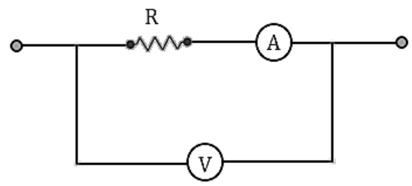
Q.1 In the circuit shown, the resistance of the voltmeter is $\mathbf{10,000\ \Omega}$ and that of the ammeter is $\mathbf{20\ \Omega}$. The ammeter reading is $\mathbf{0.10\ A}$ and voltmeter reading is $\mathbf{12\ V}$. Then value of **R** is equal to

(A) $122\ \Omega$ **(B)** $140\ \Omega$ **(C)** $116\ \Omega$ **(D)** $100\ \Omega$



Q.2 A voltmeter has a resistance of $\mathbf{G\ \Omega}$ and range **V volt**. The value of resistance used in series to convert it into voltmeter of range **nV volt** is

(A) nG **(B)** $(n-1)G$ **(C)** $\frac{G}{n}$ **(D)** $\frac{G}{n-1}$

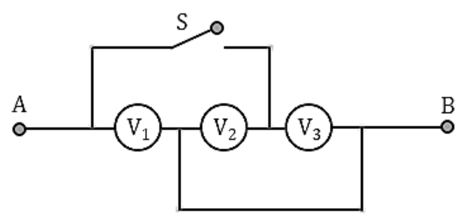
Q.3 Three voltmeters are connected as shown.
A potential difference has been applied across **A** and **B**. On closing the switch **S**, what will be the effect on The readings of voltmeters?

(A) V_1 Increases

(B) V_2 Decreases

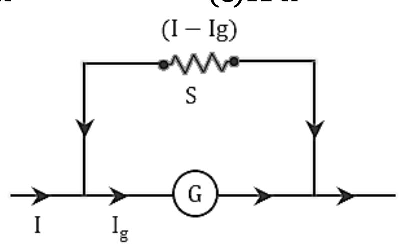
(C) V_2 And V_3 both increase

(D) One of V_2 and V_3 increases and the other decreases



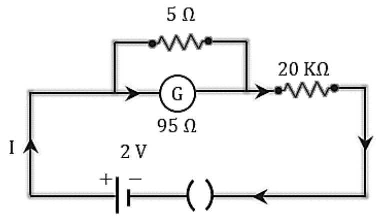
Q.4 The deflection in a moving coil galvanometer falls from **50** divisions to **10** divisions when a shunt of $\mathbf{12\ \Omega}$ is connected with it. The resistance of galvanometer coil is?

(A) $24\ \Omega$ **(B)** $36\ \Omega$ **(C)** $12\ \Omega$ **(D)** $48\ \Omega$



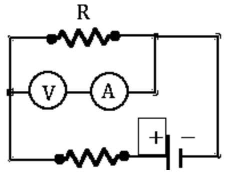
Q.5 A galvanometer of resistance $\mathbf{95\ \Omega}$ shunted by a resistance of $\mathbf{5\ \Omega}$ gives a deflection of 50 divisions when joined in series with a resistance of $\mathbf{20\ k\Omega}$ and a $\mathbf{2\ V}$ accumulator. What is the current sensitivity of the galvanometer in $\frac{\text{div}}{\mu A}$?

(A) $\frac{1}{2}$ **(B)** $\frac{1}{3}$ **(C)** $\frac{1}{6}$ **(D)** $\frac{1}{8}$



Q.6 Which of the following wiring diagrams could be used to experimentally determine **R** using ohm's law? Assume an ideal voltmeter and an ideal ammeter.

(A)



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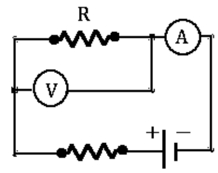
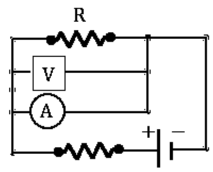


(C)



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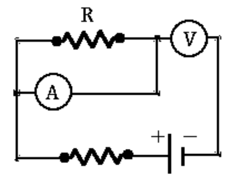
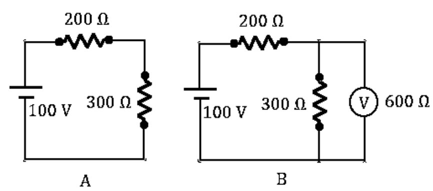


Q.7 Find potential difference across the resistance **300 Ω** given in circuit **A**and**B.**

(A)60 V And50 V **(B)**70 V and 70 V **(C)**30 V and 30 V **(D)**40 V and 30 V

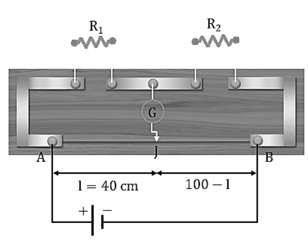


Q.8 In a meter bridge experiment, null point is obtained at **20 cm** from one end of the wire when resistance **x** is balanced against resistance**y.** If $\mathbf{x} < y$, then where will be the new position of the null point from the same end, if one decides to balance a resistance of **4x** against **y** ?

(A)50 cm **(B)**80 cm **(C)**40 cm **(D)**700 cm

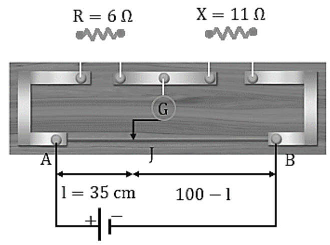
Q.9 In the figure shown for given values of **R1** and **R2** the balance point for jockey is at **40 cm** from**A.** When **R2** is shunted by a resistance of**10 Ω**, balance shifts to**50 cm**. **R1** And **R2** are [$\mathbf{AB = 1\ m}$]

(A)$\frac{10}{3}$ Ω, 5 Ω **(B)**20 Ω, 30 Ω **(C)**10 Ω, 15 Ω **(D)**5 Ω, $\frac{15}{2}$



Q.10 In a practical meter bridge setup, resistance and null point are as shown. Assuming end correction at **A** and **B** are equal, calculate end correction at**A.**

(A)25 cm (B)1.5 cm (C)1 cm (D)0.5 cm



WORKSHEET

Velocity in 2D

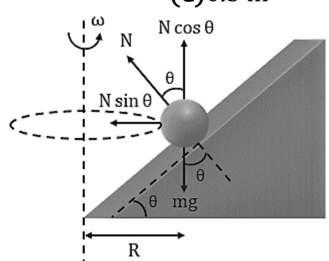
Q.1 A hollow vertical cylinder of radius **R** and height **h** has a smooth internal surface. A small particle is placed in contact with the inner side of the upper rim at a point**P**. It is given a horizontal speed $\mathbf{v_0}$ tangential to the rim. It leaves the lower rim at point**Q**, vertically below**P**. The number of revolutions made by the particle will be

(A)$\frac{h}{2\pi R}$ (B)$\frac{v_0}{\sqrt{2gh}}$ (C)$\frac{2\pi R}{h}$ (D)$\frac{v_0}{2\pi R}\left(\sqrt{\frac{2h}{g}}\right)$

Angular Velocity

Q.2 A ball is placed on a smooth inclined plane of inclination $\boldsymbol{\theta = 30°}$ to the horizontal, the inclined plane is rotating at frequency $\mathbf{0.5\ Hz}$ about a vertical axis passing through its lower end. At what distance from the lower end does the ball remains at rest?

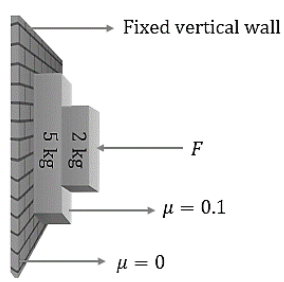
(A)0.87 m (B)0.33 m (C)0.5 m (D)0.67



Block on a Block Problems

Q.3 In the arrangement shown in the figure, the wall is smooth and the coefficient of static friction between the blocks is $\boldsymbol{\mu = 0.1}$. A horizontal force $\mathbf{F = 1000\ N}$ is applied on the **2 kg** block. Identify the wrong statement from the options given below:

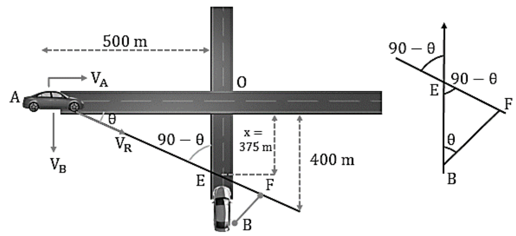
(A)The normal reaction force between the blocks is 1000 N
(B)The friction force between the blocks is zero
(C)Both the blocks accelerate downwards with acceleration g
(D)Friction force acting on 2 kg block is 2g N



Relative Velocity in 2D

Q.4 Two cars **A** and **B** are moving west to east and south to north respectively along crossroads. **A** Moves with a speed of $\mathbf{72\ kmh^{-1}}$ and is **500 m** away from point of intersection of crossroads and **B** moves with a speed of $\mathbf{54\ kmh^{-1}}$ and is **400 m** away from point of intersection of crossroads. Find the shortest distance between them in meters?

(A)20 (B)15 (C)25 (D)30



Work Energy Theorem

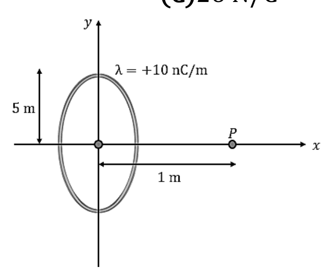
Q.5 A vertical frictionless semicircular track of radius **1 m** is fixed on the edge of a movable trolley (figure). Initially the system is at rest and a mass **m** is kept at the top of the track. The trolley starts moving to the right with a uniform horizontal acceleration$\mathbf{a} = \frac{\mathbf{2g}}{\mathbf{9}}$. The mass slides down the track, eventually losing contact with it and dropping onto the floor. Calculate the angle $\boldsymbol{\theta}$ at which it loses contact with the trolley and the track.

(A)30° (B)37° (C)53° (D)60°

Electric Field Due to a Ring along the Axis

Q.6 For the given uniformly charged ring, magnitude of the net electric field at point **P** is (in**N/C**

(A)21 N/C (B)24 N/C (C)26 N/C (D)28 N/C



Electric Field

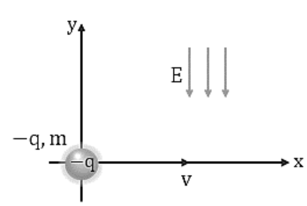
Q.7 A particle of mass **m** and charge $-\mathbf{q}$ is projected from the origin with a horizontal speed **v** into a space having an electric field of magnitude **E** directed downwards as shown in the figure. If the effect due to gravity can be neglected, then choose the correct statement(s) among the following.

(A) The kinetic energy after a displacement **y** is **qEy**

(B) The horizontal and vertical components of acceleration are $\mathbf{a_x = 0},\ \mathbf{a_y} = \frac{\mathbf{qE}}{\mathbf{m}}$

(C) The equation of trajectory is $\mathbf{y} = \frac{1}{2}\left(\frac{\mathbf{qEx^2}}{\mathbf{mv^2}}\right)$

(D)The horizontal and vertical displacements **x** and **y** after a time **t** are $\mathbf{x = vt}$ and $\mathbf{y} = \frac{1}{2}\mathbf{a_y t^2}$



Cutting of Thin Lenses

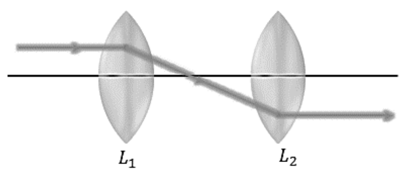
Q.8 An equiconvex lens of focal length **20 cm** is cut into two equal parts to obtain two Plano- convex lenses. The two parts are then put in contact as shown in figure. What is the focal length of the combination?

(A) Zero **(B)**5 cm **(C)**10 cm **(D)**20 cm

Combinations of Lenses & Mirrors

Q.9 In the given figure below, there are **2** convex lenses $\mathbf{L_1}$ and $\mathbf{L_2}$ having focal length $\mathbf{f_1}$ and $\mathbf{f_2}$ respectively. The distance between $\mathbf{L_1}$ and $\mathbf{L_2}$ will be:

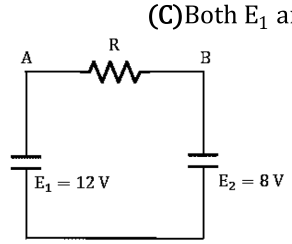
(A)f_1 **(B)**f_2 **(C)**$f_1 + f_2$ **(D)**$f_1 - f_2$



Emf and Emf Devices

Q.10 For the given figure, which battery is doing positive work?

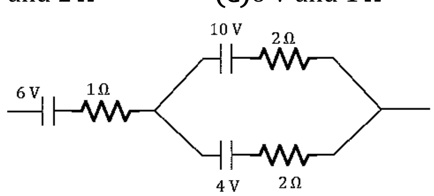
(A)E_1 **(B)**E_2 **(C)**Both E_1 and E_2 **(D)**None of these



Mixed Combination of Cells

Q.11 Find the emf and internal resistance of a single battery which is equivalent to a combination of three batteries as shown in figure.

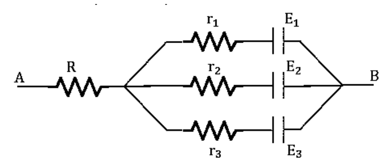
(A)3 V and 1 Ω **(B)**3 V and 2 Ω **(C)**6 V and 1 Ω **(D)**9 V and 1 Ω



Parallel Combination of Cells

Q.12 In the circuit shown in figure, emf of the batteries are $\mathbf{E_1 = 3\ V},\ \mathbf{E_2 = 2\ V},\ \mathbf{E_3 = 1\ V}$and their internal resistances are$\mathbf{R = r_1 = r_2 = r_3 = 1\ \Omega}$. The potential difference between the points **A** and**B**, and the current through branch containing resistor $\mathbf{r_2}$ will be respectively

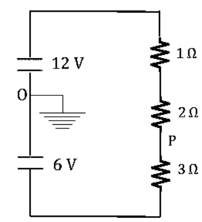
(A)2 V, 1 A **(B)**3 V, 2 A **(C)**2 V, 0 A **(D)**4 V, 1.5 A



Kirchhoff's Voltage Law

Q.13 For the given figure, potential at **P** is

(A)1 V **(B)**6 V **(C)**9 V **(D)**12 V



Series Combination of Cells

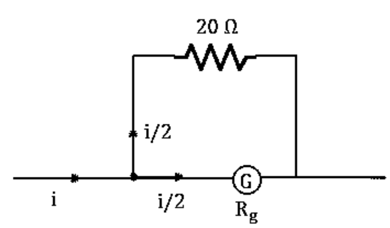
Q.14 **n** identical cells, each of emf **ε** and internal resistance**r**, are joined in series to form a closed circuit. One cell **A** is joined with reverse polarity. The potential difference across the terminal of **A** is

(A)$\frac{2\varepsilon}{n}$ **(B)**$\varepsilon\left(1-\frac{1}{n}\right)$ **(C)**$2\varepsilon\left(1-\frac{1}{n}\right)$ **(D)**$\varepsilon\left(\frac{n-2}{n}\right)$

Galvanometer

Q.15 In a galvanometer, the deflection becomes the half when it is shunted by a **20 Ω** resistor. The galvanometer resistance is?

(A)5 Ω **(B)**10 Ω **(C)**40 Ω **(D)**20 Ω



Galvanometer

Q.16 A galvanometer may be converted into an ammeter or voltmeter. In which of the following cases the resistance of the device will be the largest?

(Assume maximum current range of galvanometer = **1 mA**)

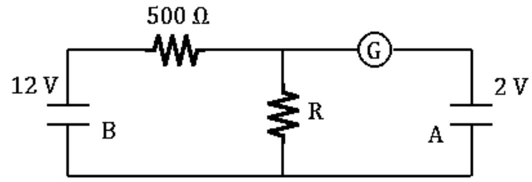
(A)an ammeter of range 10 A **(B)**a voltmeter of range 5 V

(C)an ammeter of range 5 A **(D)**a voltmeter of range 10 V

Galvanometer

Q.17 In the circuit shown in the figure, the galvanometer **G** shows zero deflection. If the batteries **A** and **B** have negligible internal resistance, the value of the resistor **R** will be

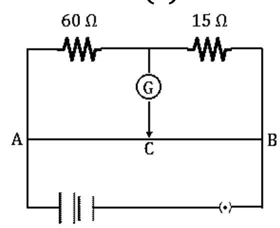
(A)100 **(B)**150 **(C)**200 **(D)**250



Meter Bridge

Q.18 If there is no deflection in the galvanometer connected in a circuit shown in figure, then the ratio of lengths **AC / CB** is

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



Meter Bridge

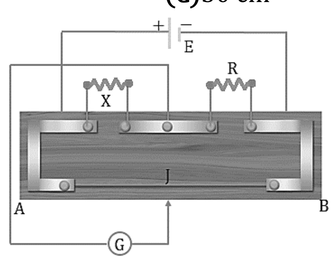
Q.19 In a meter bridge experiment, resistances are connected as shown in figure. The balancing length $\mathbf{l_1}$ is **55 cm.** Now an unknown resistance **x** is connected in series with **P** and the new balancing length is found to be **75 cm.** The value of **x** is

(A)$\frac{54}{13}$ Ω **(B)**$\frac{20}{11}$ Ω **(C)**$\frac{48}{11}$ Ω **(D)**$\frac{11}{48}$ Ω

Meter Bridge

Q.20 The figure shows a meter bridge circuit with $\mathbf{AB = 100\ cm}$, $\mathbf{X = 12\ \Omega}$ and $\mathbf{R = 18\ \Omega}$, and the jockey **J** is at the balance point. If **R** is now made $\mathbf{8\ \Omega}$, through what distance will **J** have to be moved to obtain a balanced bridge?

(A)10 cm **(B)**20 cm **(C)**30 cm **(D)**40 cm



ANSWER KEY

Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(D)	(B)	(C)	(D)	(A)	(B)	(A)	(A)	(A)	(C)
WORK SHEET										
Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(D)	(D)	(D)	(A)	(B)	(A)	(B,C,D)	(D)	(C)	(A)
Q.	11	12	13	14	15	16	17	18	19	20
Sol.	(B)	(C)	(C)	(C)	(D)	(D)	(A)	(A)	(C)	(B)