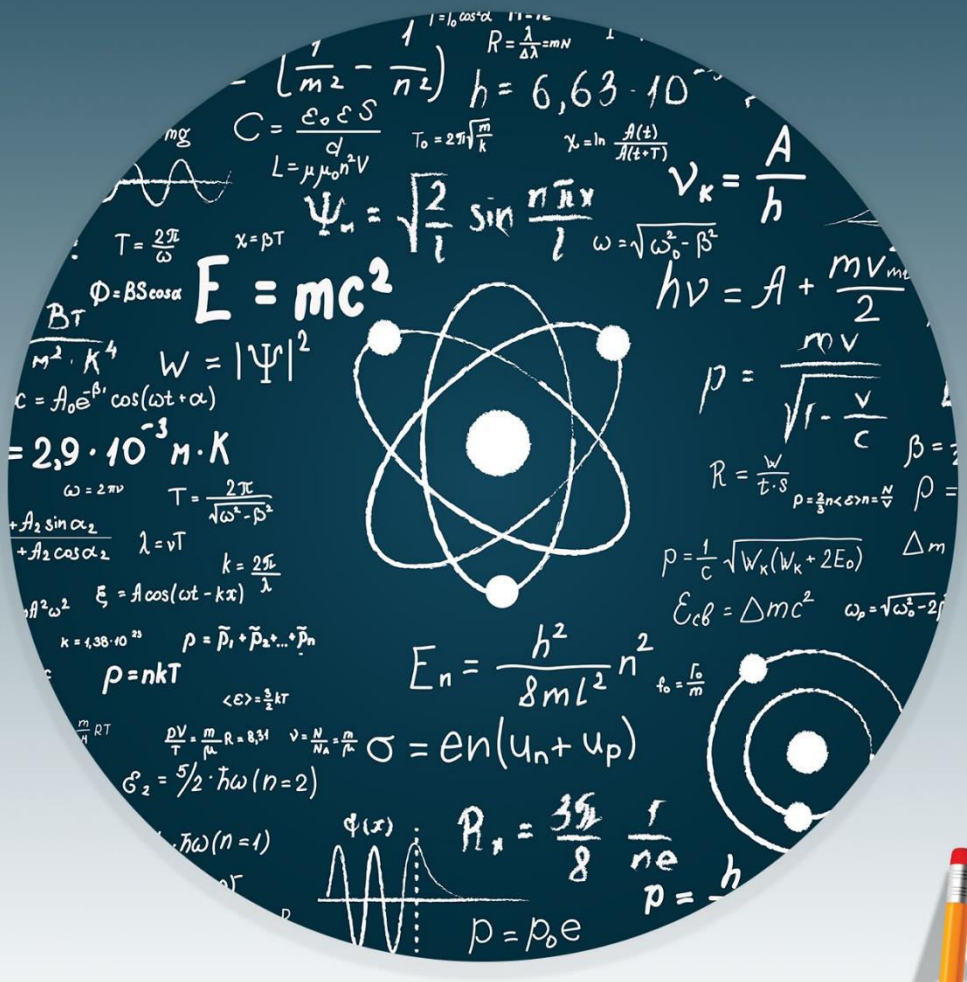
PHYSICS



WORKSHEET-2

STEP

A PROJECT BY PUNJAB GROUP

Worksheet-02

Topics:- Current, Ohm's Law, Combination of Resistors, Resistivity, Potential Difference & e.m.f, Power Dissipation, Kirchhoff's Rules, Potentiometer

USE THIS SPACE FOR SCRATCH WORK

Q.1 The graphical representation of ohm's law is:

A) Hyperbola C) Parabola

B) Ellipse D) Straight Line

Q.2 ohm is defined as:

A) volt / ampere C) ampere / volt

B) volt / coulomb D) joule / coulomb

Q.3 The resistance of a meter cube of the substance is called:

A) Resistivity C) Permittivity

B) Conductivity D) None of these

Q.4 The S.I unit of resistivity is:

A) ohm-m C) ohm-m^3

B) ohm-m^2 D) ohm-cm

Q.5 When the resistances are connected in series the equivalent resistance is equal to?

A) Sum of the reciprocal of the individual resistances

B) Sum of individual resistances

C) Product of the individual resistances

D) Can't be predicted

Q.6 The potential difference across resistances in series combination is:

A) Always same C) May be same or different

B) Always different D) None of these

Q.7 Three resistances 500 ohm, 350 ohm and 500 ohm are connected in series the equivalent resistance will be:

A) 1300 Ω C) 650 Ω

B) 1350 Ω D) 1400 Ω

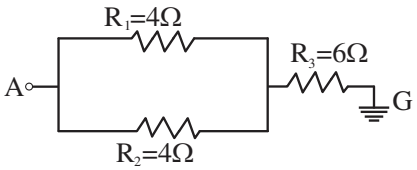
Q.8 The resistance of a 60 watt bulb in a 120 volt line is:

A) 240 Ω C) 60 Ω

B) 220 Ω D) 200 Ω

USE THIS SPACE FOR SCRATCH WORK

Q.9 In the circuit shown



If voltage applied at A is 20 V then what would be the resultant current passing through R_3.

A) 4 A C) 2.5 A

B) 6 A D) 10 A

Q.10 If a battery of 9 V is connected across 2.0 Ω resistance, then what would be the resultant current?

A) 4.0 A C) 3.5 A

B) 4.5 A D) 5.0 A

Q.11 How many different resistances are possible with two equal resistors?

A) 2 C) 4

B) 3 D) 5

Q.12 Internal resistance of the cell is caused due to the:

A) Static charges C) Electrolyte

B) Electrodes D) None of these

Q.13 A voltmeter directly connected across a battery in a circuit where current is flowing, will measure:

A) Emf

B) Terminal potential difference

C) Internal resistance

D) None of these

Q.14 Value of current for ideal short circuit is:

A) Zero C) Both are possible

B) Infinity D) Non-zero but finite

Q.15 Value of current is _____ for open circuit.

A) Zero C) Either A or B

B) Infinity D) Non-zero but finite

Q.16 For close circuit (with load applied across battery), the emf E of battery is related with terminal potential difference V_t as:

A) $E > V_t$ C) $E = V_t$

B) $E < V_t$ D) All of these

USE THIS SPACE FOR SCRATCH WORK

Q.17 **Kirchhoff's 1st rule is in accordance with law of conservation of:**

A) Energy C) Mass

B) Momentum D) Charge

Q.18 **When the battery is being charged, then emf E and terminal Potential difference V_t are related as:**

A) $E > V_t$ C) $E = V_t$

B) $E < V_t$ D) Any of these

Q.19 **The potential difference between the terminals of a battery in open circuit is 2.2 V. When it is connected across a resistance of 5 Ω, the potential falls to 1.8 V. The current drawn from battery is:**

A) 0.46 A C) 0.26 A

B) 0.54 A D) 0.36 A

Q.20 **Referring to Q .19, the internal resistance of battery is:**

A) 3.1 Ω C) 1.1 Ω

B) 2.1 Ω D) 0.51 Ω

Q.21 **In the rules for finding the potential changes, if a resistor is traversed in the direction of current, the change in potential is:**

A) Zero C) Positive

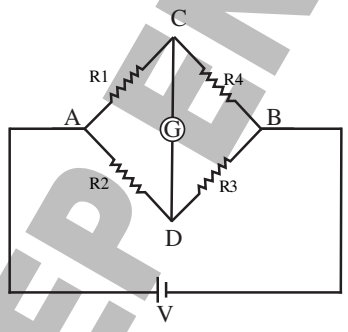
B) Negative D) Any of these

Q.22 **Kirchhoff's 2nd rule is based on:**

A) Energy conservation C) Charge conservation

B) Mass conservation D) Momentum conservation

Q.23 **In the bridge shown below:**



The final expression of balanced bridge is:

A) $\frac{R_1}{R_2} = \frac{R_3}{R_4}$ C) $\frac{R_2}{R_4} = \frac{R_1}{R_3}$

B) $\frac{R_1}{R_3} = \frac{R_4}{R_2}$ D) $\frac{R_1}{R_4} = \frac{R_2}{R_3}$

USE THIS SPACE FOR SCRATCH WORK

Q.24 **In the bridge circuit shown in Q.23, if $R_1=R$, $R_2=R$, $R_3=2R$ and $R_4=2R$, then the effective Resistance between A and B is:**

A) $\frac{5R}{2}$ C) $\frac{3R}{2}$

B) $\frac{7R}{2}$ D) $\frac{4R}{3}$

Q.25 **Referring to the values of resistances in Q.24, the effective resistance between C and D is:**

A) $\frac{5R}{2}$ C) $\frac{3R}{2}$

B) $\frac{7R}{2}$ D) $\frac{4R}{3}$

Q.26 **Referring to the Q.24, the net current through Galvanometer is:**

A) Zero C) Half of maximum

B) Maximum D) Can't be predicted

Q.27 **Wheatstone bridge is based on Kirchhoff _____.**

A) 1^{st} C) 3^{rd}

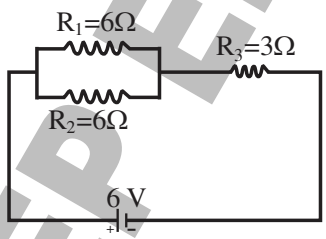
B) 2^{nd} D) 4^{th}

Q.28 **A charge of 90 C passes through a wire in 1 hour and 15 minutes. What is the current in the wire?**

A) 1 mA C) 20 mA

B) 5 mA D) 10 mA

Q.29 **Find the equivalent resistance of the circuit:**



A) 3 Ω C) 6 Ω

B) 12 Ω D) 4 Ω

Q.30 **Referring to Q.29, the total current drawn from source is:**

A) 0.5 A C) 1 A

B) 2 A D) 0.25 A

USE THIS SPACE FOR SCRATCH WORK

Q.31 **Referring to Q.29, the current passing through R_1 is:**

A) 0.5 A C) 1 A

B) 2 A D) 0.25 A

Q.32 **Referring to Q.29, the current passing through R_2 is::**

A) 0.5 A C) 1 A

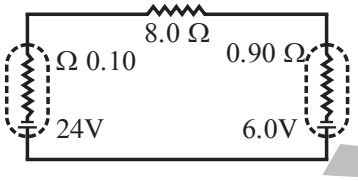
B) 2 A D) 0.25 A

Q.33 **Referring to Q.29, the current passing through R_3 is:**

A) 0.5 A C) 1 A

B) 2 A D) 0.25 A

Q.34 **Calculate terminal potential difference of 24 V cell in circuit:**



A) 24.2 V C) 24 V

B) 23.8 V D) 22.6 V

Q.35 **Referring to Q.34, Calculate terminal potential difference of 6 V cell in circuit:**

A) 4.2 V C) 7.8 V

B) 5.5 V D) 6 V

Q.36 **2×10^6 electrons pass through a conductor in 1 ms. Find electric current flowing through conductor:**

A) 32×10^{-9} A C) 3.2×10^{-10} A

B) 32×10^{-10} A D) 0.32×10^{-10} A

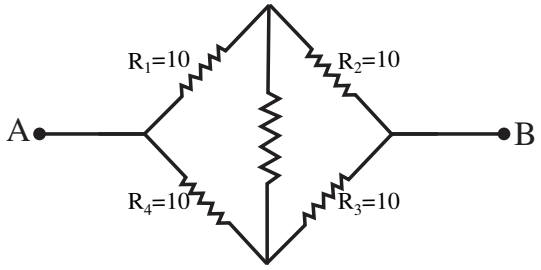
Q.37 **A carbon resistor is connected to a battery of 50 V and 2 A current is passing through it. If voltage is increases to 75 V, the current will become:**

A) 3 A C) 4.5 A

B) 1.5 A D) 6 A

USE THIS SPACE FOR SCRATCH WORK

Q.38 If the resistance of each resistor is 10 ohm in the following figure, then what will be the effective resistance between points 'A' and 'B':



A) 40 ohm
C) 30 ohm
B) 50 ohm
D) 10 ohm

Q.39 The ratio of effective resistances of two identical resistors, first connected in series then in parallel is:

A) 1:2
C) 4:1
B) 2:1
D) 1:4

Q.40 A wire carrying electronic current is:

A) Negatively charged
C) Electrically neutral
B) Positively charged
D) Any of these

Q.41 To compare two emfs in potentiometer, we use:

A) $\frac{E_1}{E_2} = \frac{\ell_2}{\ell_1}$
C) $\frac{E_1}{E_2} = \frac{r_2}{r_1}$
B) $\frac{E_1}{E_2} = \frac{\ell_1}{\ell_2}$
D) $\frac{E_1}{E_2} = \frac{\ell_1 \ell_2}{\ell_1 + \ell_2}$

ANSWER KEY (Worksheet-02)									
1	D	11	B	21	B	31	A	41	B
2	A	12	C	22	A	32	A		
3	A	13	B	23	D	33	C		
4	A	14	B	24	C	34	B		
5	B	15	A	25	D	35	C		
6	C	16	A	26	A	36	C		
7	B	17	D	27	B	37	A		
8	A	18	B	28	C	38	D		
9	C	19	D	29	C	39	C		
10	B	20	C	30	C	40	C		

SOLUTIONS

Unit – 9 (WS-02)

Q.1 Answer is "D"

Solution:- Graph of ohm's law is between "V" and "I". Since $V \propto I$, so, graph is straight line inclined with "V-axis".

Q.2 Answer is "A"

Solution:- By ohm's law:

$$R = \frac{V}{I}$$

$$1 \text{ ohm} = \frac{1 \text{ volt}}{1 \text{ ampere}}$$

Q.3 Answer is "A"

Solution:- Resistivity of material of wire is defined as:

$$\rho = \frac{RA}{L} \quad \rho = \frac{R\left(1\ m^2\right)}{\left(1\ m\right)}$$

Q.4 Answer is "A"

Solution:- By formula

$$\rho = \frac{RA}{L} = \frac{\Omega\ m^2}{m} = \Omega\ m$$

Q.5 Answer is "B"

Solution:- $R_e=R_1+R_2+R_3+. . . . .$

Q.6 Answer is "C"

Solution:- If resistances are same then potential is also same, otherwise it is different.

Q.7 Answer is "B"

Solution:- $R_e=R_1+ R_2+ R_3$

Q.8 Answer is "A"

Solution:- Use relation:- $P = \frac{V^2}{R}$

Q.9 Answer is "C"

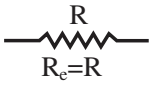
Solution:- $I = \frac{V}{R_e}$

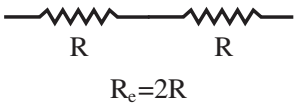
Q.10 Answer is "B"

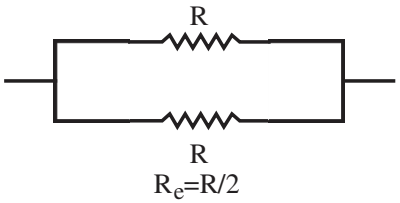
Solution:- $I = \frac{V}{R}$

Q.11 Answer is "B"

Solution:- By two resistors of equal value, following different resistances can be obtained:

i. 

ii. 

iii. 

Q.12 Answer is "C"

Solution:- Internal resistance is the hindrance which charge carriers feel while passing through electrolyte inside the battery.

Q.13 Answer is "B"

Solution:- When current is flowing through circuit, the voltmeter measures terminal potential difference. When current is not flowing, voltmeter reads emf.

Q.14 Answer is "B"

Solution:- For short circuit

$R = 0 \Rightarrow I=\infty$

Q.15 Answer is "A"

Solution:- For open circuit

$I=0 \Rightarrow R=\infty$

Q.16 Answer is "A"

Solution:- When battery is being discharged: $E = V_t + Ir$

Q.17 Answer is "D"

Solution:- Kirchhoff's first rule is another statement of law of conservation of charge.

Q.18 Answer is "B"

Solution:- When battery is being charged then

$E = V_t - Ir$

Q.19 Answer is "D"

Solution:- $V_t = IR \Rightarrow I = \frac{V_t}{R} = \frac{1.8}{5}$

Q.20 Answer is "C"

Solution:- $E = V_t + Ir$

Q.21 Answer is "B"

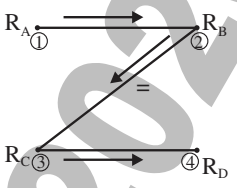
Solution:- Read rules for finding potential changes at the end of 2nd Kirchhoff's rules.

Q.22 Answer is "A"

Solution:- Kirchhoff's 2nd rule is based on law of conservation of energy.

Q.23 Answer is "D"

Solution:- Trick:



$\frac{R_A}{R_B} = \frac{R_C}{R_D}$

Q.24 Answer is "C"

Solution:- Ignore Galvanometer while finding Equivalent resistance.

Q.25 Answer is "D"

Solution:- Ignore Galvanometer while finding Equivalent resistance.

Q.26 Answer is "A"

Solution:- For balanced Bridge; $I_g=0$

Q.27 Answer is "B"

Solution:-

Principle of Wheat stone Bridge.

Q.28 Answer is "C"

Solution:- $I = \frac{Q}{t}$

Q.29 Answer is "C"

Solution:- $R_e = (R_1 \parallel R_2) + R_3$

Q.30 Answer is "C"

Solution:- $V = I R_e$

Q.31 Answer is "A"

Solution:- $I_1 = \left(\frac{R_2}{R_1 + R_2} \right) I$

Q.32 Answer is "A"

Solution:- $I_2 = \left(\frac{R_1}{R_1 + R_2}\right) I$

Q.33 Answer is "C"

Solution:- $I_3 = I_1 + I_2$

Q.34 Answer is "B"

Solution:-

Step-I

Find net current through circuit

$$I = I_{net} = \frac{V_{net}}{R_e} = \frac{24-6}{0.1+8+0.9} = 2 \text{ A}$$

Step-II

$$E = V_t + Ir$$

$$V_t = E - I_{net} r$$

$$V_t = 24 - (2)(0.1) = 23.8 \text{ V}$$

Q.35 Answer is "C"

Solution:-

Step-I

Finding net current through circuit

$$I = I_{net} = \frac{V_{net}}{R_e} = \frac{24-6}{0.1+8+0.9} = 2 \text{ A}$$

Step-II

When two batteries of different voltages are connected such that their high potential terminals or low potential terminals are combined, then smaller battery gets charged & for smaller battery;

$$E = V_t - Ir$$

$$V_t = E + Ir$$

$$V_t = 6 + (2)(0.9)$$

$$V_t = 7.8 \text{ V}$$

Q.36 Answer is "C"

Solution:-

Use:

$$I = \frac{Q}{t} = \frac{ne}{t}$$

Q.37 Answer is "A"

Solution:-

Initially

$$V = IR$$

$$R = \frac{V}{I} = \frac{50}{2} = 25\ \Omega$$

After increasing voltage

$$I' = \frac{V'}{R} = \frac{75}{25} = 3 \text{ A}$$

Q.38 Answer is "D"

Solution:-

$$R_{AB} = (10+10) \| (10+10)$$

Q.39 Answer is "C"

Solution:-

$$R_s = nR$$

$$R_P = \frac{R}{n}$$

Taking ratio

$$\frac{R_s}{R_P} = \frac{nR}{\frac{R}{n}} = n^2$$

Q.40 Answer is "C"

Solution:-

Any current carrying object is electrically neutral.

Q.41 Answer is "B"

Solution:-

To compare two emf we use:

$$\frac{E_1}{E_2} = \frac{\ell_1}{\ell_2}$$

STEP

A PROGRAM BY PUNJAB GROUP