DPP
DAILY PRACTICE PROBLEMS

CLASS : XIIth | **Solutions** | **SUBJECT : PHYSICS**
DATE : | | **DPP NO. : 4**

Topic :- Current Electricity

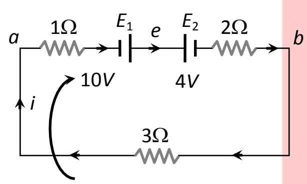
1 **(a)**

$i = \frac{e}{R} \Rightarrow 3 \times 10^{-7} = \frac{(30 \times 10^{-6}) \times \theta}{50} \Rightarrow \theta = 0.5°$

2 **(d)**

Since $E_1(10V) > E_2(4V)$

So current in the circuit will be clockwise



Applying Kirchhoff's voltage law

$-1 \times i + 10 - 4 - 2 \times i - 3i = 0 \Rightarrow i = 1A$ (a to b via e)

$\therefore$ Current $= \frac{V}{R} = \frac{10-4}{6} = 1.0\ ampere$

3 **(d)**

Given, $V = 10 \times 10^{-6}t - \frac{1}{40} \times 10^{-6}t^2$

At neutral temperature

$\frac{dV}{dt} = 0$

$\therefore\ 10 \times 10^{-6} - \frac{1}{20} \times 10^{-6}\, t_n = 0$

or $t_n = 200°C$

Also at neutral temperature, thermo-emf is maximum.

Thus,

$V_{max} = 10 \times 10^{-6}(200) - \frac{1}{40} \times 10^{-6}(200)^2$

$= 2 \times 10^{-3} - 1 \times 10^{-3} = 1$ mv

4 **(d)**

For conversion of galvanometer (of resistance) into voltmeter, a resistance R is connected in series

$\therefore i_g = \frac{V_1}{R+G}$ and $i_g = \frac{V_2}{2R+G}$

$$\Rightarrow \frac{V_1}{R+G} = \frac{V_2}{2R+G} \Rightarrow \frac{V_2}{V_1} = \frac{2R+G}{R+G} = \frac{2(R+G) - G}{(R+G)}$$

$$= 2 - \frac{G}{(R+G)} \Rightarrow V_2 = 2V_1 - \frac{V_1 G}{(R+G)} \Rightarrow V_2 < 2V_1$$

5 **(c)**

$I = \frac{E}{R_T} = \frac{2.5}{10+R}$ and $V = I.R = \frac{2.5 \times 10}{10+R} = \frac{25}{10+R}$

$$x = \frac{V}{L} = \frac{25}{(10+R)L}$$

$$E = x.l_1$$

$$\Rightarrow 1 = \frac{25}{(10+R)L} \times \frac{L}{2} \Rightarrow 25 = 20 + 2R$$

$$\Rightarrow 2R = 5 \Rightarrow R = \frac{5}{2}$$

$\therefore$ Now the resistance is doubled

$$R^1 = \frac{5}{2} \times 2 = 5\Omega$$

$$\therefore x = \frac{25}{(10+5)L} = \frac{25}{15.L} = \frac{5}{3L}$$

$$E = x.l_2$$

$$\Rightarrow 1 = \frac{5}{3L}.l_2 \Rightarrow l_2 = \frac{3L}{2} = 0.6L$$

6 **(a)**

Voltage sensitivity $= \frac{Q}{V}$

Current sensitivity $= \frac{Q}{I}$

Also, potential difference

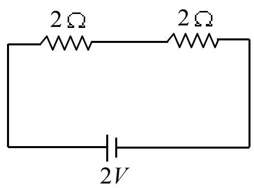
$V = IG$

Hence, $\frac{V_s}{I_s} = \frac{Q/V}{Q/I} = \frac{I}{V} = \frac{I}{IG}$

$$\therefore \frac{V_s}{I_s} = \frac{1}{G}$$

7 **(c)**

In steady state the branch containing capacitors, can be neglected. So reduced circuit is as follows



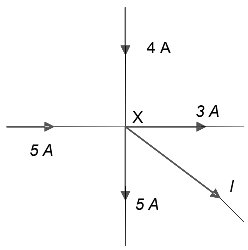
Power $P = \frac{V^2}{R} = \frac{(2)^2}{4} = 1W$

8 **(b)**

According to Kirchhoff's first law

(5A)+(4A)+(-3A)+(-5A)+I=0

Or I=-1A



9 **(b)**

When the heating coil is cut into two equal parts and these parts are joined in parallel, the resistance of coil is reduced to one fourth, so power consumed will become 4 times *i.e* . 400 Js^{-1}

10 **(d)**

The emf of the standard cell must be greater than that of experimental cells, otherwise balance point is not obtained

11 **(d)**

$E = \alpha t + \frac{1}{2}\beta t^2$, graph between E and t will be a parabola, such that first emf increases and then decreases

12 **(d)**

Potential difference between A and B

$V_A - V_B = 1 \times 1.5$

$\Rightarrow V_A - 0 = 1.5V \Rightarrow V_A = 1.5V$

Potential difference between B and C

$V_B - V_C = 1 \times 2.5 = 2.5V$

$\Rightarrow 0 - V_C = 2.5V \Rightarrow V_C = -2.5V$

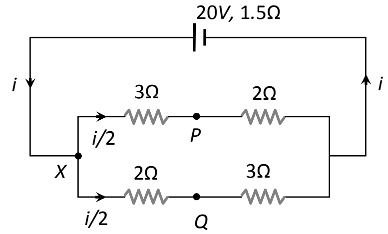
Potential difference between C and D

$V_C - V_D = -2V \Rightarrow -2.5 - V_D = -2 \Rightarrow V_D = -0.5V$

13 **(d)**

$R_{eq}=\frac{5}{2}\Omega$

$i=\frac{20}{\frac{5}{2}+1.5}=5A$



Potential difference between X and P,

$V_X - V_P=\left(\frac{5}{2}\right)\times 3=7.5V$ ....(i)

$V_X - V_Q=\frac{5}{2}\times 2=5V$ ....(ii)

On solving (i) and (ii) $V_P - V_Q=-2.5\ volt; V_Q>V_P$

Short Trick : $(V_P - V_Q)=\frac{i}{2}(R_2 - R_1)=\frac{5}{2}(2-3)=-2.5$

$\Rightarrow V_Q>V_P$

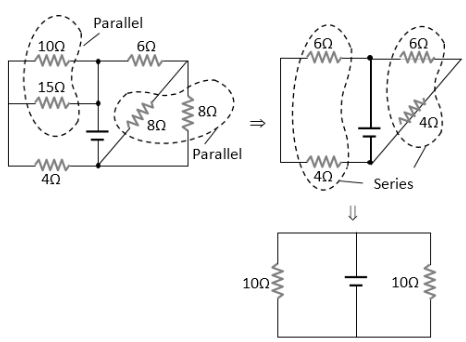
14 **(c)**

Initially the inductance will oppose the current which tries to flow through the inductance. But 10Ω and 20Ω can conduct. The current will be

$\frac{2V}{30\Omega}=\frac{1}{15}A$

15 **(c)**

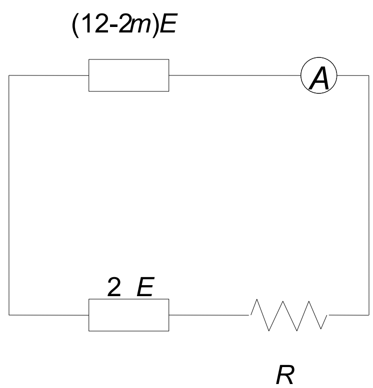
Given circuit can be reduced to a simple circuit as shown in figures below



16 **(d)**

Let polarity of m cells in a 12 cells battery is reversed, then equivalent emf of the battery $=(12-2m)E$

Now the circuit can be drawn as



When 12-cell battery and 2-cell battery aid each other, then current through the circuit

$$i_1 = \frac{(12 - 2m)E + 2E}{R}$$

or $3 = \frac{(14 - 2m)E}{R}$ ....(i)

When they oppose each other, the current through the circuit.

$$i_2 = \frac{(12 - 2m)E - 2E}{R}$$

or $2 = \frac{(10 - 2m)E}{R}$ ...(ii)

Dividing Eq. (i) by Eq. (ii), we have

$$\frac{3}{2} = \frac{14 - 2m}{10 - 2m}$$

or $30 - 6m = 28 - 4m$

or $2m = 2$

or $m = 1$

17 **(b)**

$i = qv = 1.6 \times 10^{-19} \times 6.6 \times 10^{15} = 10.56 \times 10^{-4} A = 1 mA$

18 **(d)**

$R = \rho \frac{l}{A}$ and $P \propto \frac{1}{R} \Rightarrow P \propto \frac{A}{l} \Rightarrow P \propto \frac{d^2}{l} \Rightarrow P_A = 2P_B$

19 **(a)**

Let the resistance of each heater wire is R. When two wires are connected in series, the heat developed is

$$H_1 = \frac{V^2 t}{2R} \quad ...(i)$$

When two heater wires are connected in parallel, the heat developed is

$$H_2 = \frac{V^2 t}{R/2} = \frac{2V^2 t}{R} \quad \text{...(ii)}$$

Dividing Eq. (i) by Eq. (ii), we get

$$\frac{H_1}{H_2} = \frac{1}{4} \text{ or } H_1 : H_2 = 1 : 4$$

20 **(a)**

$$R_{\text{eff}} = \frac{(P+Q)(R+S)}{(P+Q+R+S)} = \frac{4}{3} R$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	D	D	D	C	A	C	B	B	D
Q.	11	12	13	14	15	16	17	18	19	20
A.	D	D	D	C	C	D	B	D	A	A