

Sunday 7th September 2025  
Lesson 18  
IWA

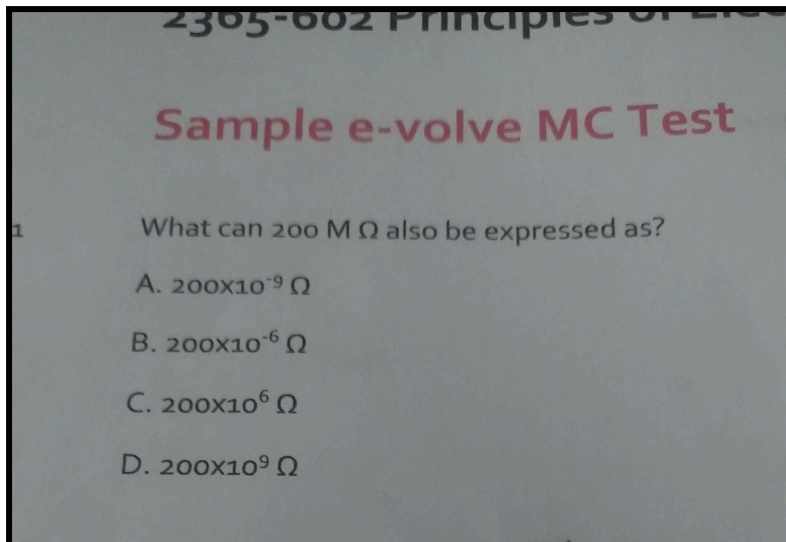
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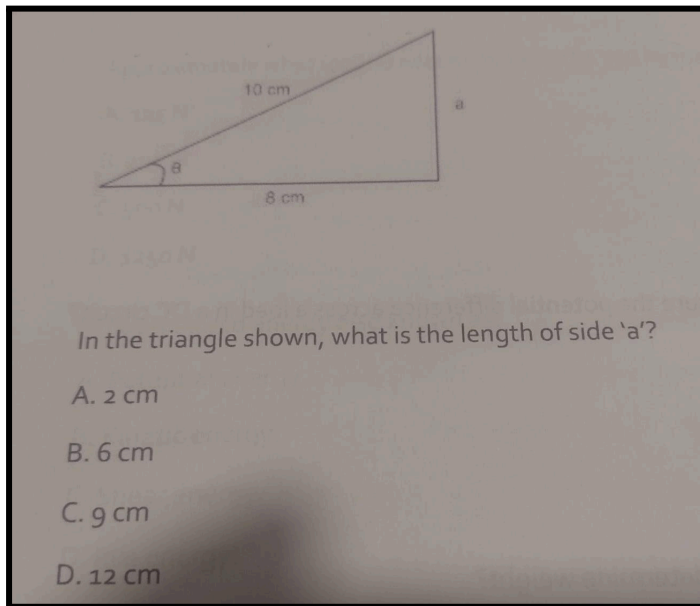
## Class room - Worksheet walkthrough

5357 - 003 Electrical Scientific Principles and Technologies /  
2365-602 Principles of Electrical Science

### Question 1



## Question 2:



### Question 2 working out:

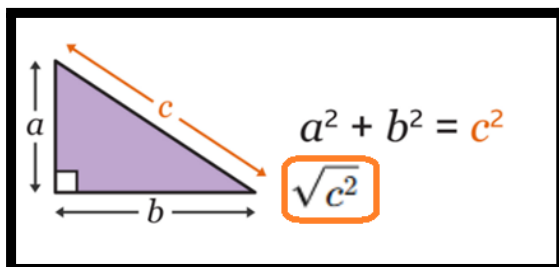
#### Foundation:

***The formula  $a^2 + b^2 = c^2$  is known as the Pythagorean theorem, which states that in a right-angled triangle, the square of the hypotenuse (the longest side) is equal to the sum of the squares of the other two sides (the legs).***

***This means that if you square the lengths of the two shorter sides (a and b) and add them together, you get the same value as squaring the length of the longest side (c).***

Original source: google

Answer is 6 cm



**C = The hypotenuse which is the longest side of the triangle.**

**a = 8 cm | c = 10 cm | b = ?**

1) Following, the rule we know that performing the addition:

- $a^2 + b^2 = c^2$
- $a^2 + b^2$  equates to  $c^2$

The question already gave us the value for  $c$  to be 10. So  $c^2 = 100$ .

Therefore,  $a^2 + b^2$  has to equal 100.

We already have a value for  $a$  to be 8 cm. So  $a = 8$  cm.

$8^2 = 64$ . Which is 36 away from 100. The square root of 36 is 6. Therefore the answer for  $b = 6$  cm.

## Question 3

3

What is the volume of a room that measures 3 m in width, 8 m in length, and the ceiling is 2.4 m high?

A. 13.4 m<sup>2</sup>

B. 13.4 m<sup>3</sup>

C. 57.6 m<sup>2</sup>

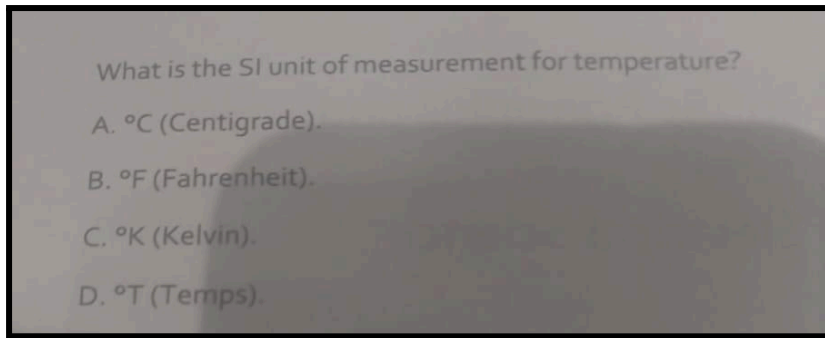
D. 57.6 m<sup>3</sup>

### Question 3 working out

The answer is C.

Perform the multiplication  $3 \text{ m} \times 8 \text{ m} \times 2.4 \text{ m} = 57.6 \text{ m}^2$

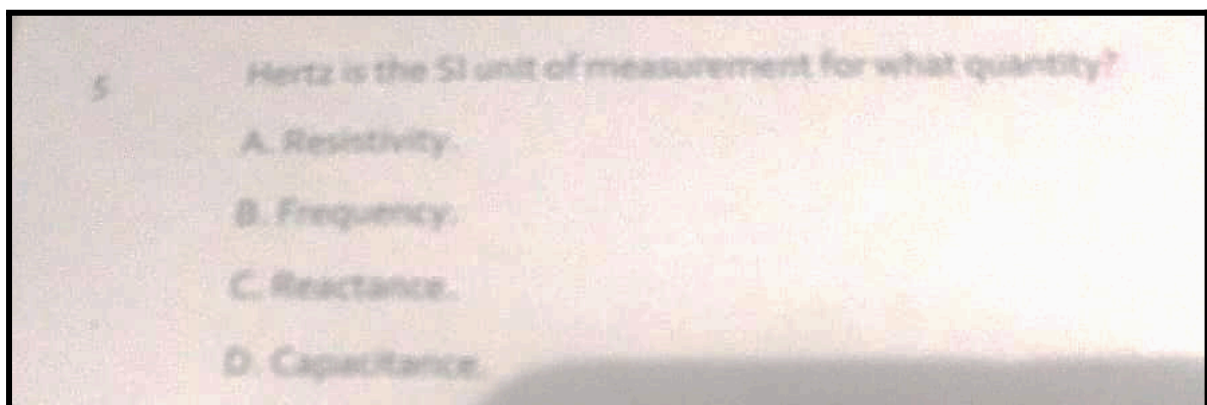
## Question 4



**Question 4 working out**

The answer is Kelvin

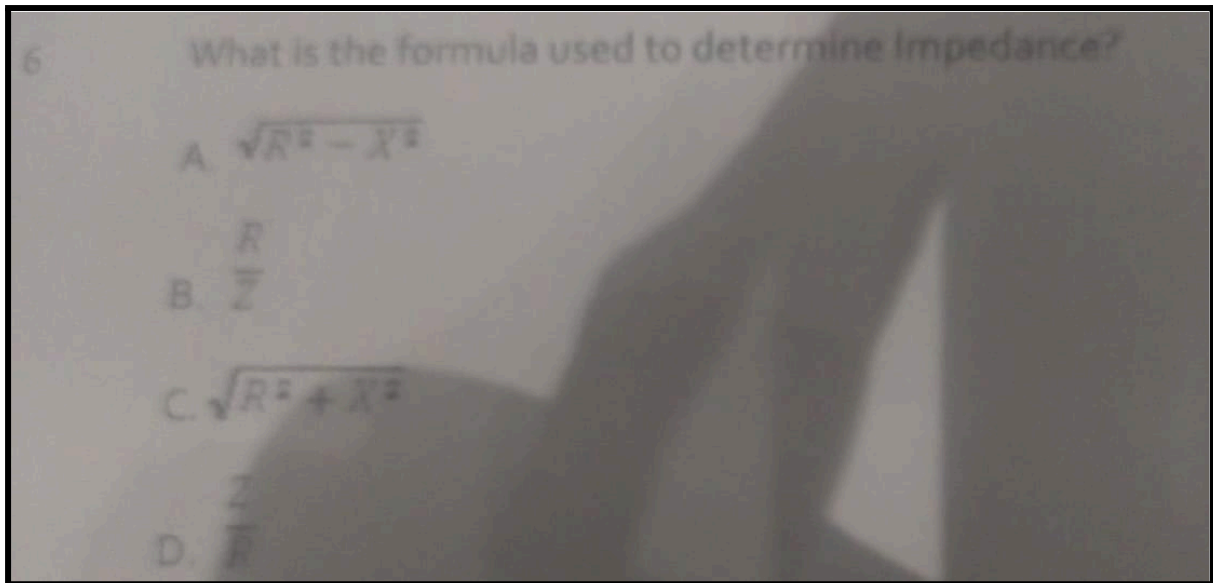
## Question 5



**Question 5 working out**

The answer is B frequency

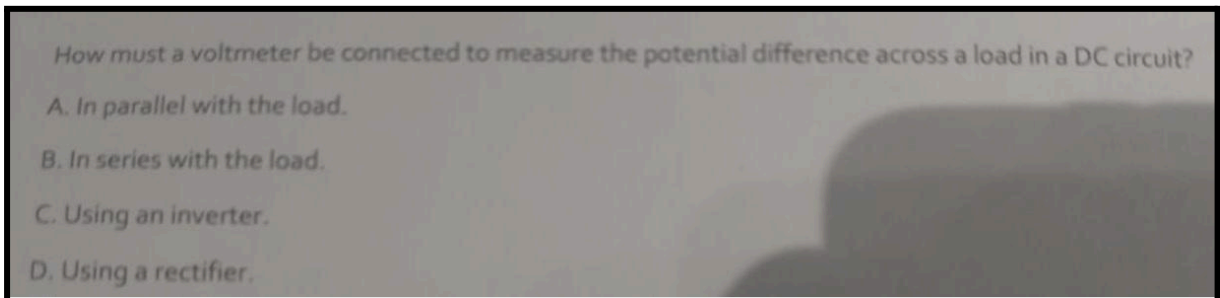
## Question 6



**Question 6 working out**

The answer is C

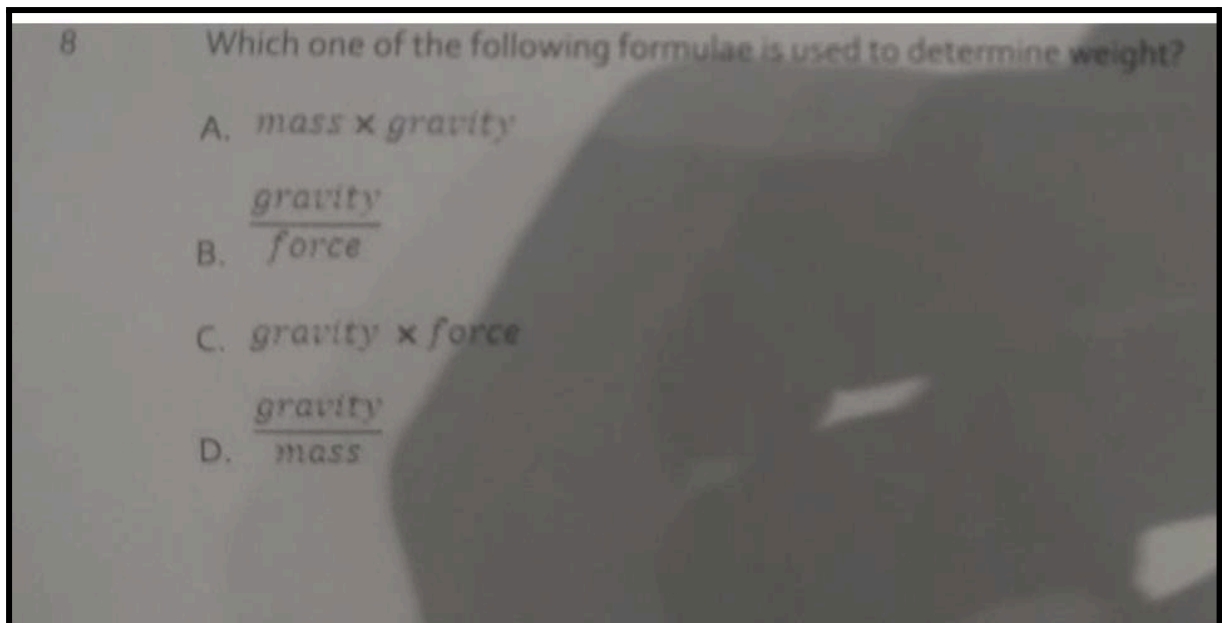
## Question 7



**Question 7 working out**

The answer is A

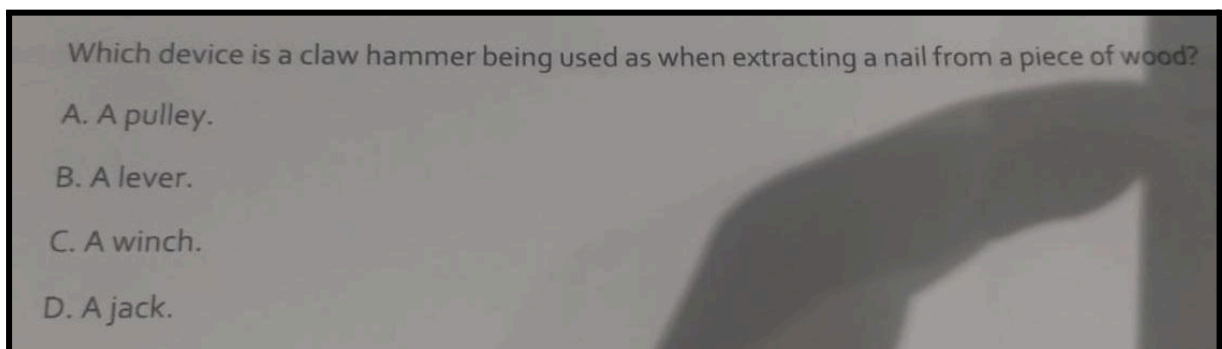
## Question 8



**Question 8 working out**

The answer is A) weight = mass x gravity

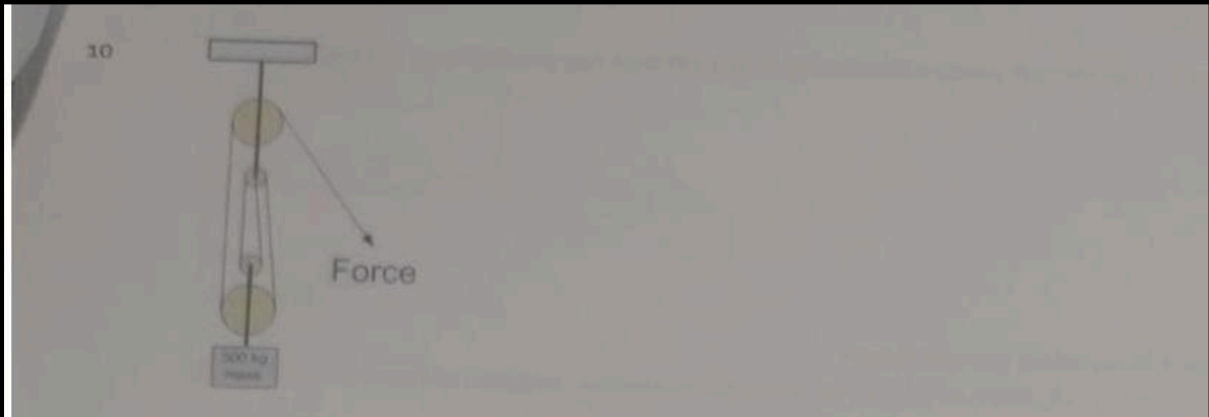
## Question 9



**Question 9 working out**

The answer is B) A lever

## Question 10



The diagram shows a pulley system with a fixed upper pulley and a movable lower pulley. A rope is anchored to the ceiling, passes under the lower pulley, then over the upper pulley, then under the lower pulley again, and finally over the upper pulley a third time. A 500 kg mass is attached to the bottom of the lower pulley. An arrow labeled 'Force' points downwards from the free end of the rope. The number '10' is in the top left corner.

Approximately what force is needed to raise the 500 kg mass shown in the diagram?

- A. 125 N
- B. 250 N
- C. 500 N
- D. 1250 N

### Question 10 working out

There are 4 pulleys (represented by four circles)

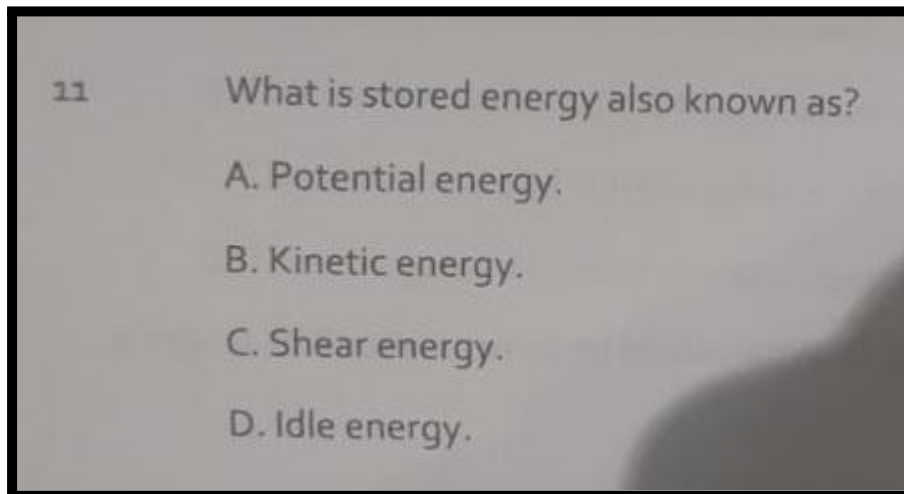
The weight is 500 kg.

The formula is: Force = Mass x gravity

$$4905 = 500 \text{ kg} \times 9.81$$



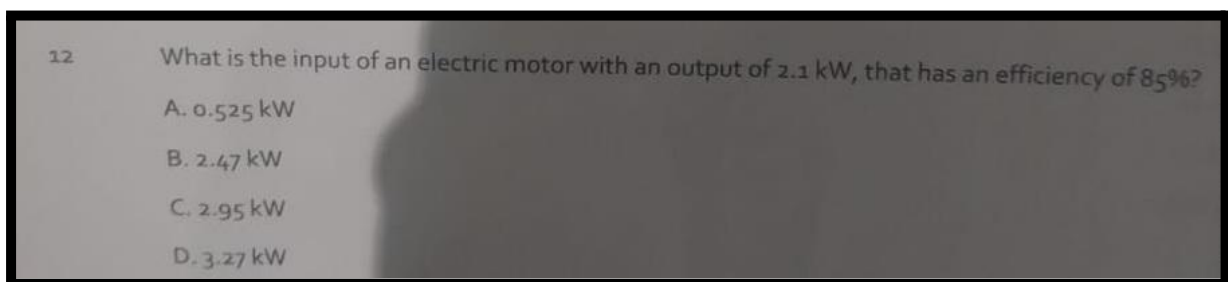
## Question 11



### Question 11 working out

The answer is A) Potential energy

## Question 12



### Question 12 working out

The answer is B  $\Rightarrow 2.1 / 0.85 = 2.47$

## Question 13

13 What would be the approximate power required to raise a 500 kg mass to a height of 50 m in 90 seconds?

A. 0.277 kW  
B. 2.72 kW  
C. 37.5 kW  
D. 55.5 kW

### Question 13 working out

$$\frac{(500 \times 9.81)}{90} \times 50$$
$$\frac{\text{Mass} \times \text{Distance}}{\text{Time}}$$

## Question 14

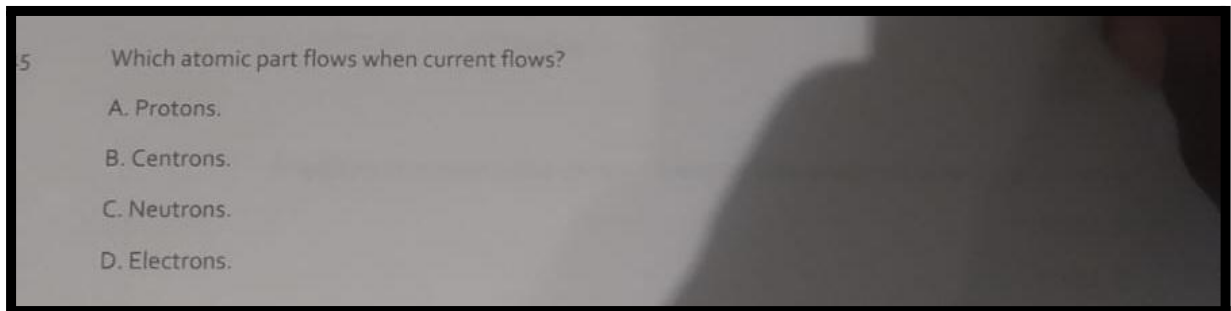
14 What is the input of an electric motor with an output of 5 kW that has an efficiency of 80%?

A. 4 kW.  
B. 4.25 kW.  
C. 6 kW.  
D. 6.25 kW.

### Question 14 working out

$$5 / 0.80 = 6.25 \text{ kW}$$

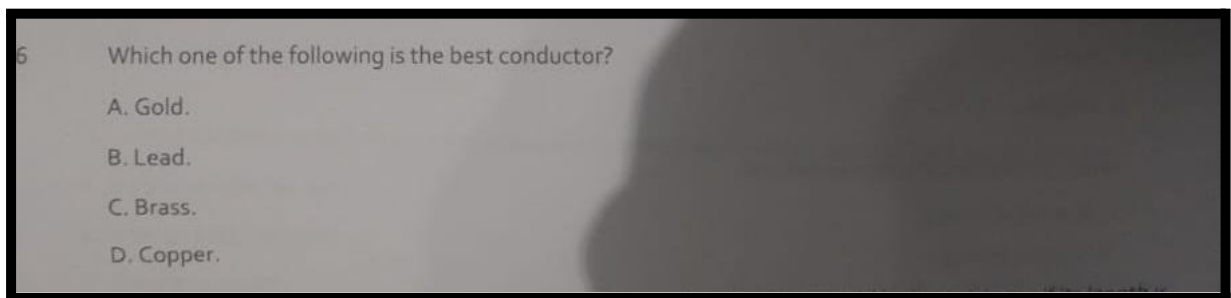
## Question 15



### Question 15 working out

The answer is A) Protons

## Question 16

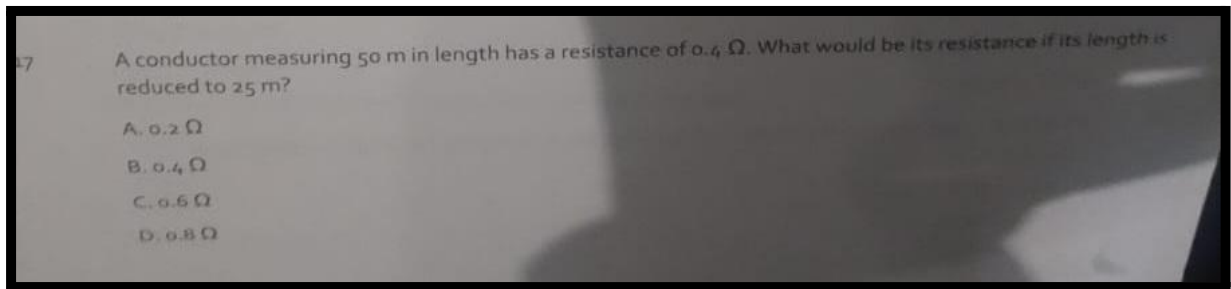


### Question 16 working out

The correct answer is D) Copper.

Gold is also a conductor of electricity.

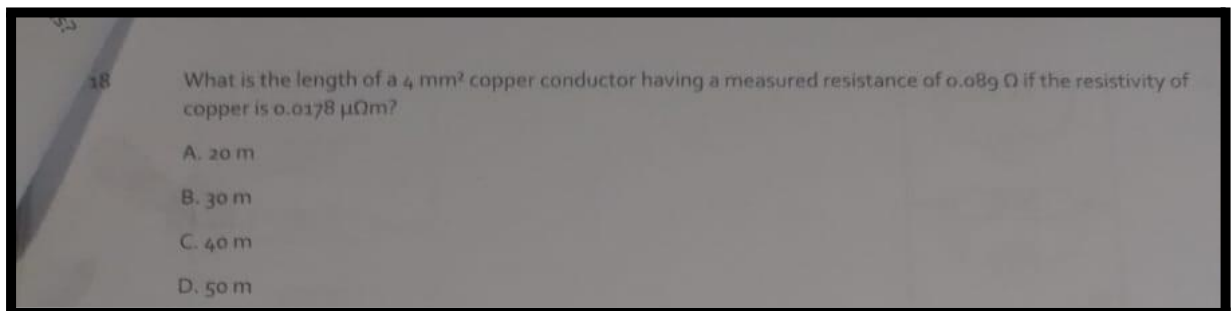
## Question 17



The correct answer is A) 0.2 ohms.

When you half the distance you half the resistance.

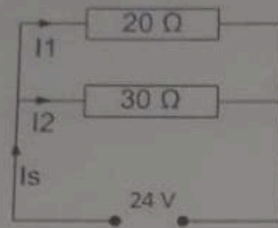
## Question 18



Question 18 working out

## Question 19

19



What is the relationship between voltage and current across the resistors for the circuit shown?

- A. Same voltage, same current across each resistor.
- B. Different voltage, same current across each resistor.
- C. Same voltage, different current across each resistor.
- D. Different voltage, different current across each resistor.

### Question 19 working out

The circuit shown is a Parallel circuit.

The answer is D.

In a parallel circuit; the voltage is constant, the current differentiates.

In a series circuit; the current is the same and the voltage changes based on the resistors.

## Question 20

20

Which one of the following statements is correct for a series circuit?

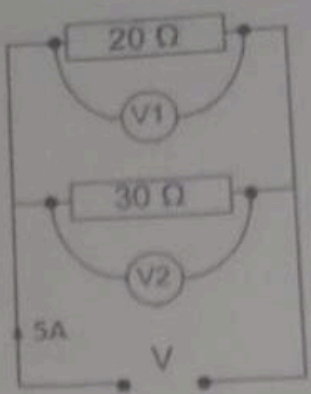
- A. The voltage varies across the resistors but the current is constant.
- B. The current varies across the resistors but the voltage is constant.
- C. The resistance and current varies when the voltage is constant.
- D. The voltage and current remains constant when resistance changes.

### Question 20 working out

The answer is **A) The voltage varies across the resistors but the current is constant.**

## Question 21

21



The circuit diagram shows a series circuit. At the bottom, there is a DC voltage source labeled 'V' with an arrow pointing upwards, indicating the positive terminal is at the top. A current of '5A' is indicated on the left vertical wire, with an arrow pointing upwards. The circuit contains two resistors in series. The top resistor is labeled '20 Ω' and has a voltmeter 'V1' connected in parallel across it. The bottom resistor is labeled '30 Ω' and has a voltmeter 'V2' connected in parallel across it. The circuit is completed by a vertical wire on the right side.

For the circuit shown, what would be the voltage reading of voltmeter (V<sub>1</sub>)?

- A. 20 V
- B. 30 V
- C. 50 V
- D. 60 V

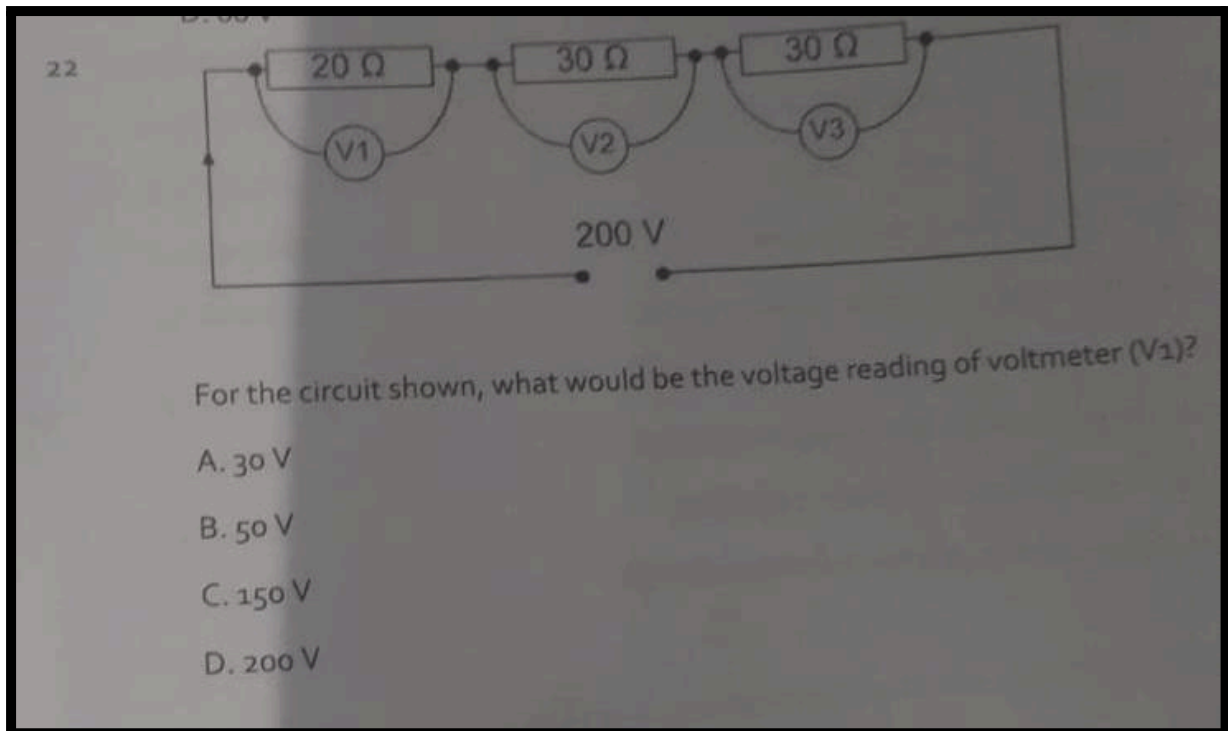
Question 21 working out

VIR formula triangle.

$$V = I \times R.$$

Therefore, 5 A (the current is constant in a series) x 20 ohms of resistance -

## Question 22



### Question 22 working out

The answer is **B) 50 V**.

This circuit is a series circuit.

In a series circuit the current is constant and the voltage changes around the resistors.



The **total voltage** is given as **200 V**.

We can calculate the **total resistance** as  $(20\Omega + 30\Omega + 30\Omega) = 80\Omega$ .

We can then calculate the **total current** for the series circuit = **2.5 A**.

$$I = V / R \Rightarrow 2.5 \text{ A} = 200 \text{ V} / 80\Omega$$

The current of **2.5 A** is constant in a series circuit.

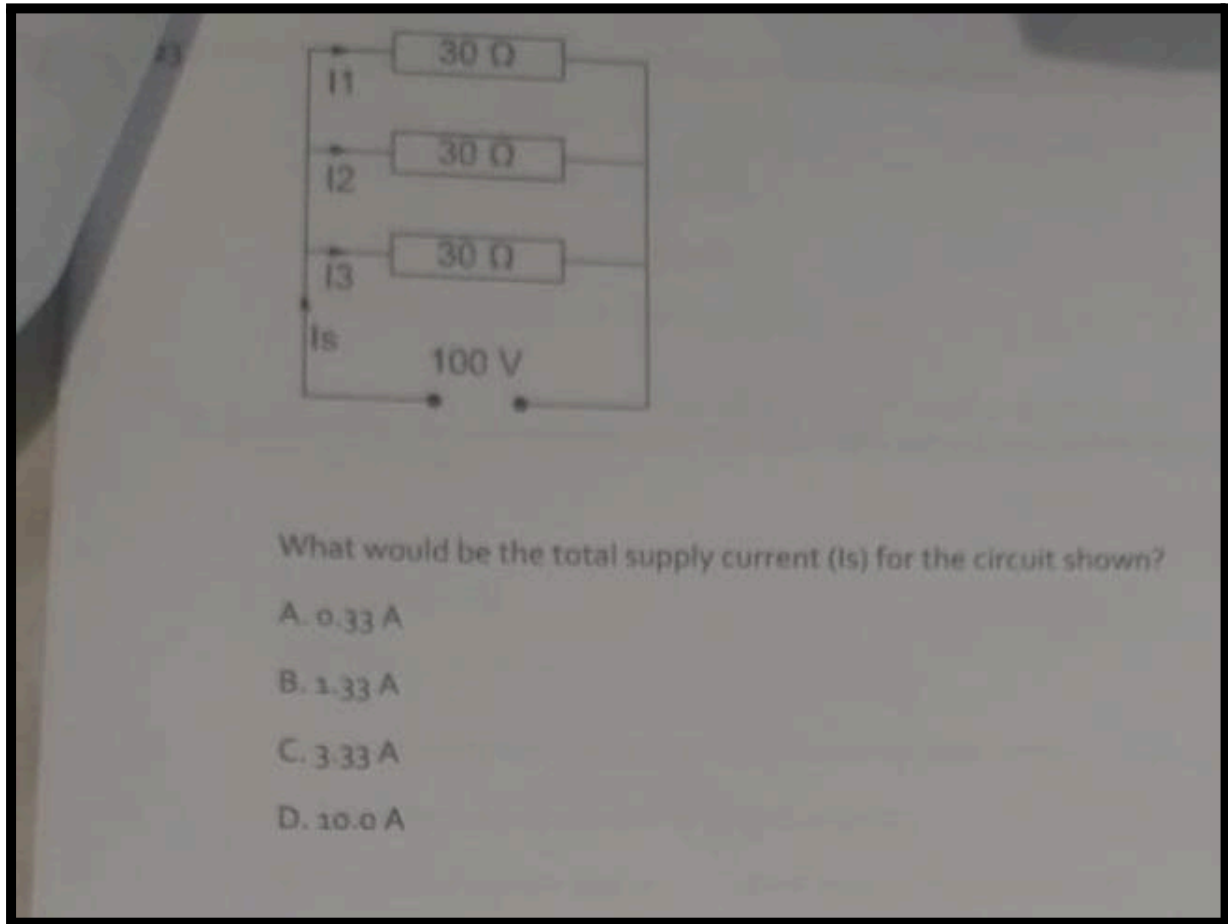
Then we do Ohms law around each resistor.

$$V1 = 2.5 \text{ A} \times 20\Omega \Rightarrow 50 \text{ V}$$

$$V2 = 2.5 \text{ A} \times 30\Omega \Rightarrow 75 \text{ V}$$

$$V3 = 2.5 \text{ A} \times 30\Omega \Rightarrow 75 \text{ V}$$

## Question 23



### Question 23 working out

$$V_T = 100\text{ V}$$

$$I_T = ?$$

$R_T = 90\ \Omega$  (we do not add up the resistor/resistance values as we would do in a series circuit)

$$1/r_t = 1/30 + 1/30 + 1/30$$

$$0.1 = 0.0333 + 0.0333 + 0.0333$$

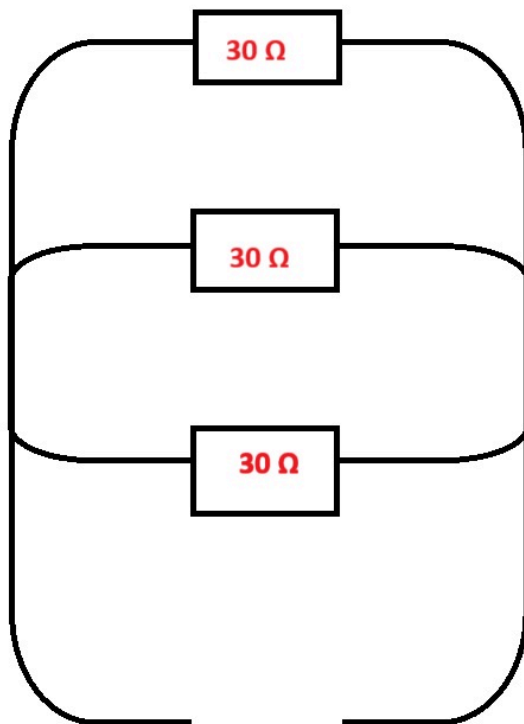
$$0.1 \Rightarrow 10\ \Omega \text{ (multiply by 100)}$$

$$I_T = 100\text{ V} / 10\ \Omega$$

$$I_T = 10\text{ amps}$$

In a parallel circuit; the **voltage** is constant and the **current** differentiates.





V = 100 Volts  
I = 10 Amps  
R = 10 Ω

$$V/R = I$$

Parallel circuit:

- **Voltage** is constant
- **Current** changes around each resistor

Resistor one

$$100 \text{ V} / 30 \text{ } \Omega = 3.33 \text{ amps}$$

Resistor two

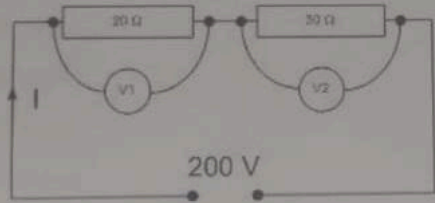
$$100 \text{ V} / 30 \text{ } \Omega = 3.33 \text{ amps}$$

Resistor three

$$100 \text{ V} / 30 \text{ } \Omega = 3.33 \text{ amps}$$

## Question 24

24



The diagram shows a series circuit with a 200 V DC voltage source at the bottom. Two resistors are connected in series at the top: a 20 Ω resistor on the left and a 30 Ω resistor on the right. A voltmeter labeled V1 is connected in parallel across the 20 Ω resistor, and another voltmeter labeled V2 is connected in parallel across the 30 Ω resistor. An arrow labeled 'I' indicates the current flowing upwards from the negative terminal of the voltage source.

How would the current passing through the 20 Ω resistor be determined for the circuit shown?

- A. Dividing the supply voltage by 20 Ω.
- B. Multiplying the supply voltage by 20 Ω.
- C. It would be half the total supply current.
- D. It would be equal to the total supply current.

### Question 24 working out

The answer is D

The **current** is constant in a series circuit and the **voltage** changes around the resistors.

$$I = \text{Voltage} / \text{Resistance}.$$

$$200\text{V} / 50 \text{ ohms } \Omega = 4 \text{ amps}$$

## Question 25

25

What would be the total circuit resistance if a parallel circuit contained five resistors all having a resistance of 50 Ω?

- A. 0.1 Ω
- B. 5 Ω
- C. 10 Ω
- D. 50 Ω

### Question 25 working out

The answer is **C) 10 Ω**

The questions: "What would be the total circuit resistance if a parallel circuit contained five resistors all having a 50Ω?"

Let's carefully add step by step:

You have

$$\frac{1}{50} + \frac{1}{50} + \frac{1}{50} + \frac{1}{50} + \frac{1}{50}.$$

All the denominators are the same, so we just add the numerators:

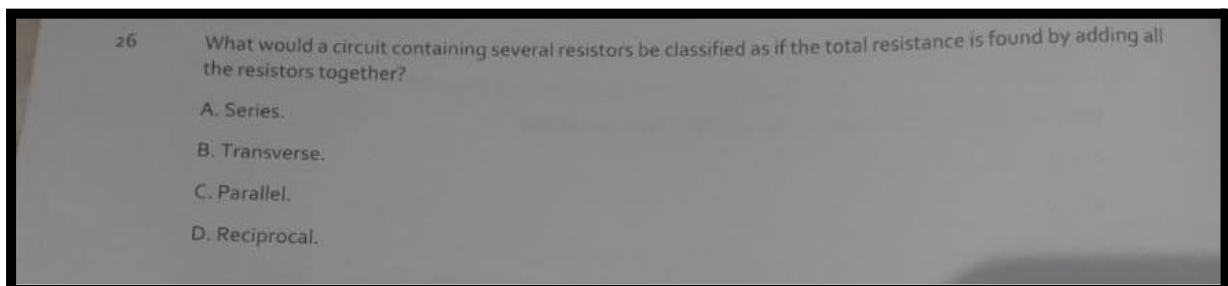
$$\frac{1 + 1 + 1 + 1 + 1}{50} = \frac{5}{50}.$$

Now simplify:

$$\frac{5}{50} = \frac{1}{10}.$$

$$\frac{1}{10} = 0.1$$

## Question 26



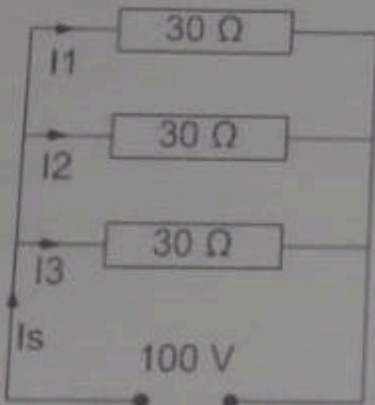
### Question 26 working out

The answer is **A) Series.**

In a series circuit you can calculate the total resistance by adding all of the individual resistors together.

## Question 27

27



What is the power dissipated in the circuit shown?

A. 100 W.  
B. 300 W.  
C. 1 kW.  
D. 3 kW.

### Question 27 working out

In a parallel circuit the **voltage** is constant. The **current** differentiates.

Whenever power is mentioned the formula to use is **PIV**.  $P = I \times V$ .

The question provides us with the **voltage** and the information to calculate the total **resistance**. However, we need to use the VIR formula triangle first to get the **I (current)** in order to calculate the power.

$$V = 100V$$

$$I = ?$$

$$R \Rightarrow$$

$$1/30 + 1/30 + 1/30 = 3/30.$$

$$3/30 \text{ simplified} = 1/10 \Rightarrow 0.1.$$

$$0.1 \times 100 = \mathbf{10\Omega}.$$

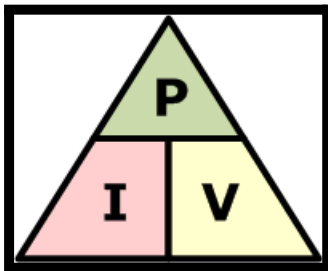
$$100\text{V} / 10\Omega = 10 \text{ amps}$$

$$V = 100\text{V}$$

$$I = 10 \text{ amps}$$

$$R = 10\Omega$$

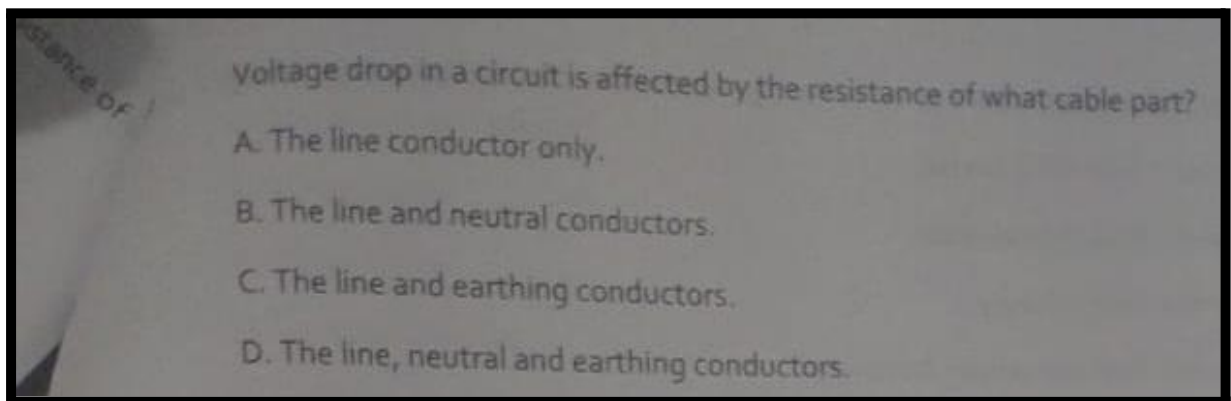
Now we have the **current** and the **voltage** so we can deduce the **power**. Using the **power** formula triangle.



$$\text{Power} = \text{Current} \times \text{Voltage}$$

$$1\text{kW} = 10 \text{ amps} \times 100\text{V}$$

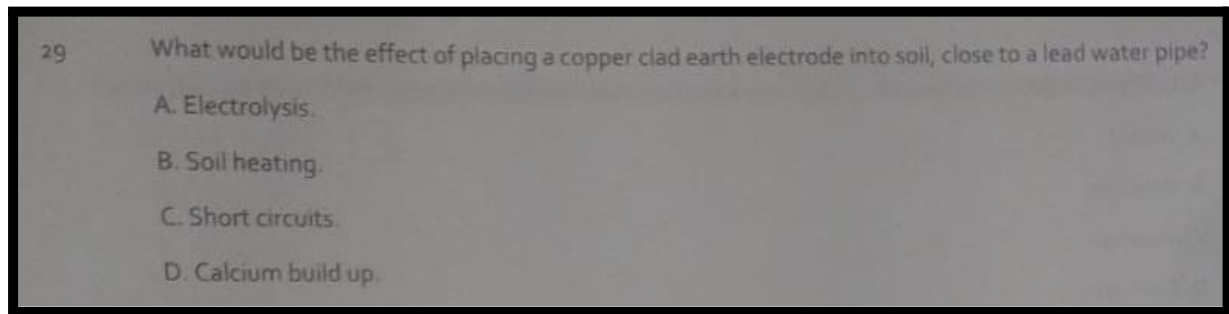
## Question 28



### Question 28 working out

The answer is B

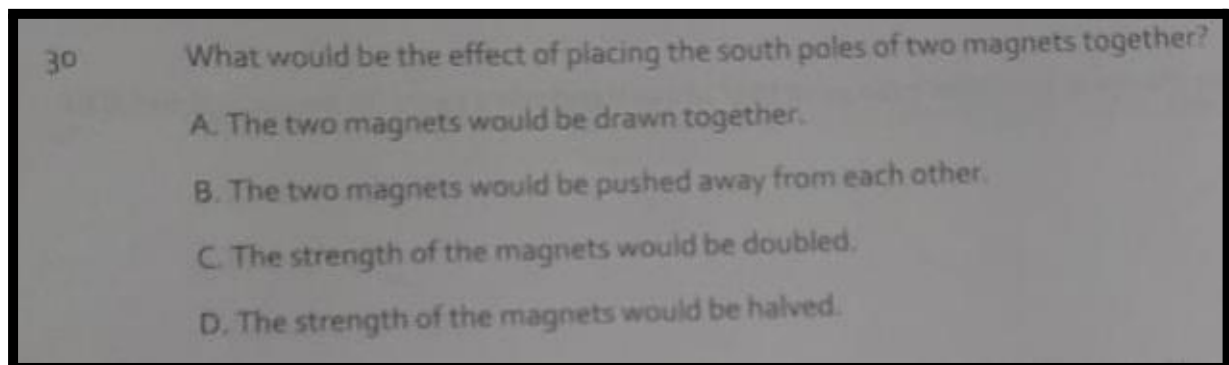
## Question 29



### Question 29 working out

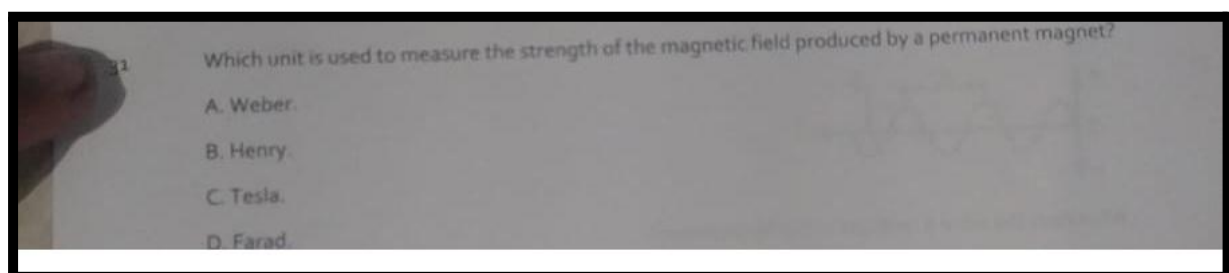
The answer is A

## Question 30



The answer is B

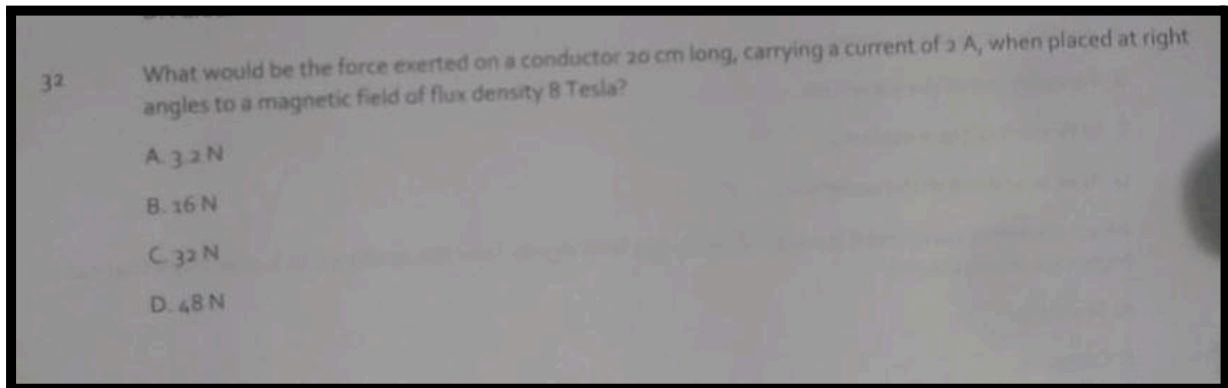
## Question 31



### Question 31 working out

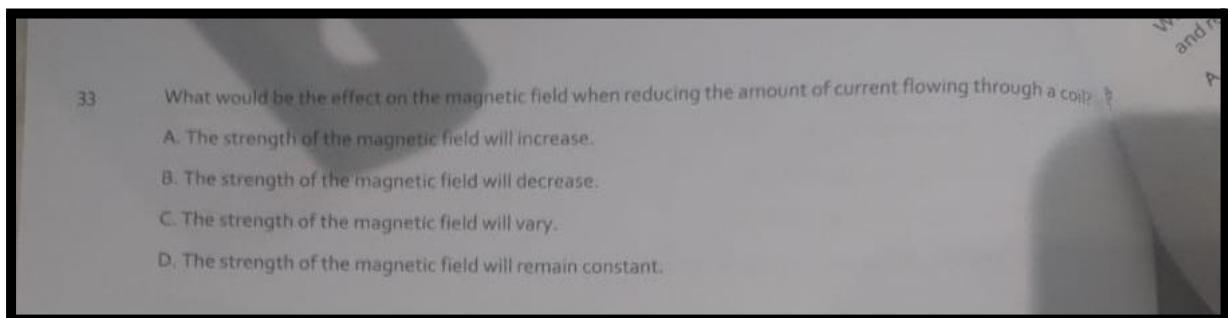
The answer is B

## Question 32

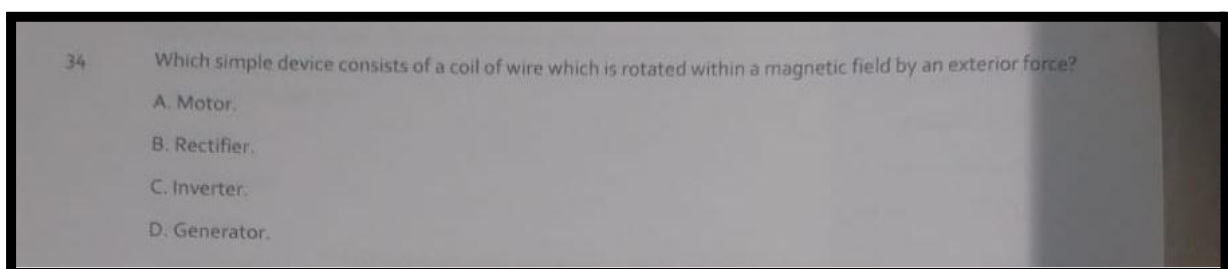


Question 32 working out

## Question 33



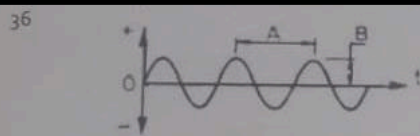
## Question 34



## Question 35

- 35 What would be the flux change in a coil that induces an EMF of 150 V and takes 10 ms for the current to fall to zero?
- A. 0.15 Wb.
  - B. 1.5 Wb.
  - C. 15 Wb.
  - D. 150 Wb.

## Question 36



What does the value B, indicate in the figure shown?

- A. Average value of the waveform.
- B. Periodic time of the waveform.
- C. RMS value of the waveform.
- D. Peak amplitude of the waveform.

## Question 37

- 37 Which electronic component is used to amplify low level signals from PIR detectors, to higher levels that can trigger the alarm circuit?
- A. Thyristor.
  - B. Capacitor.
  - C. Transistor.
  - D. Resistor.

## Question 38

- which electronic component is used in a remote control device to pulse a pattern that a receiver recognises and responds accordingly?
- A. Zener Diode.
  - B. Photo Diode.
  - C. Thermionic Diode.
  - D. Light Emitting Diode.



## Question 39

- 39 Which electronic components resistance will vary significantly more than standard resistors with temperature?
- A. Thermistor.
  - B. Capacitor.
  - C. Transistor.
  - D. Inverter.

## Question 40

- 40 Which electronic component is a semiconductor that converts light into current?
- A. Zener Diode.
  - B. Photo Diode.
  - C. Capacitor.
  - D. Transistor.

## Classroom theory

Mass never changes and stays the same.

Weight changes due to the impact of gravity. A person would have a different weight on earth compared to outer space.