Vydhyuthapravahathinte Bhalangal

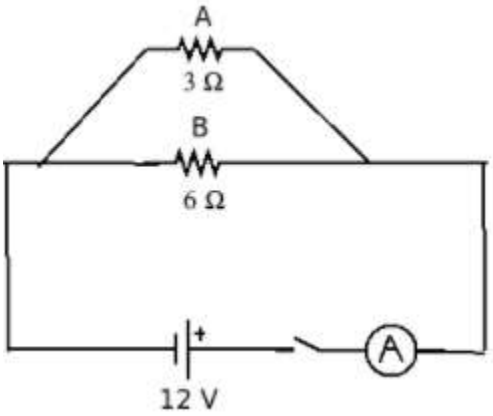
Question 1: It is said that a fuse wire of proper amperage should be used in an electrical circuit. Why **Marks :(2)**

Solution: If amperage of fuse wire is more than correct value, the circuit does not break even excess current flows through circuit. If amperage of fuse wire is less, the circuit breaks when device is switched on.

Question 2: An electric heater of resistance 230Ω is connected to 230V supply. Calculate the heat energy produced by it in 1 second. **Marks :(2)**

Solution: $H = V^2/R\ xt = (230 \times 230 / 230) \times 1 = 230$ J

Question 3: Analyse the given circuit diagram and answer the following questions. **Marks :(4)**



1. **What will be the electric current through the resistance A?**
2. **What will be the electric current through the resistance B?**
3. **What will be the ammeter reading?**
4. **How should be the resistance wire be arranged to reduce the ammeter reading?**

Solution:

1. Current through A, $I_1 = V/R = 12/3 = 4A$
2. Current through B, $I_2 = V/R = 12/6 = 2A$
3. Ammeter Reading = I1 + I2 = 4 + 2 = 6 or

   1/R = 1/R1 + 1/R2 = 1/3 + 1/6 = 3/6

   R = 6/3 = 2 ohm

I = V/R = 12/ 2 = 6 A

4. Connect the resistance in series

Effective resistance when connected in series = 3 + 6 = 9 ohm

Intensity of Electric Current I = 12 / 9 = 1.33 A

Question 4: Nichrome is not used as filament in filament lamps. Why? Marks :(1)

Solution: Nichrome can only remain red hot and does not produce white light while heating it.

Question 5: Ajith says that if we use tungsten as heating coil we will get light energy as well as heat energy. What is your response to his statement? Marks :(1)

Solution: Tugston cannot used as heating coil because it gets oxidised while heating.

Question 6: A filament Lamp designed to work at a potential difference 250V has power 100W. What will be the power of this lamp when connected to a 100V supply? Marks :(3)

Solution: We know, power P = V2/R

R = V2/P = 250 x 250 /100 = 625 W

When connected to 100 V power supply

Power P = V2/R

= 100 x 100 / 625 = 16 W

Question 7: A heating coil of 10000Ω resistance works in 250V supply. Marks :(4)

1. **What is the current flowing in it?**
2. **What is the power of heater?**
3. **Will there be any difference in the temperature, If we reduce the length of the heating coil? Why?**

Solution: a) I = V/R = 250/1000 = .25 A

b) P = V^2 /R =250 x250 /1000 = 62.5 W

c) Yes, The resistance decreases when length of the conductor decreases .So the power increases and the heat also increases

Question 8: Nowadays LED Lamps are widely used. Marks :(3)

1. **Name any two parts of this lamp & write the working of it.**
2. **Name ant two instruments/tools used inthe making of LED Lamp.**

Solution: (a).LED Chip board -LED is connected

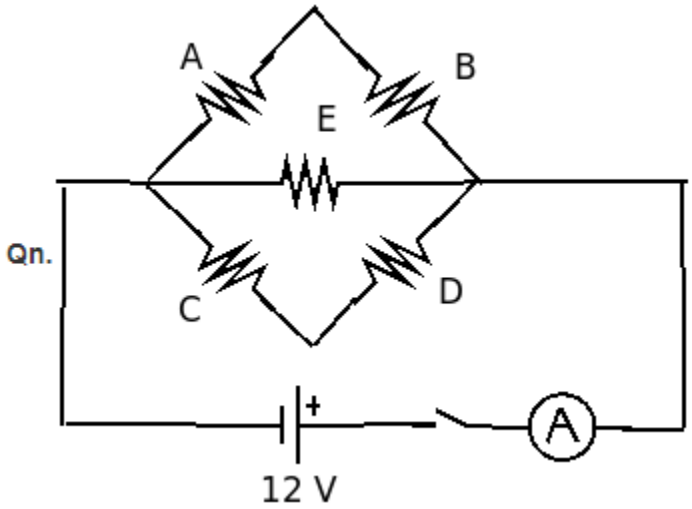
Heat sink - to absorb heat
Power supply Board-Provides required DC to LED

Diffuser cup -Transmit light outside

Base Unit- Connect the LED to the holder

(b) Soldering Iron, player, Solder lead

Question 9:



A, B, C, D & E are five 10Ω resistors connected in a circuit as in the given diagram. Marks :(4)

1) Calculate the effective resistance of the circuit. 2

2) What is the electric current through the circuit. 2

Solution: Effective resistance of A and B R_1 =A+B=10+10=20 ohm

Effective resistance of c and D R_2 = C + D= 10 +10 = 20 ohm

Effective resistance in the circuit

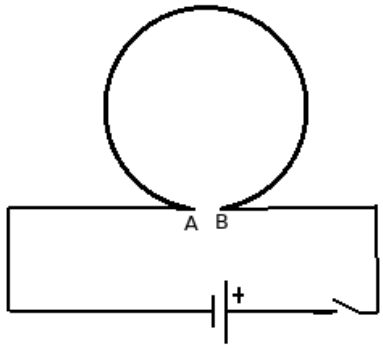
1/R = 1/R1 + 1/R2 + 1/E = 1/20 + 1/20 + 1/10

= (1 + 1 + 2)/ 20 = 4 / 20

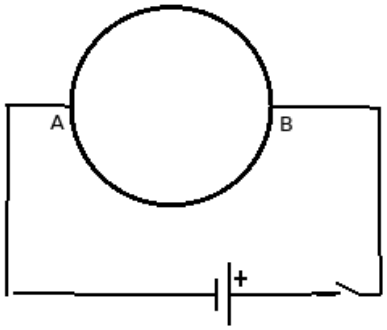
Effective resistance R = 20 /4 = 5 Ohm

b) Intensity of electric current I = V/R = 12/5 = 2.4 A

Question 10: Resistance of a 20cm long conductor is 20Ω. The conductor is bent into circular loops and connected in the circuit as in the given diagrams, calculate the resultant resistance in each case. Marks :(4)



Fig(i)



Fig(ii)

Solution: Fig (i) Effective resistance = 20 Ohms (1)

Fig (ii) two 10Resistances are connected as parallel so

Effective resistance, $1/R = 1/R_1 + 1/R_2 = 1/10 + 1/10$

$=2/10 = 1/5$

Effective resistance, R = 5 Ohm (2)

Question 11: Power of a bulb which works in 220V is 100W. When the voltage in the circuit decreases the power becomes 25W, what will be the voltage at that time? Marks :(2)

Solution: $P = V^2/R$

$R = V^2/P = 220 \times 220 / 100 = 484$

Voltage decreased $V^2 = 25 \times 484 = 12100$

V = 110 V

Question 12: **Marks :(4)**

A	**B**
Heat Sink	**Converts AC to DC & suitable voltage is supplied.**
Diffuser Cup	**LEDs are fixed.**
Power supply board	**Light emitting part.**
LED Chip Board.	**System to absorb heat energy produced.**

Solution:

A	B
Heat Sink	System to absorb heat energy produced.
Diffuser Cup	Light emitting part.

Power supply board Converts AC to DC & suitable voltage is supplied.

LED Chip Board. LEDs are fixed.

Question 13: Match the foll0wing related to LED Lamp. Marks :(4)

Heat Sink Converts AC to DC & suitable voltage is supplied.

Diffuser Cup LEDs are fixed.

Power supply board light emitting part.

LED Chip Board. System to absorb heat energy produced.

Solution:

A	B
Heat sink	to absorb heat energy produced.
Diffuser Cup	light emitting part.
Power supply board	Converts AC to DC & suitable voltage is supplied.
LED Chip Board.	LEDs are fixed

Question 14: LED Lamps save energy & are ecofriendly. Justify this statement. Marks :(3)

Solution: *As there is no filament, there is no loss of energy in the form of heat.

* Since there is no mercury and fluorescent materials in it, it is not harmful to environment

* High longevity and can be reusable

Question 15: Calculate the amount of heat energy produced when 1A current flows through a 1Ω resistance wire for 1 hour. Marks :(2)

Solution: R = 1Ohm, I = 1 A, t = 1 h = 3600 s

$H = I^2Rt$

H = 1A x 1A x 1Ohm x 3600 s

= 3600 J

Question 16: Calculate the highest resistance that can be made by using five 1Ω resistors? (1)

What is the lowest resistance made by the same five 1 ohm resistors? (1)

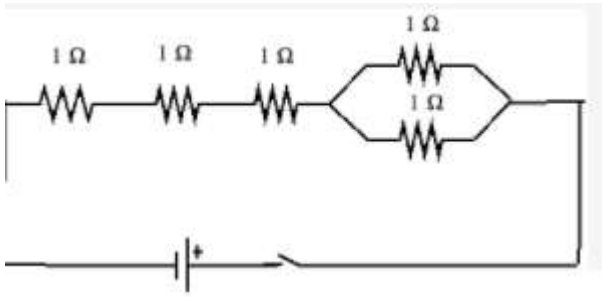
Draw a circuit in which these resistances are arranged in order to get the effective resistance = 3 1/2 Ω. (2)

Solution: 1. Effective resistance R = 1+1+1+1+1 = 5 ohm

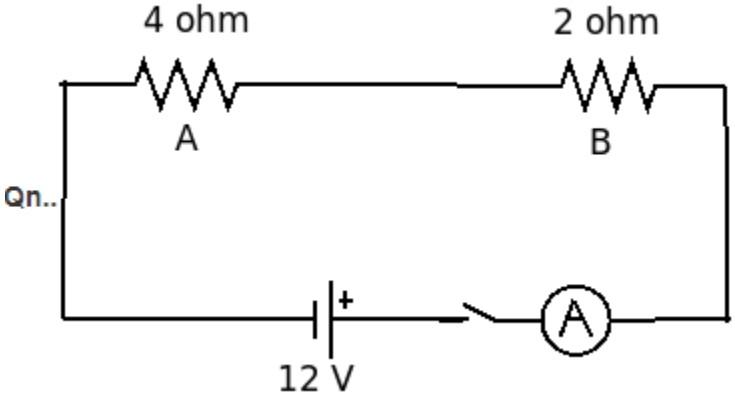
2. Lowest effective resistance, 1/R= 1/1 +1 /1+ 1/1 + 1/1+1/1

R = 1/5ohm

3.



Question 17: **Marks :(4)**



1. **Calculate the effective resistance in the above circuit. (1)**
2. **If the electric current is flowing for 10minutes , calculate the amount of heat energy produced.(1)**
3. **Calculate the heat energy produced in 10 minutes if these resistors are connected in parallel .(2)**

Solution: a) $R=R_1+R_2$

=4+2=6 Ohm

b) $H = V^2 /Rt$ = (12 x 12 /6) x 10 x 60

= 14400 J

c) Effective resistance R = R1R2 /R1+R2 = 4x2 / 4+2 = 8/6 = 4/3

Heat $H = V^2 Rt$ = 12x12 /(4/3) x10 x 60 = 64800 J

Question 18: An electrical device of power 440W is connected to 230V power supply. Which among the following is the amperage of fuse to be used in this circuit? Marks :(1)

(a) 0.5A (b) 2A (c) 1.5A (d) 4A

Solution: 2A

Amperage = wattage/voltage

= 440/230

=1.9

So, amperage = 2A

Question 19: The given experiment is based on heating effect of electric current Marks :(4)

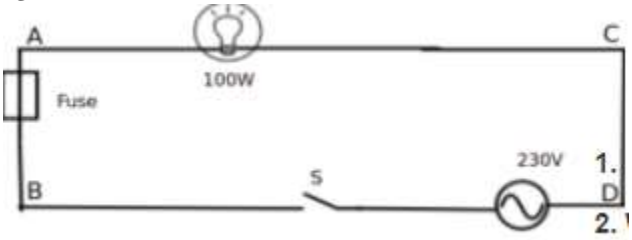
1. **Which device is used to change the intensity of current in the circuit? (1)**
2. **Nichrome is used to make the heating coil to change the temperature of water...Why do we use this material as heating element? (1)**
3. **If we double the length of the coil immersed in water, what will be the change in the heat energy produced? (2)**

Solution: a. Rheostat

b. nichrome, Nichrome has high resistivity and high melting point

(c) When the length doubles the current decreases to half .so heat also decreases to half

Question 20: Marks :(4)



1. **When the switch is on calculate the current in the circuit (1)**
2. **What is the purpose of fuse in a circuit? (1)**
3. **What is the amperage of the fuse wire that can be used in this circuit?(2)**

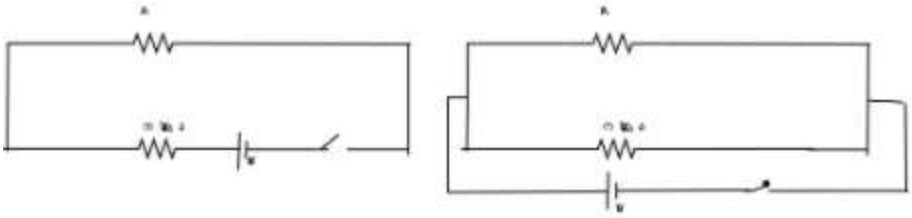
Solution: (a) P= V x I

I = P/V= 100/230 = 0.434

(b) Fuse melts during Short circuit and overload

(c) Amperage = 0.5A

Question 21: Aluminium and Nichrome wires of same length and thickness are used in the given circuit. Marks :(3)



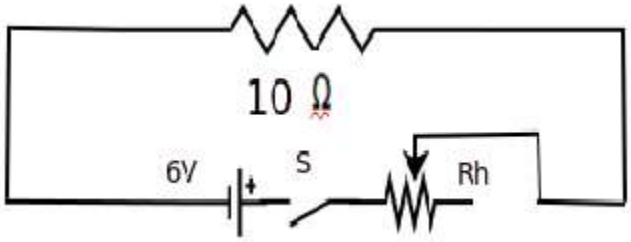
1. **In which circuit the current through Aluminium and Nichrome are the same? (1)**
2. **In which circuit, Nichrome wire gets heated more. Explain. (2)**

Solution: (a) a

(b) a

In circuit (a) the resistances are connected in series and the current is same. So nichrome wire having more resistance heats more

Question 22: Analyse the diagram and answer the following questions. Marks :(4)



How is Rheostat and resistor connected in this circuit?

If the Rheostat offers a Resistance of 50Ω, what is the current in the circuit?

Solution: a) Series connection. (1)

b) Resistance in the circuit = 10 Ω + 50 Ω= 60 Ω

I = $\frac{v}{R}$ .....½

I = $\frac{6}{60}$ = $\frac{1}{10}$ A or 0-1 A.....½

c) H = I^2 Rt .....½

H= (I X V X t) = 0.1 * 6 * 300 = 180 J 1

H = 180 J .....½

or (3)

H= $\frac{v2t}{R}$, $\frac{6^2 \times 300}{60}$ = 180 J

Question 23: If a bulb labelled as 100W/230V is connected to 115V power supply, what will be its Power? Marks :(1)

(100W. 25W, 12.5W, 50W)

Solution:

P = 25W

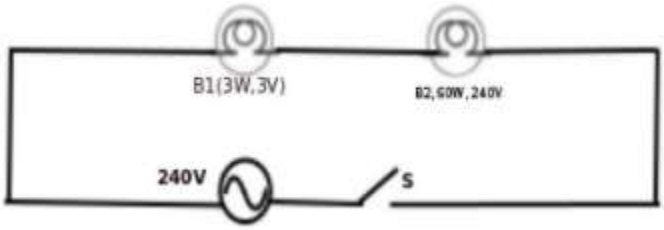
P = V^2/R

= (230 X 230)/100 = 529 ohm

P = V^2/R

= (115 x 115)/529 = 25W

Question 24: Observe the given circuit Diagram.B1 is a torch bulb and B2 is an ordinary incandescent bulb. Marks :(4)



1. **Among B1 and B2 which one have higher resistance?**
2. **If we switch on the circuit as arranged in diagram, Whether both the bulbs will glow or not glow**
3. **What happens if we switch on the circuit after replacing B2 with another B1. Explain.**

Solution: a) B2 ..... ½

$R = V^2/ P$.....½

b) Glows (1)

c) Resistance decreases, current increases....(.1)

So the bulbs in the circuit fuses.....(1)

Question 25: a) Write two disadvantages of incandescent lamps? (1)

b) What is the arrangement/facility provided to increase the life of such bulbs.(2)

c) How does the oxidation of filament reduced in such lamps? (1)

Solution: a) A portion of electric energy is loses as heat

Forms shadow

Short life time

b) Vaporisation can be reduced by filling some inert gas at low pressure inside the bulb. Nitrogen is usually used for this purpose

c) In order to avoid oxidation of tungsten, the bulb is evacuated.

Question 26: When excess electric current flows through the circuit, fuse wire melts & breaks the circuit. Marks :(2)

a) Whether heat energy is produced when allowed amount of current flows in the circuit? If yes why doesn't the fuse wire break? (2)

b) Why does fuse wire melt when excess electric current flows through the circuit?(2)

Solution: a) Yes heat is produced. When current is flowing through the fuse wire small quantity of heat is producing but that heat is transmitting to the surroundings. That heat is not enough to melt the fuse wire

b) When more current is flowing more heat is generated. Due to that heat, fuse wire melts

Question 27: Find the relation in the first then complete the second pair Marks :(2)

a) Bulb : Light effect

Safety Fuse : ..... (1)

b) Nichrome : High Melting Point

Fuse wire: ..... (1)

Solution: a) Heating effect

b) Low melting point

Question 28: a) Name any to electrical heating devices. (1)

b) Name the constituent metal in the alloy used to make the heating coil of a heating appliance. (1)

c) Calculate the heat energy produced when 1A current flows through 100Ω resistance wire for 1hour. (2)

Solution:

a) Soldering iron, Electric water heater, Electric oven

b- Ni,Cr, Mn,Fe

c -

R = 100 ohm

I = 1A

t = 1h

t = 3600 s

H = I^2Rt

H= 1x1 x100 x3600

= 360000J

Question 29: Heat energy produced in a current carrying conductor is equal to the product of square of current through the conductor, Resistance of the conductor and the time for which the current flows. Marks :(3)

a) Which law is stated above? (1)

b) If we increase the current 10 times, what will be the increase in the heat energy produced? (1)

c) If double the resistance of the conductor what will be the change in the heat energy produced ? (2)

Solution:

a -Joule's law ---------- (1)

b. H = I^2Rt

H = $(10*I)^2Rt$

H = 100 I^2Rt H= 100H

= V/2R

= I/2

=H/2

c. I = V/R

Question 30: Find the relation and complete the following. **Marks :(1)**

Electrical energy →Heat energy → Heating effect → Electric Stove

Electrical energy →Chemical energy → Chemical effect → ..... (1)

Solution: Storage battery

Question 31: A and B are two electrical devices, **Marks :(3)**

Device A	**Device B**
230V	**230V**
1000W	**50W**

1. **If both the devices are working for the same time which among will produce more electrical Energy? (1)**
2. **Which device has more resistance? Justify your answer? (2)**

Solution:

a) device A.....½

b) device B .....½

R = $\frac{v^2}{P}$, $\frac{230^2}{500}$, $\frac{230^2}{1000}$ 1

When the resistance increases the power decreases.....(1)

Question 32: Find the correct answer from the following. **Marks :(1)**

The device works on the heating effect of electric current (1)

(Fan, LED, Fuse, CFL)

Solution: Fuse

Question 33: 240V power supply is maintained in household circuits **Marks :(3)**

1. **Find the resistance of heating coil of an electric iron if 2A current is flowing through it. (2)**
2. **How much electrical energy is consumed when this device works for 5 minutes? (2)**

Solution:

R = $\frac{v}{I}$ ..... ½, a) R = $\frac{240}{2}$ = 120Ω 1

b) Electrical energy = I^2Rt ; ..... ½ OR

Electrical energy = $V \times I \times T$

= $240 \times 2 \times 300$ J.....1½

= 144000 J

Question 34: Match suitably: **Marks :(3)**

A	B	C
Heater	Voice coil	Light effect
Bulb	Heating Coil	Electromagnetic Induction
Microphone	Armature	Chemical effect
	Filament	Heat Effect

Solution:

Match suitably:

A	B	C
Heater	Heating Coil	Heat Effect
Bulb	Filament	Light effect
Microphone	Voice coil	Electromagnetic Induction

Question 35: The cautionary measures are given while the fuse wire is included in the circuit. **Marks :(2)**

1. **Fuse wire should not extend out of the carrier base.**
2. **Edges of the fuse wire should be fixed firmly.**
3. **Fuse wire should be connected in parallel to the circuit.**

1. **Which statement among the above is correct ? (1)**
2. **Rewrite the wrong statement after necessary corrections. (1)**

Solution: (a) (i) , (ii)..... ½+ ½

(b) Fuse should connect in series with the circuit (1)

Question 36: In an electric heater 800 W, 400V is labelled. ***Marks :(3)***

a) What does it mean? (1)

b) If it is working in 200V power supply calculate the current through the device. Find the power in this situation? (2)

Solution:

a) In 400 V power supply the power is 800W.....1

b) R = $\frac{v^2}{P}$ = 200 Ω.....1

P = $\frac{v^2}{R}$ = $\frac{200^2}{200}$ = 200w 1

I = . $\frac{v}{R}$ = 200/200= 1 A 1