes

PREPPERNET



$$I\ (AMPS) = \frac{P\ (WATTS)}{E\ (VOLTS)}$$

$$I\ (AMPS) = \frac{120W}{12V}$$

I = 10A

PREPPERNET

T5C12
WHAT IS IMPEDANCE?

A. A measure of the opposition to AC current flow in a circuit

B. The inverse of resistance

C. The Q or Quality Factor of a component

D. The power handling capability of a component

PREPPERNET

The inverse of resistance is conductance (the measure is the Mho - can you see how this is related to Ohm?). So that's not the answer.

The measure of Q is something covered on the General and Extra exams - it's too deep for the Technician exam. So that's not the answer.

Power handling capability? Power is measured in Watts, so the power handling capability would be measured in Watts. Components are certainly rated in things like Watts and Volts and even Amps, but none of those things are called impedance. So that's not the answer.

And that leaves "It is a measure of the opposition to AC current flow in a circuit."

Impedance, incidentally, is measured in Ohms.

T5C13
WHAT IS A UNIT OF IMPEDANCE?

A. Volts

B. Amperes

C. Coulombs

D. Ohms

PREPPERNET

Impedance is actually very similar to resistance in many ways -- which makes sense, since impede and resist are roughly synonymous.

Thus it makes sense that they share the same unit -- Ohms.

The main difference between resistance and impedance is that impedance changes with frequency.

Inductors pass direct current (frequency of 0) but have a higher impedance the higher the frequency, since inductors tend to resist changes in current.

Capacitors have infinite impedance with DC and the higher the frequency the lower the impedance (capacitors resist changes in voltage).

PREPPERNET

T5C14
WHAT IS THE PROPER ABBREVIATION FOR MEGAHERTZ?

A. mHz

B. mhZ

C. Mhz

D. MHz

PREPPERNET

M is the SI abbreviation for mega, indicating millions or

$\times 10^6$ *(6 zeros)*

Hz is the SI unit abbreviation for Hertz or cycles per second.

Therefore the proper abbreviation for megahertz is..

MHz

T5D01
WHAT FORMULA IS USED TO CALCULATE CURRENT IN A CIRCUIT?

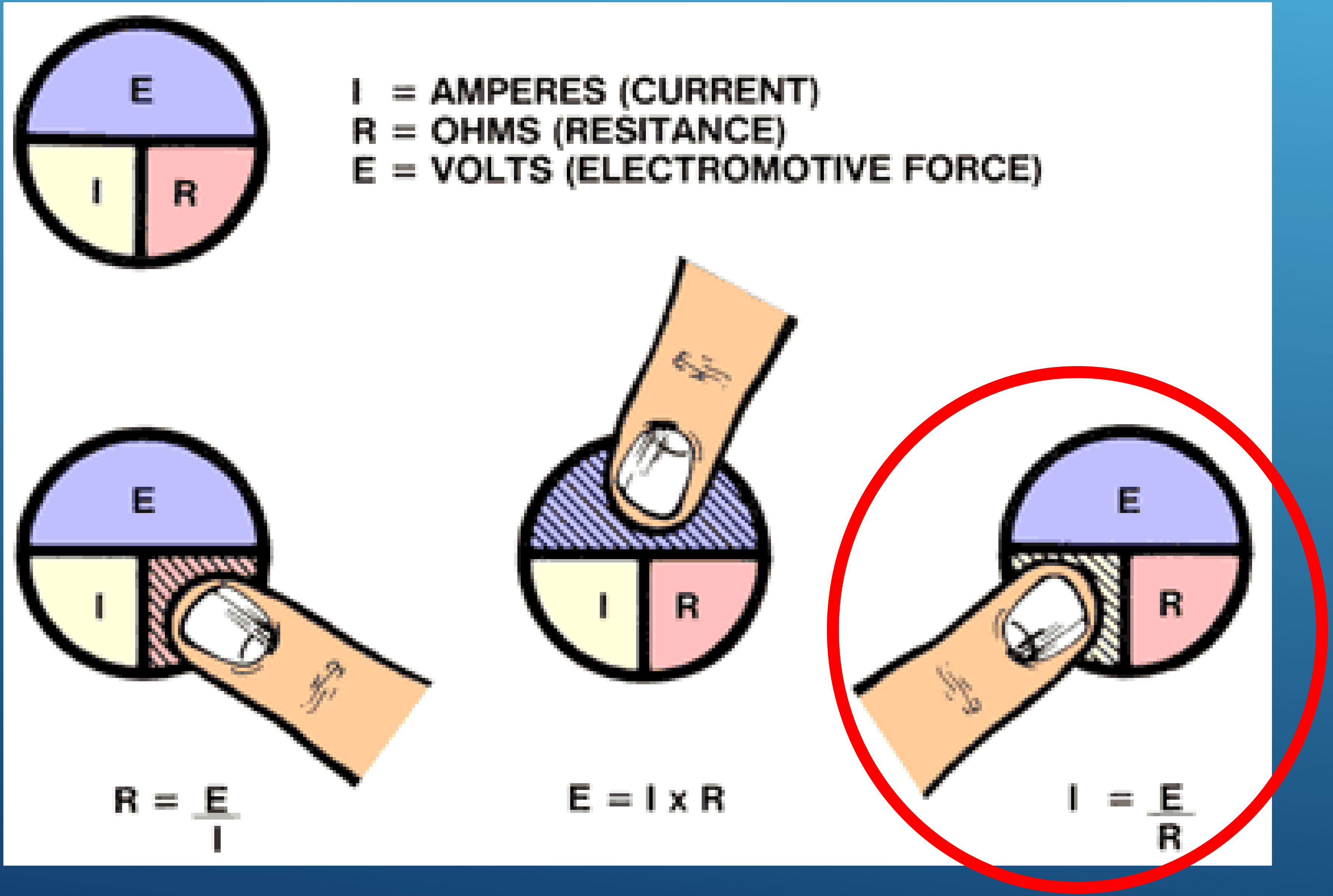
A. Current (I) equals voltage (E) multiplied by resistance (R)

B. Current (I) equals voltage (E) divided by resistance (R)

C. Current (I) equals voltage (E) added to resistance (R)

D. Current (I) equals voltage (E) minus resistance (R)

PREPPERNET



I = AMPERES (CURRENT)
R = OHMS (RESITANCE)
E = VOLTS (ELECTROMOTIVE FORCE)
E
I
R
R = E / I
E = I x R
I = E / R

T5D02
WHAT FORMULA IS USED TO CALCULATE VOLTAGE IN A CIRCUIT?

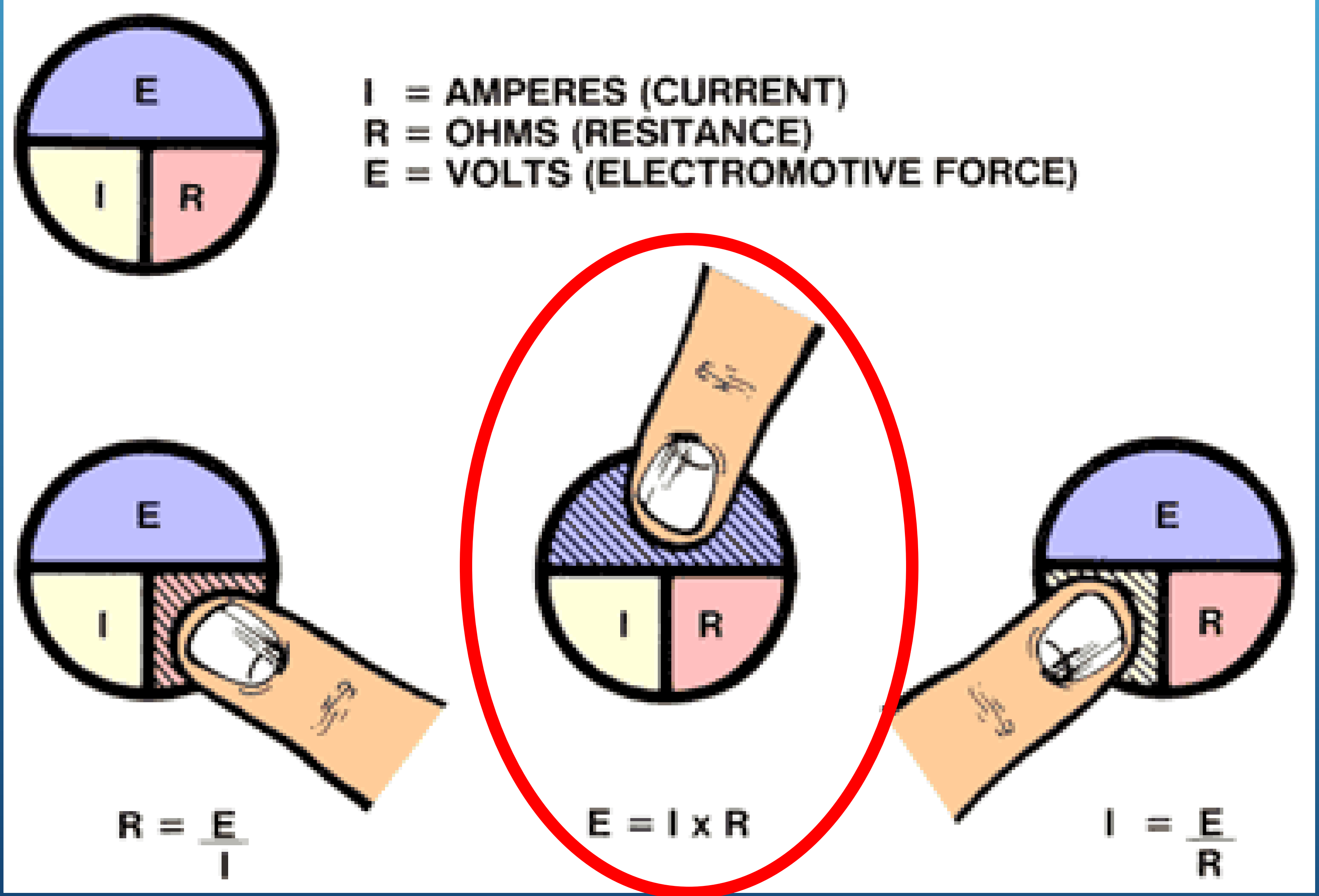
A. Voltage (E) equals current (I) multiplied by resistance (R)

B. Voltage (E) equals current (I) divided by resistance (R)

C. Voltage (E) equals current (I) added to resistance (R)

D. Voltage (E) equals current (I) minus resistance (R)

PREPPERNET


E
I
R
I = AMPERES (CURRENT)
R = OHMS (RESITANCE)
E = VOLTS (ELECTROMOTIVE FORCE)
E
I
R
E
I
R
E
I
R
R = E/I
E = I x R
I = E/R
PREPPERNET

T5D03
WHAT FORMULA IS USED TO CALCULATE RESISTANCE IN A CIRCUIT?

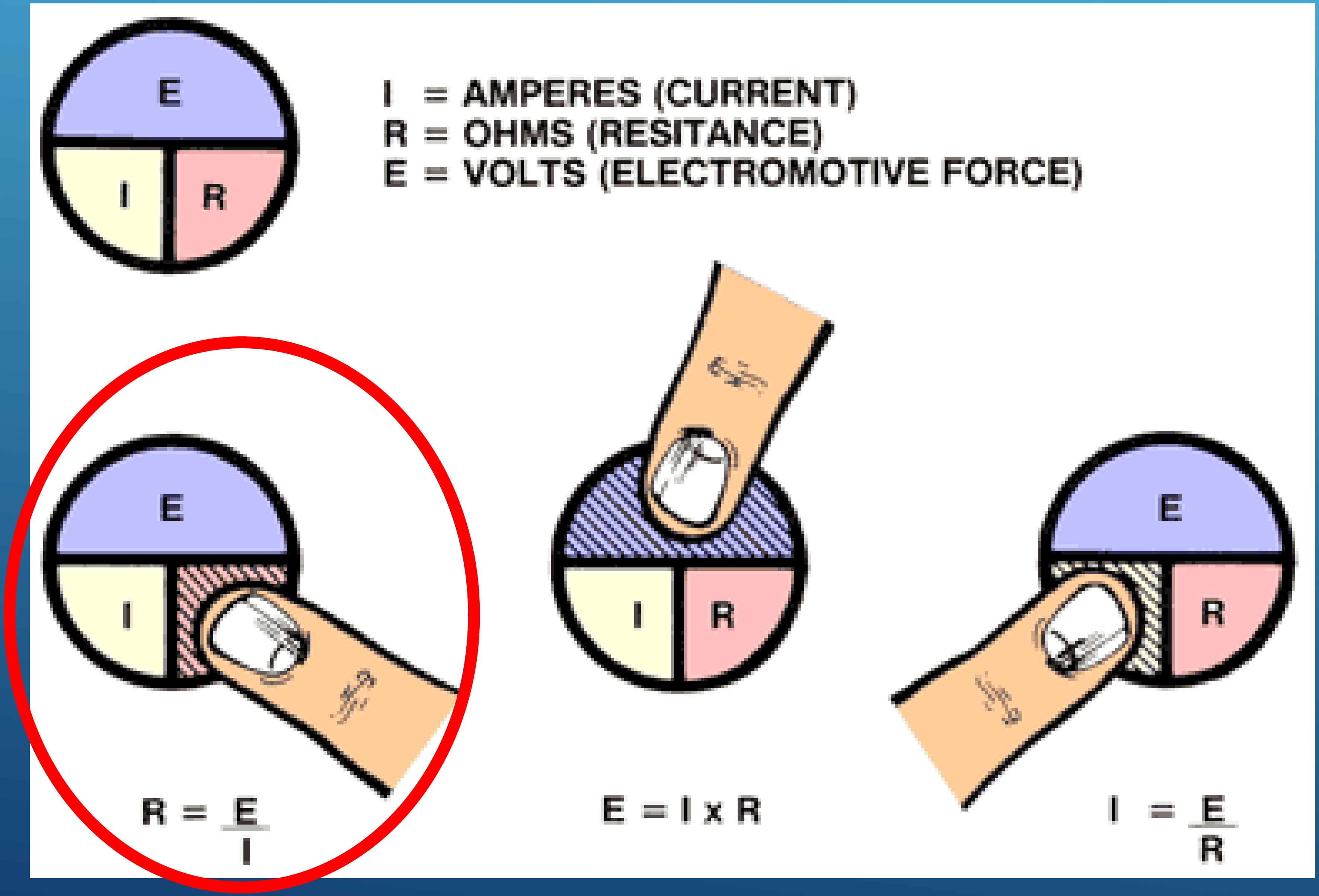
A. Resistance (R) equals voltage (E) multiplied by current (I)

B. Resistance (R) equals voltage (E) divided by current (I)

C. Resistance (R) equals voltage (E) added to current (I)

D. Resistance (R) equals voltage (E) minus current (I)

PREPPERNET



I = AMPERES (CURRENT)
R = OHMS (RESITANCE)
E = VOLTS (ELECTROMOTIVE FORCE)
E
I
R
R = E / I
E = I x R
I = E / R

PREPPERNET

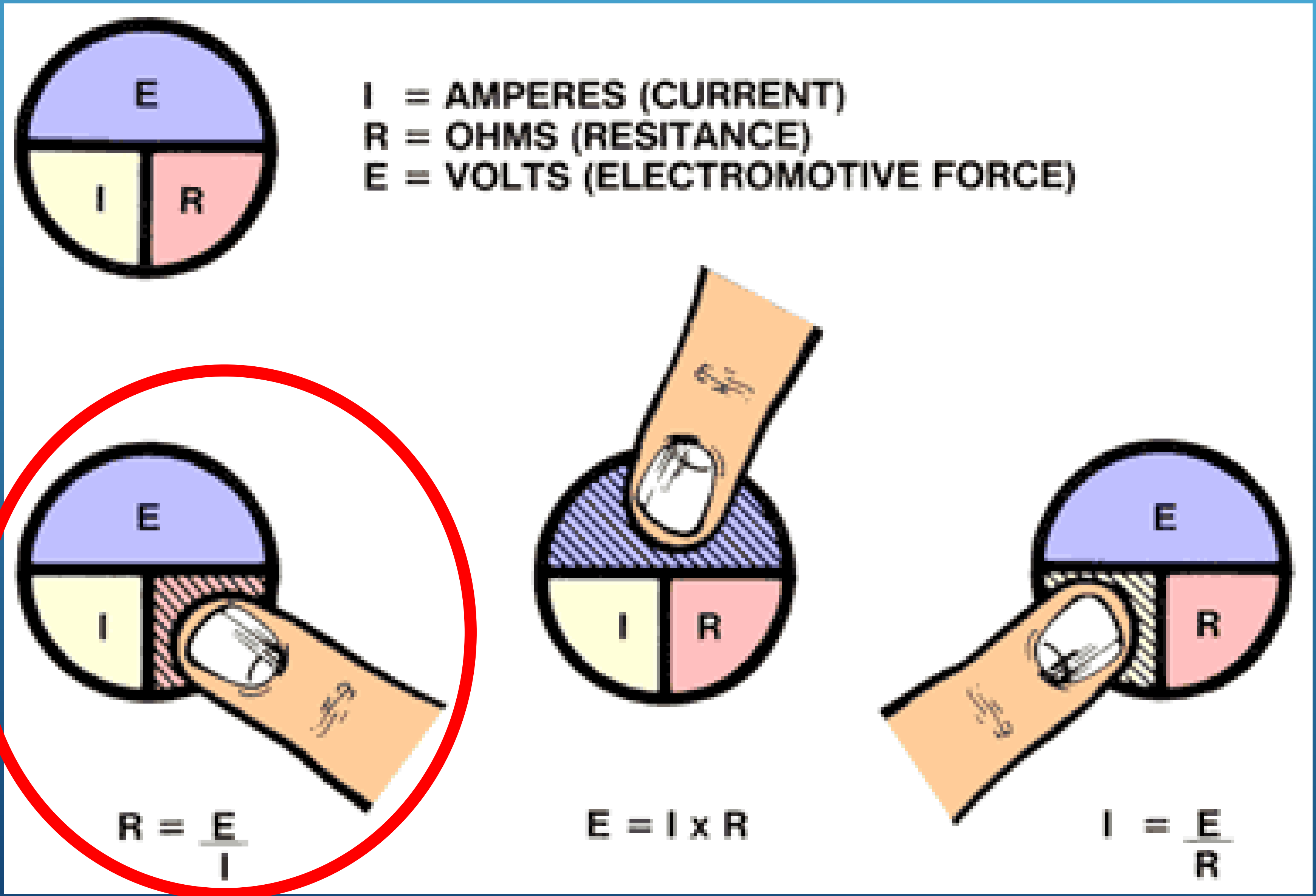
T5D04
WHAT IS THE RESISTANCE OF A CIRCUIT IN WHICH A CURRENT OF 3 AMPERES FLOWS THROUGH A RESISTOR CONNECTED TO 90 VOLTS?

A. 3 ohms

B. 30 ohms

C. 93 ohms

D. 270 ohms



$$R\ (OHMS) = \frac{E\ (VOLTS)}{I\ (AMPS)}$$

$$R\ (OHMS) = \frac{90V}{3A}$$

$$R = 30\Omega$$

PREPPERNET

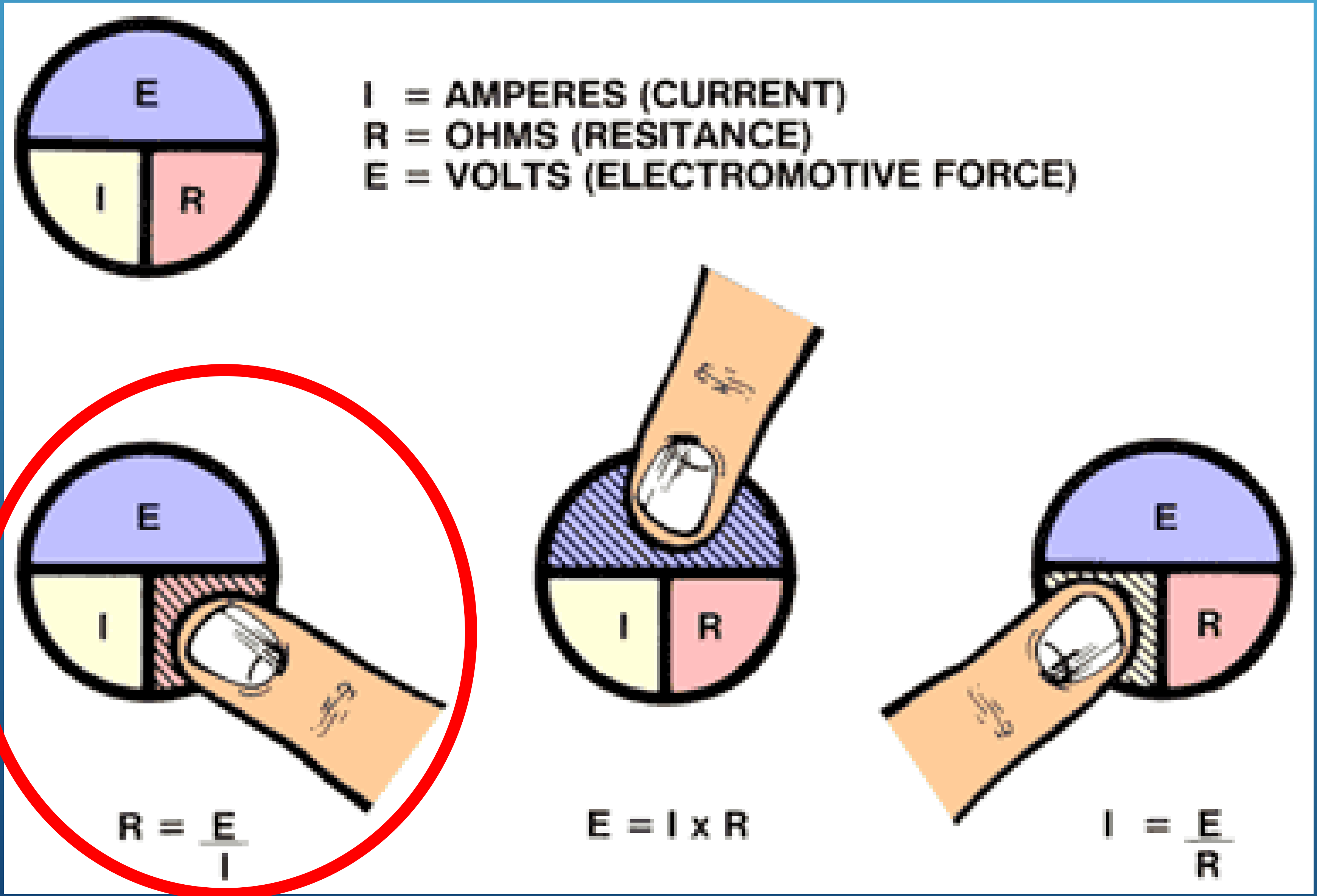
T5D05
WHAT IS THE RESISTANCE IN A CIRCUIT FOR WHICH THE APPLIED VOLTAGE IS 12 VOLTS AND THE CURRENT FLOW IS 1.5 AMPERES?

A. 18 ohms

B. 0.125 ohms

C. 8 ohms

D. 13.5 ohms



$$R\ (\text{OHMS}) = \frac{E\ (VOLTS)}{I\ (AMPS)}$$

$$R\ (\text{OHMS}) = \frac{12V}{1.5A}$$

$$R = 8\Omega$$

PREPPERNET

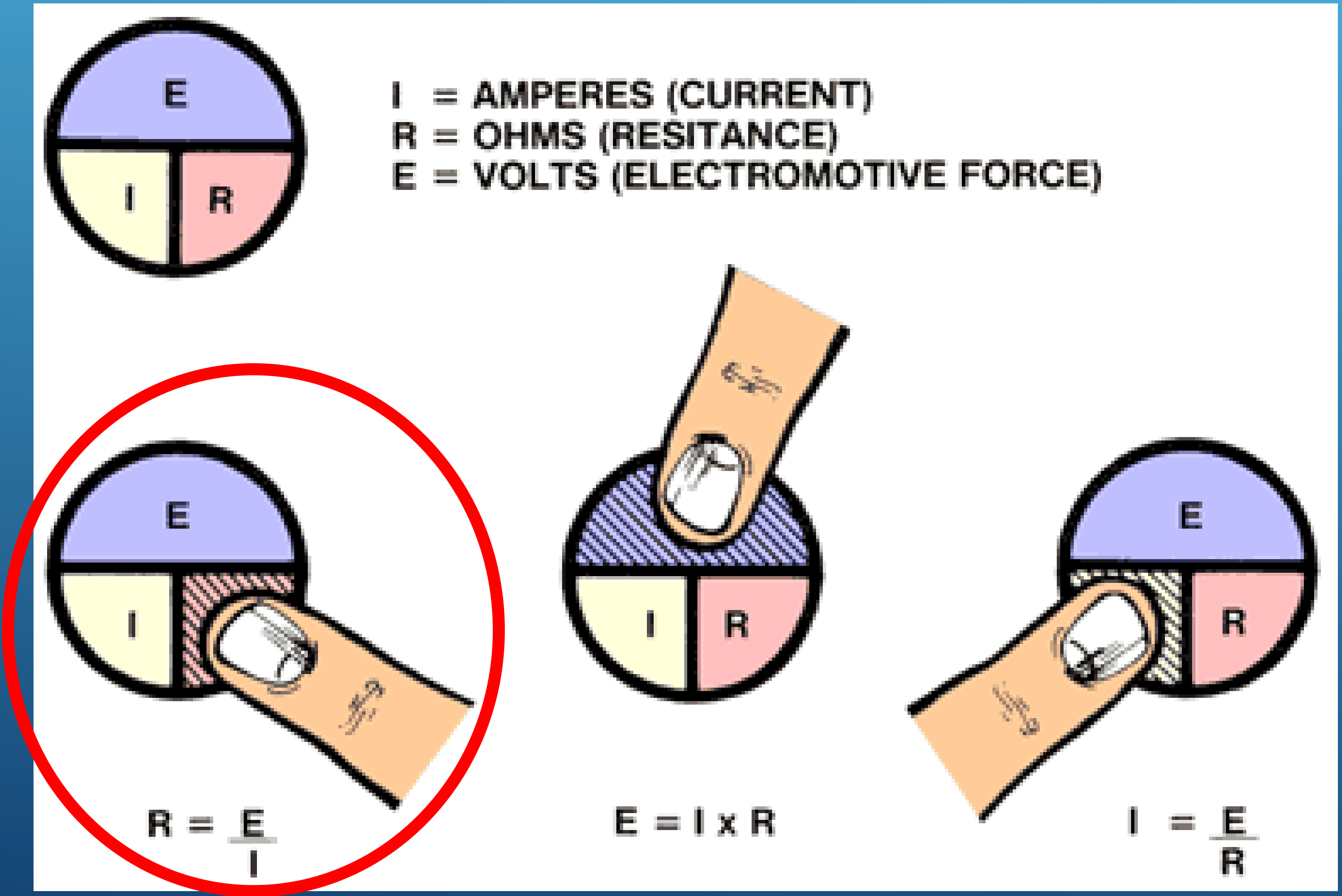
T5D06
WHAT IS THE RESISTANCE OF A CIRCUIT THAT DRAWS 4 AMPERES FROM A 12-VOLT SOURCE?

A. 3 ohms

B. 16 ohms

C. 48 ohms

D. 8 ohms



$$\text{R (OHMS)} = \frac{E\ (VOLTS)}{I\ (AMPS)}$$

$$\text{R (OHMS)} = \frac{12V}{4A}$$

$$R = 3\Omega$$

PREPPERNET

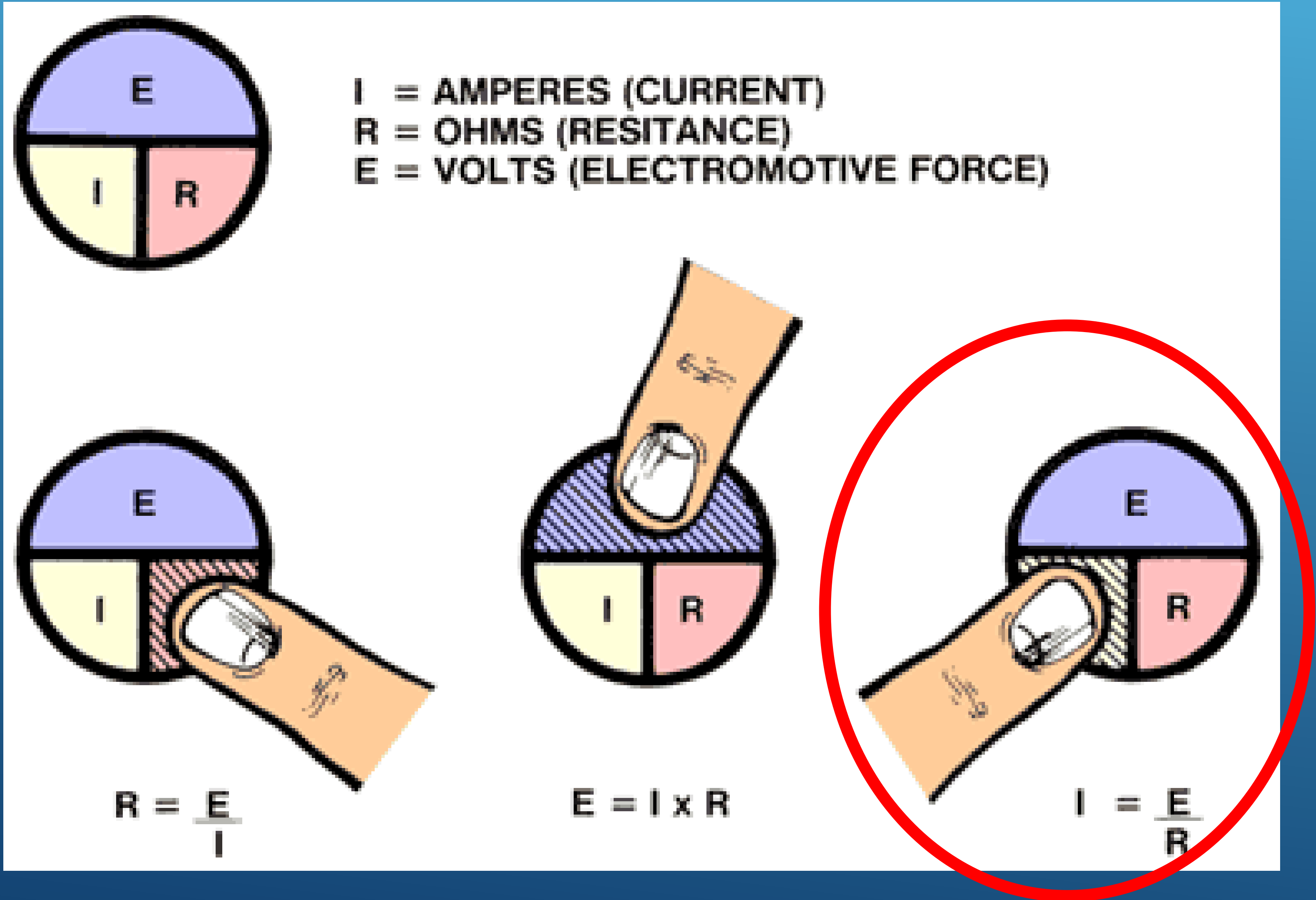
T5D07
WHAT IS THE CURRENT IN A CIRCUIT WITH AN APPLIED VOLTAGE OF 120 VOLTS AND A RESISTANCE OF 80 OHMS?

A. 9600 amperes

B. 200 amperes

C. 0.667 amperes

D. 1.5 amperes



$$I\ (AMPS) = \frac{E(VOLTS)}{R\ (OHMS)}$$

$$I\ (AMPS) = \frac{120V}{80\Omega}$$

$$I = 1.5A$$

PREPPERNET

T5D08
WHAT IS THE CURRENT THROUGH A 100-OHM RESISTOR CONNECTED ACROSS 200 VOLTS?

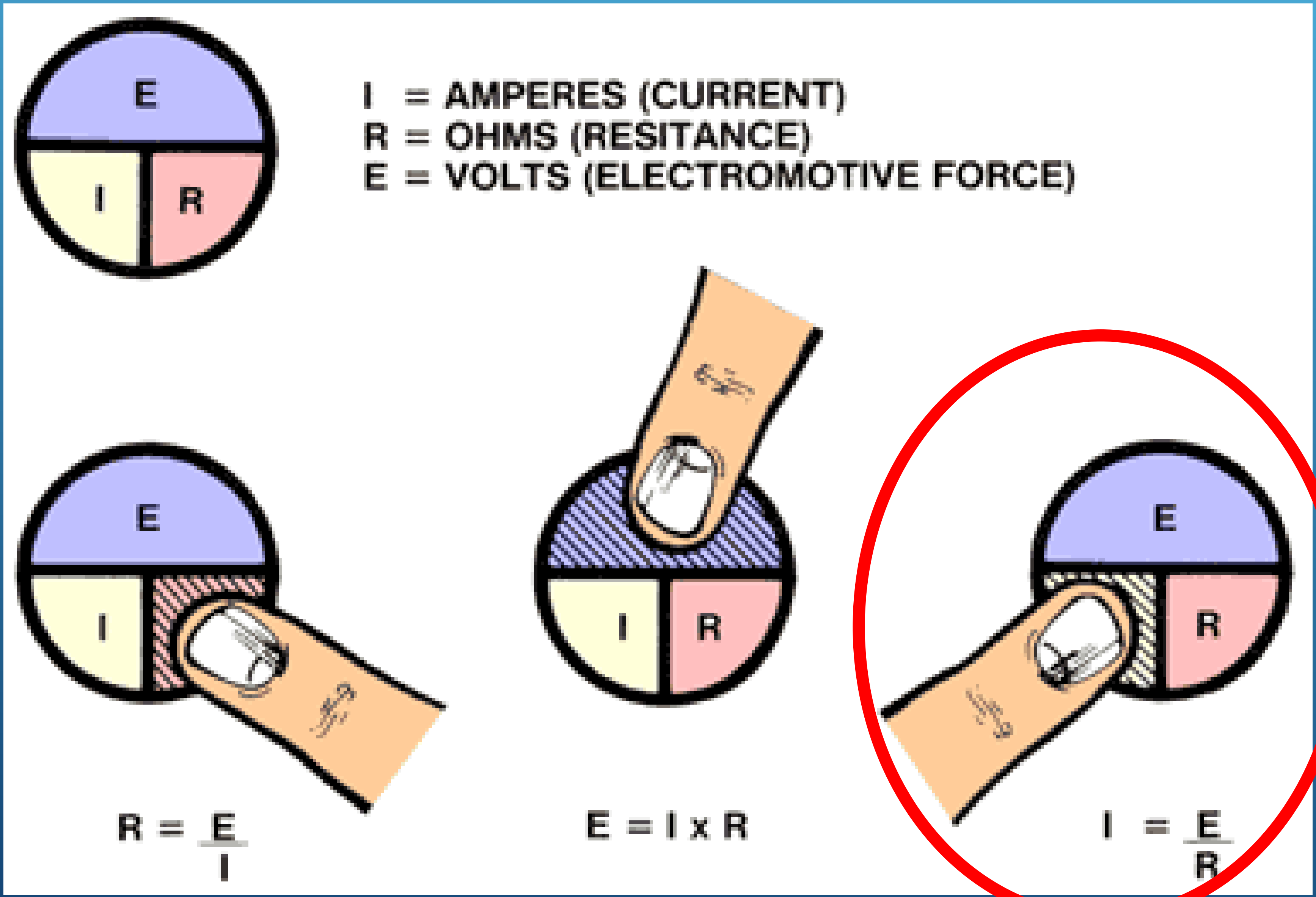
A. 20,000 amperes

B. 0.5 amperes

C. 2 amperes

D. 100 amperes

PREPPERNET



$$I\ (AMPS) = \frac{E(VOLTS)}{R\ (OHMS)}$$

$$I\ (AMPS) = \frac{200V}{100\Omega}$$

$$I = 2A$$

PREPPERNET

T5D09
WHAT IS THE CURRENT THROUGH A 24-OHM RESISTOR CONNECTED ACROSS 240 VOLTS?

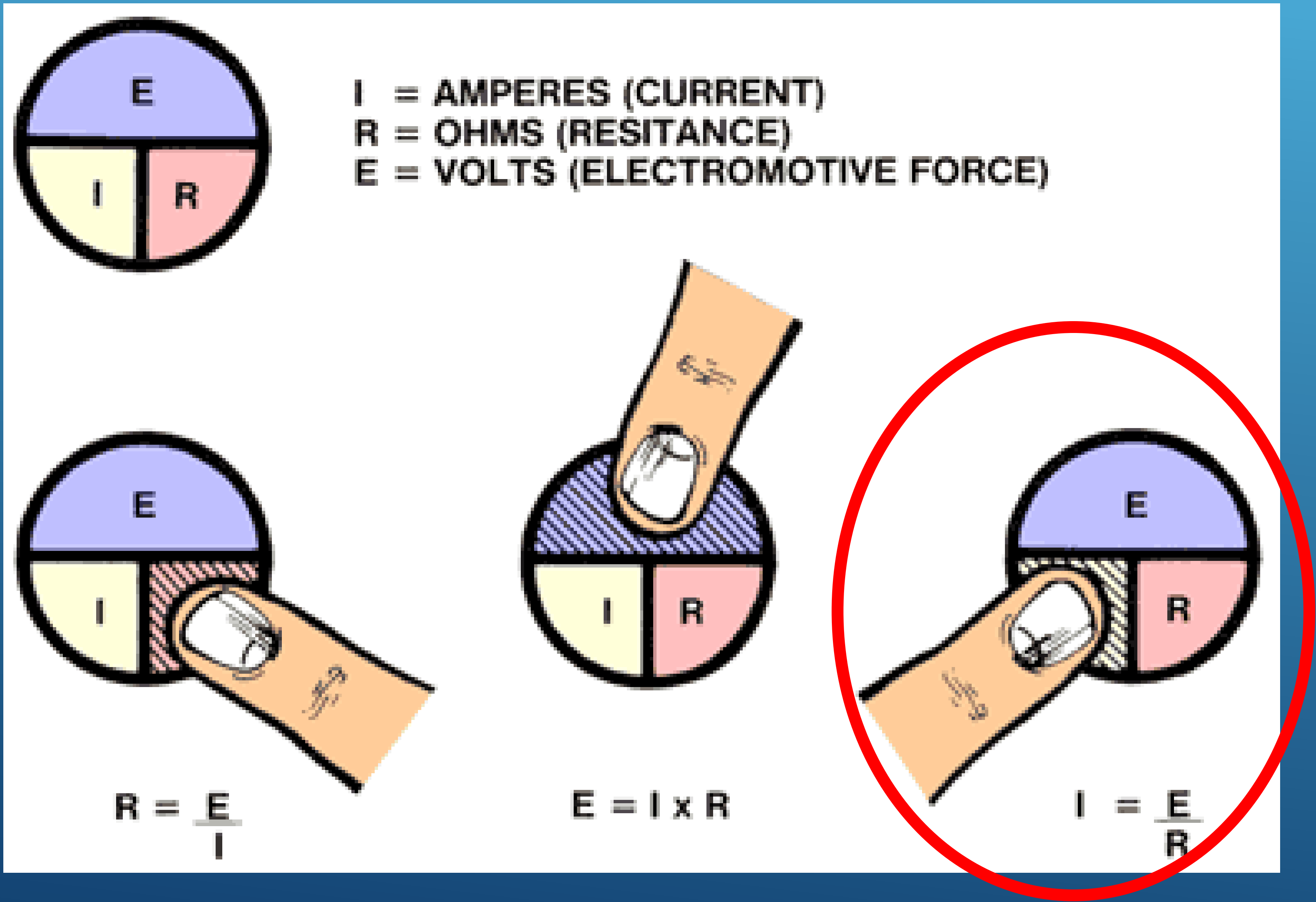
A. 24,000 amperes

B. 0.1 amperes

C. 10 amperes

D. 216 amperes

PREPPERNET



$$I\ (AMPS) = \frac{E(VOLTS)}{R\ (OHMS)}$$

$$I\ (AMPS) = \frac{240V}{24\Omega}$$

I = 10A

PREPPERNET

T5D10
WHAT IS THE VOLTAGE ACROSS A 2-OHM RESISTOR IF A CURRENT OF 0.5 AMPERES FLOWS THROUGH IT?

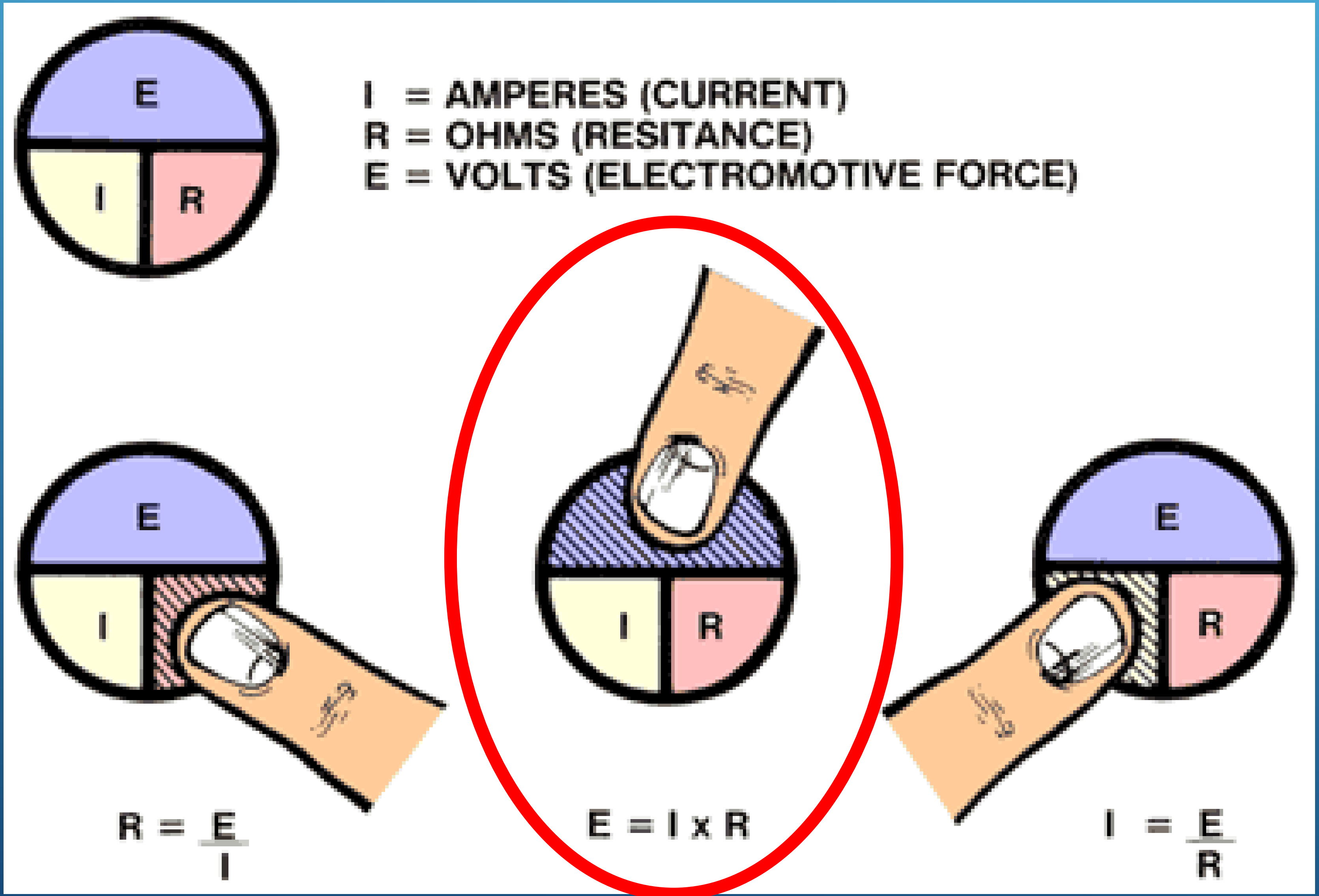
A. 1 volt

B. 0.25 volts

C. 2.5 volts

D. 1.5 volts

PREPPERNET



E (VOLTS) =
I (AMPS) X R (OHMS)

E (VOLTS) = 0.5A X 2Ω

E = 1V

PREPPERNET

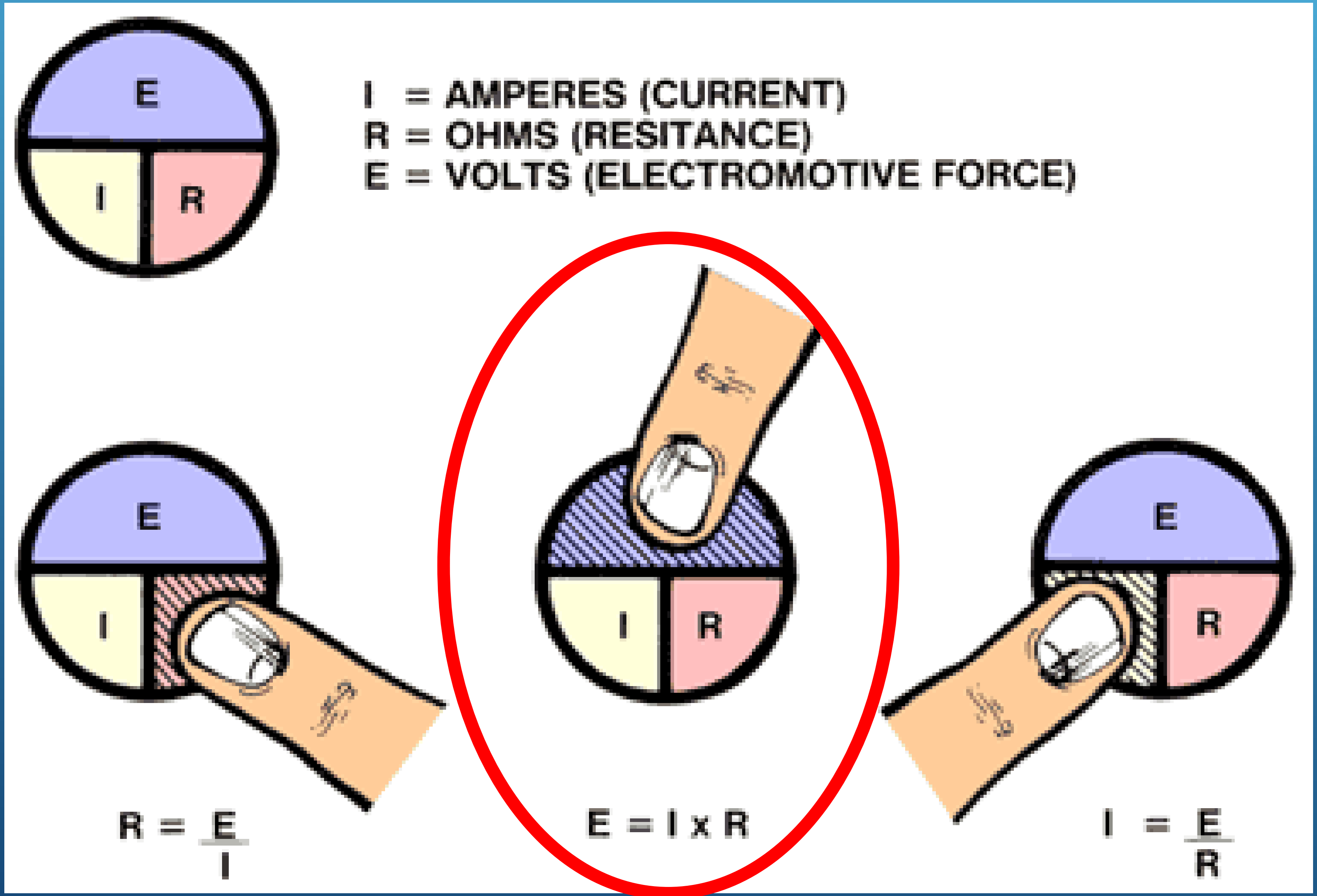
T5D11
WHAT IS THE VOLTAGE ACROSS A 10-OHM RESISTOR IF A CURRENT OF 1 AMPERE FLOWS THROUGH IT?

A. 1 volt

B. 10 volts

C. 11 volts

D. 9 volts



E (VOLTS) =
I (AMPS) X R (OHMS)

E (VOLTS) = 1A X 10Ω

E = 10V

PREPPERNET

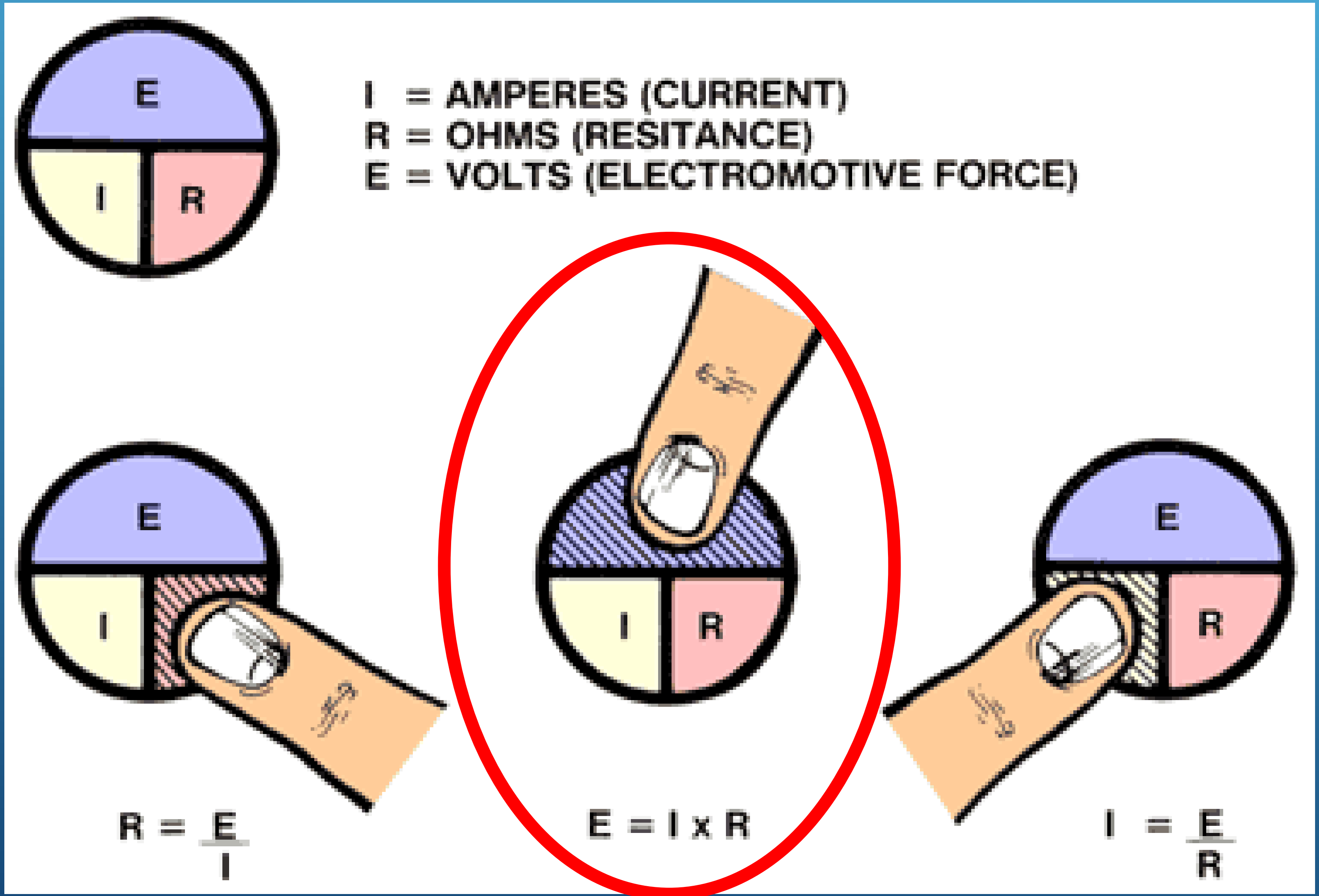
T5D12
WHAT IS THE VOLTAGE ACROSS A 10-OHM RESISTOR IF A CURRENT OF 2 AMPERES FLOWS THROUGH IT?

A. 8 volts

B. 0.2 volts

C. 12 volts

D. 20 volts



E (VOLTS) =
I (AMPS) X R (OHMS)

E (VOLTS) = 2A X 10Ω

E = 20V

PREPPERNET

T5D13
WHAT HAPPENS TO CURRENT AT THE JUNCTION OF TWO COMPONENTS IN SERIES?

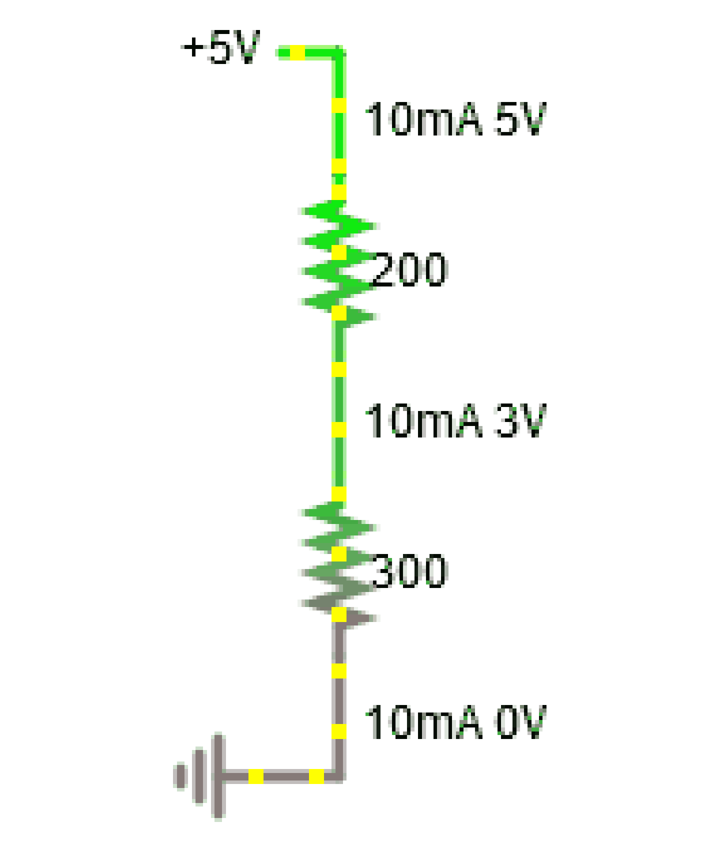
A. It divides equally between them

B. It is unchanged

C. It divides based on the on the value of the components

D. The current in the second component is zero

The current is determined by the total resistance through the whole series so the current at the junction is unchanged as can be seen from the fact that all three test points show 10mA, and the dots move at the same speed through the whole series.



T5D14
WHAT HAPPENS TO CURRENT AT THE JUNCTION OF TWO COMPONENTS IN PARALLEL?

A. It divides between them dependent on the value of the components

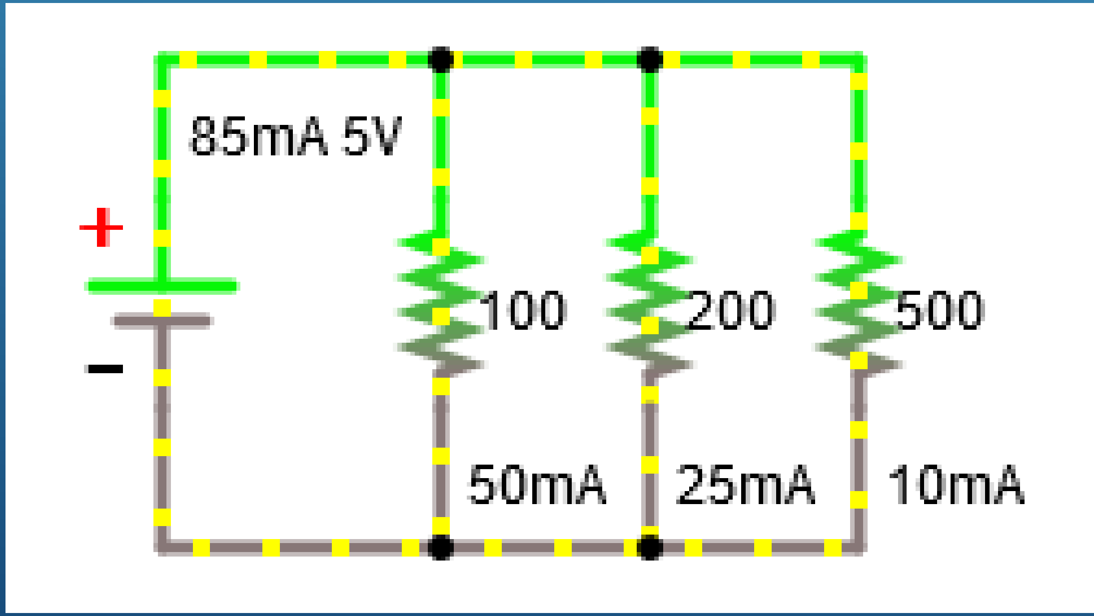
B. It is the same in both components

C. Its value doubles

D. Its value is halved

Notice that across the components in parallel the current (85mA) is divided between the components based on the value of the components

In this case the components are resistors and their values are resistance in ohms. The dots are moving faster through the 100Ω resistor than they are through the 500Ω resistor. The speed of the dots indicates the amount of current, indicating less current through the higher value resistors.



T5D15
WHAT IS THE VOLTAGE ACROSS EACH OF TWO COMPONENTS IN SERIES WITH A VOLTAGE SOURCE?

A. The same voltage as the source

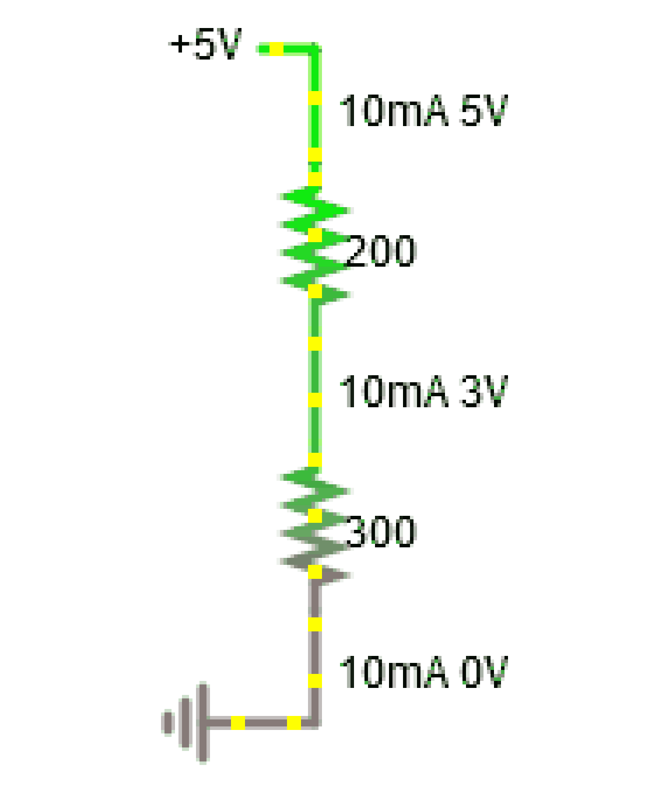
B. Half the source voltage

C. It is determined by the type and value of the components

D. Twice the source voltage

PREPPERNET

The current in the series doesn't change, but the voltage across each of the two components does change. So it is determined by the type and value of the components, in this case the resistance of the resistors.



PREPPERNET

T5D16
WHAT IS THE VOLTAGE ACROSS EACH OF TWO COMPONENTS IN PARALLEL WITH A VOLTAGE SOURCE?

A. It is determined by the type and value of the components

B. Half the source voltage

C. Twice the source voltage

D. The same voltage as the source

PREPPERNET

Notice that across the components in parallel the voltage (5V) is the same as the voltage source..

The values of the resistors have no effect.