Numerical Questions for Electricity

1) A wire of length 3 m and area of cross-section $1.7X10^{-6}$ m^2 has a resistance $3X10^{-2}$ ohm.

a) What is the formula for resistivity of the wire and what is the unit of it

b) Calculate the resistivity of the wire

Ans)

a) Resistivity of the wire is given by

$$\rho = \frac{RA}{L}$$

And It unit is Ohm-m

b) In this case

L=3 m

A=$1.7X10^{-6}$ m^2

R=$3X10^{-2}$ ohm

So

ρ=$1.7X10^{-8}$ Ohm-m

2) The table given below shows the resistivity of three Material X, Y and Z?

Samples	X	Y	Z
Resistivity	$3\ X10^{-9}$	$11.1\ X10^{-6}$	$18X10^{-17}$

a) Arrange the samples in increasing order of conductivity

b) Which of these is best conductor?

c) Which are these is best insulator?

Ans)

a) Conductivity is inversely proportional to resistivity

So

Y< X< Z

b) Z is the best conductor as it has least resistivity

c) Y is the best insulator as it has highest resistivity

3) There are m resistor each of resistance R. First they all are connected in series and equivalent resistance is X. Now they are connected in parallel and equivalent resistance is Y. What is the ratio of X and Y?

Ans)

Series combination

X=R+R+R+…….= mR

Parallel combination

$$\frac{1}{Y}=\frac{1}{R}+\frac{1}{R}+\cdots..=\frac{m}{R}$$

Or Y=R/m

So X : $Y=m^2$: 1

4) We have four resistors A ,B ,C and D of resistance 4ohm,8ohm ,12 ohm and 24 ohm respectively?

1	Lowest resistance which can be obtained by combining these four resistors	
2	highest resistance which can be obtained by	

	combining these four resistors	

Ans)

Lowest resistance is obtained in parallel combination

$$\frac{1}{R}=\frac{1}{4}+\frac{1}{8}+\frac{1}{12}+\frac{1}{24}$$

Or R=2Ω

Highest resistance is obtained in series combination

R=4+8+12+24=64Ω

5) Three resistors 5Ω, 10Ω and 30Ω are connected in parallel with the battery of Voltage 6V?

S.no	**Questions**	
1	The value of current across each resistor	
2	The value of Potential difference across each resistor	
3	Total current in the circuit	
4	Effective resistance of the circuit	

Ans)

Potential difference remains same across parallel combination

So current in each resistor is calculated as

$I_1=V/R_1=6/5=1.2$ A

$I_2=V/R_2=6/10=.6$ A

$I_3=V/R_3=6/30=.2$ A

Total current in the circuit

$I=I_1+I_2+I_3=1.2+.6+.2=2$ A

Effective resistance

$$\frac{1}{R}=\frac{1}{5}+\frac{1}{10}+\frac{1}{30}$$

⇨ R= 3Ω

6) An electric bulb draws a current of .8 A and works on 250 V on the average 8 hours a day.

a) Find the power consumed by the bulb

b) If the electric distribution company changes Rs 5 for 6 KWH, what is the monthly bill for 60 days

Ans) Power of the electrical bulb is given by

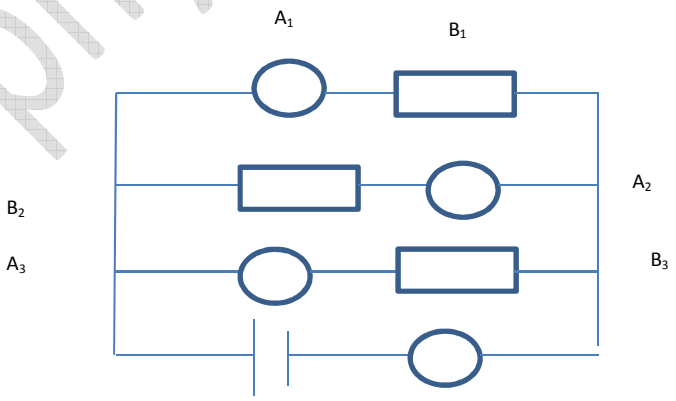
P=V X I=.8 A X 250 V= 200 W =.2 KW

Total energy consumption by the bulb in 60 days

E=P X t= .2 X8 X60=96 KWH

So cost will be =5X96/6=80 Rs

7)



A

A_1 ,A_2 ,A_3 and A are ammeters connected in the circuit

B_1 ,B_2 and B_3 are three identical bulbs

They all are connected to Voltage source as shown in Figure

When the three bulb are working good and glowing ,the current recorded in Ammeter A is 6 A

Answer Following questions

a) Same amount of current will go through each Bulb. And the value is 2 A .True or False

b) If the Bulb B_3 is blown away, the bulb B_1 and B_2 will start glowing more. True or False

c) What will happen to all the ammeter reading if Bulb B_1 is blown away

d) The current shown in Ammeter A remains even any bulb goes down. True or False

Ans)

a) Since Bulb are identical and connected in parallel with Voltage. Same current will flow through each bulb. Since the total current is 6 A.Individual current will be 2 A

b) If the Bulb B_3 is blown away, The potential difference across other bulb still remains same, So same current will flow and they will glow as it is. No change

c) when Bulb B_1 goes down, the current in that part become zero.

So reading of Ammeter A_1 becomes zero

Reading of Ammeter A_2 will remain same i.e. 2 A

Reading of Ammeter A_3 will remain same i.e. 2 A

Reading of Ammeter A will be = 2+2=4 A

d) As shown above, the reading of Ammeter A will change

8) Gave the formula for each

1	Ohm's Law	
2	Resistance in terms of Length,Area,resistivity	
3	Current in terms of Resistance and Voltage	
4	Equivalent Resistance for Resistors in Series	
5	Equivalent Resistance for Resistors in Parallel	
6	Power produced in the resistance	

Solutions

1	Ohm's Law	V=IR
2	Resistance in terms of Length,Area,resistivity	$R = \rho \frac{L}{A}$
3	Current in terms of Resistance and Voltage	$I = \frac{V}{R}$
4	Equivalent Resistance for Resistors in Series	$R=R_1+R_2+R_3.....$
5	Equivalent Resistance for Resistors in Parallel	$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$
6	Power produced in the resistance	$P=I^2R$