PREPARATION FOR BOARD PRACTICALS JAN 2015

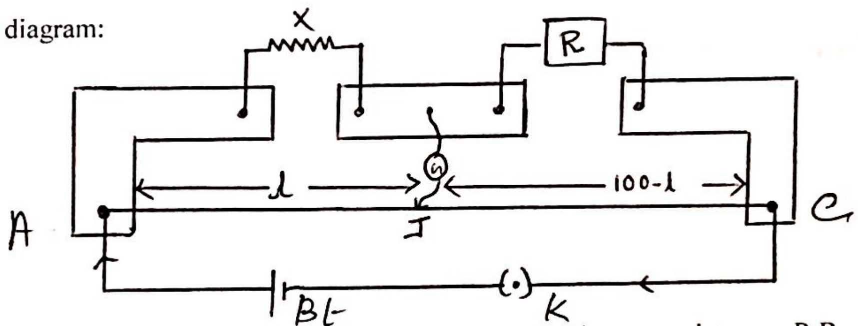
EXPERIMENT : 1 METER BRIDGE – UNKNOWN RESISTANCE

Aim:
To determine the unknown resistance using metre bridge.

Apparatus required
Meter bridge, standard resistance box, jockey, key galvanometer battery, unknown resistance coil, connecting wires, metre scale etc.
Theory
It works on the Wheatstone's principle. When the bridge is in balanced state P/Q=R/S
Where P,Q,R,S are the four resistors in the various arms of the bridge
Formula
Unknown resistance of the coil is $X = \frac{Rl}{(100-l)}$ in ohm

Where
X- unknown resistance of the coil (in Ω)
l—balancing length (in m)
R – Known resistance in ohm.

Circuit diagram:



AC – 1m wire of metre bridge, Bt – battery, K- key, X – unknown resistance , R.B – resitance Box , G – Galvanometer, J- Jockey

Tabular column
To find the unknown resistance(X):-

Sl.No.	Resistance in thebox(R) in Ω	Balancing length X in left gap(l_1) cm	Balancing length X in left gap(l_2) cm	Mean l in cm	(100-l) in cm	Unknown resistance `X=Rl/100-l in Ω
1.						
2.						
3.						
4.						
5.						

Calculation: $X = Rl/100-l$

1.
2.
3.
4.
5.
6 Mean X = ------- ohm

Precautions

1. The connections should be neat and tight
2. Plugs in the resistance box should be tight.

Sources of error

1. The wire of meter bridge may not be of uniform cross section
2. The value of the resistance of the wire and the resistance box may change due to change in temperature

Result

The unknown resistance of the given coil X=----------Ω

Experiment : 2 **METER BRIDGE—SPECIFIC RESISTANCE**

Aim

To find the unknown resistance and specific resistance of the given material using a meter bridge

Apparatus required

Meter bridge, standard resistance box, jockey, key galvanometer battery, unknown resistance coil, connecting wires, metre scale screw gauge etc.

Theory

It works on the Wheatstone's principle. When the bridge is in balanced state P/Q=R/S

Where P,Q,R,S are the four resistors in the various arms of the bridge

Formula

Unknown resistance of the coil is $X = \frac{Rl}{(100-l)}$ in ohm

Specific resistance of the coil is $\varrho = X\pi r^2/L$ in ohm meter

Where

X- unknown resistance of the coil (in Ω)

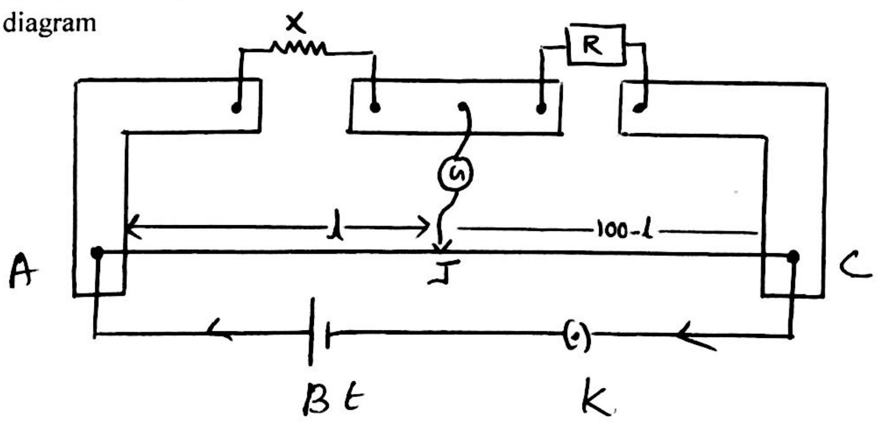
l—balancing length (in m)

r—radius of the coil (in m)

L—length of the coil (in m)

R – Known resistance in ohm.

Circuit diagram



AC – 1m wire of metre bridge, Bt – battery, K- key, X – unknown resistance , R.B – resitance Box , G – Galvanometer, J- Jockey.

Precautions

1. The connections should be neat and tight
2. Plugs in the resistance box should be tight

Sources of error

1.The wire of meter bridge may not be of uniform cross section
2.There may be error due to contact resistance

Observations

The length of the wire(L) = -------cm = ---------m.

Radius of the given wire(r) = --------m.

Tabular column

To find the unknown resistance(X):-

Sl.No.	Resistance in thebox(R) in Ω	Balancing length X in left gap(l_1) cm	Balancing length X in left gap(l_2) cm	Mean l in cm	(100-l) in cm	Unknown resistance `X=Rl/100-l in Ω
1.						
2.						
3.						
4.						
5.						

Mean X=----Ω

Calculation: Unknown resistance $X = Rl/100-l$.

1.
2
3
4
5
6.

Mean X = ----ohm

7. specific resistance

$\rho = X\pi r^2/L$ = ------------------ ohm metre

Result

The specific resistance of the given coil ρ=------------Ωm.

Experiment No : 3 : Potentiometer – Comparison of EMFs

Aim:-
To compare the emfs of 2 given primary cells by using potentiometer

Apparatus required

Potentiometer, battery eliminator, two primary cells, two way key, jockey, galvanometer etc.

Formula

$E_1/E_2=l_1/l_2$

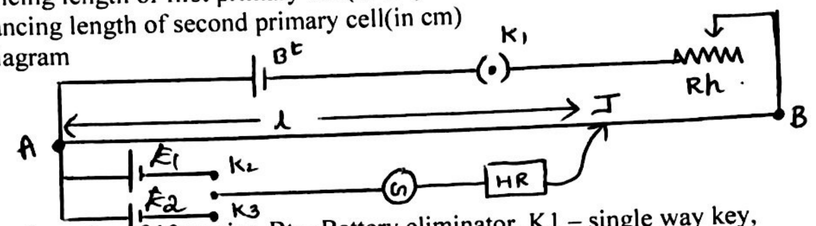
E_1---emf of first primary cell(in volt)

E_2---emf of second primary cell(in volt)

l_1----balancing length of first primary cell(in cm)

l_2---- balancing length of second primary cell(in cm)

Circuit diagram



AB- Potentio meter of 10m wire, Bt – Battery eliminator, K1 – single way key, Rh – rheostat , J- Jockey, G- galvanometer, HR- High resistance, K2 and K3 two way key, E1 and E2 – primary cells

Observation

Tabular column

Sl.No.	Balancing length when E_1 is connected (l_1) in cm	Balancing length when E_2 is connected (l_2) in cm	Ratio of emfs $E_1/E_2=l_1/l_2$
1.			
2.			
3.			
4.			
5.			
6.			

Mean E_1/E_2= -------- no unit.

Calculation: $E_1/E_2 = l_1/l_2$

1

2

3

4

5

6

7. Mean E1/E2 = -------------------------

Precautions

1. Emf of the driver cell should be greater than the emfs of the primary cells
2. Current should not be passed for a long time

Source of error

1. There may be error due to contact resistances.
2. The wire may not be of uniform thickness.

Result

The ratio of emfs of two primary cells E_1/E_2= ------------------- (no unit)

EXPERIMENT : 4 **CONCAVE MIRROR**

Aim

To determine the focal length of a given concave mirror by ~~(i)~~ u-v method ~~(ii) u-v graph (iii)1/u-1/v graph~~

Apparatus required

Optic bench, concave mirror, mirror stand, screen, light source, meter scale etc.

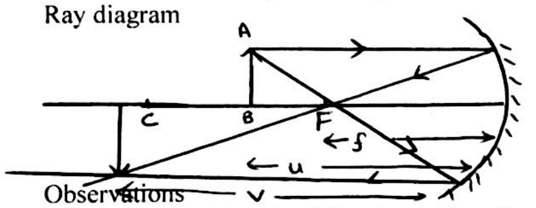
Formula

The focal length of given concave mirror is

$$f = \frac{uv}{u+v} \quad \text{in cm}$$

where, u—object distance from the mirror(in cm)
v—image distance from the mirror(in cm)
f – focal length of the given concave mirror (in cm)

Ray diagram



Observations

The rough focal length of the given mirror by distant object method

f = ----------------cm

Tabular column

Sl No	Object distance(u) in cm	Image distance(v) in cm	Focal length of concave mirror F=uv/u+v in cm
1.			
2.			
3.			
4.			
5.			
6.			

Mean f= ------------------------cm

Calculation Focal length $f = \frac{uv}{u+v}$.
1.
2
3

4
5
6
7. Mean f = -------cm

Precautions

1.The pole of the mirror, object and screen should lie on the same straight line
2.The images formed should be sharp.

Sources of error

1. Errors may be due to parallax
2. Errors may be due to defect of vision of the student

Result

The Focal length of the given mirror by ~~(i)~~ u-v method = ----------------cm.
~~(ii) graph = cm~~

Experiment No.5 **CONVEX LENS**

Aim

To find the focal length of the given convex lens by u-v method

Apparatus required

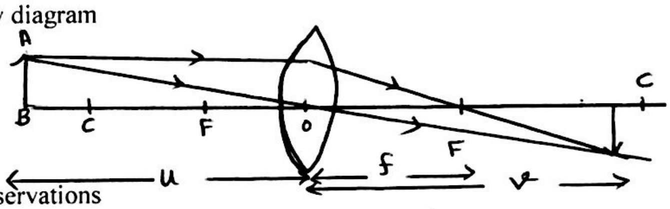
Optical bench,convex lens, lens holder, screen, light source, meter scale etc.

Formula

Focal length of the given convex lens is $f = \frac{uv}{u+v}$ in cm.

u—object distance from the lens(in cm)
v—image distance from the lens(in cm)
f – focal length of the given convex lens (in cm)

Ray diagram



Observations

The rough focal length of the given convex lens= --------------------cm

Tabular column

Sl. No.	Object distance u (in cm)	Image distance v (in cm)	Focal length of the given convex lens f =uv/u+v(cm)
1.			
2.			
3.			
4.			
5.			
6.			

Mean f= -------------------cm

Calculation: Focal length $f = \frac{uv}{u+v}$.
1
2
3
4
5
6
7 mean f = ----------cm

Precautions

1.The optic centre of the lens, screen, and object should lie in the same straight line
2. The lens should not be very large focal length.

Sources of error

1. Errors may be due to parallax
2. Errors may be due to defect of vision of the student

Result

The Focal length of the given lens
by u-v method = ------------cm.

EXPERIMENT NO. 6 CONCAVE LENS

Aim

To determine the focal length of a given concave lens using a convex lens

Apparatus required

Optical bench,convex lens, lens holder, screen, light source, meter scale etc.

Formula

The focal length of the given concave lens is

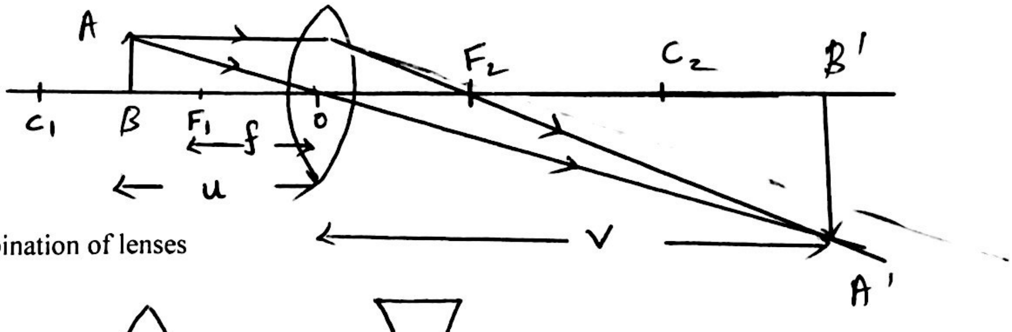
f_1=Ff/f-F in cm

Where

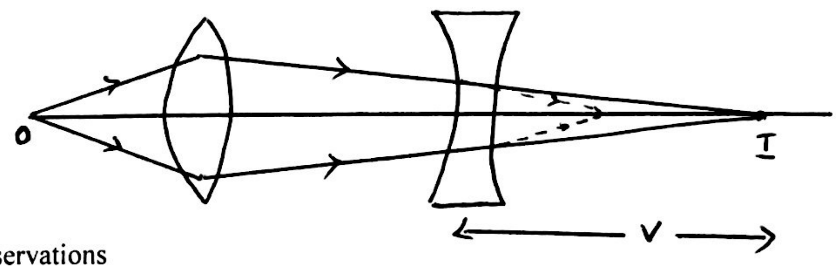
f ---focal length of the given convex lens(in cm)
F----focal length of the combination of lenses(in cm)
f_1 -----focal length of concave lens (in cm)

Ray diagrams

(i)convex lens



(ii)combination of lenses



Observations

The rough focal length of the given convex lens=--------------cm

Tabular column

I FOCAL LENGTH OF CONVEX LENS (f)

Sl. No.	Object distance u (in cm)	Image distance v (in cm)	Focal length of the given convex lens f =uv/u+v(cm)
1. 2. 3. 4. 5.			

Mean f= ------------------cm

II FOCAL LENGTH OF COMBINATION (F)

Tabular column

Sl. No.	Object distance u (in cm)	Image distance v (in cm)	Focal length of the COMBINED LENS F =uv/u+v(cm)
1. 2. 3. 4. 5.			

Mean F= ------------------cm

Calculation

I Focal length of convex lens $f = \frac{uv}{u+v}$.

1

2

3

4

5

6 mean f = -----------------cm

II Focal length of combined lens $F = \frac{uv}{u+v}$

1

2

3

4

5

6 Mean F =----------------cm

III Focal length of concave lens

$f_l = Ff/f-F$ in cm

f1 = -----------cm

Precautions

1. The optic centre of the lens, screen, and object should lie in the same straight line
2. The lens should not be very large focal length.

Sources of error

1. Errors may be due to parallax
2. Errors may be due to defect of vision of the student

Result

The focal length of the given concave lens=-------------------------------cm

EXPERIMENT NO.7 GLASS PRISM

Aim

To determine the angle of minimum deviation for a given prism by plotting a graph between the angle of incidence and angle of deviation.

Apparatus

A drawing board, a glass prism, a few pins, two sheets of white paper, a few drawing pins, a protractor, a half meter scale and a graph sheet.

Theory

Angle of minimum deviation (D) is the angle at which the refracted ray passing thro' the prism will be parallel to the base of the prism and ∠i = ∠e & ∠r_1 = ∠r_2

Ray diagram

ABC- glass prism

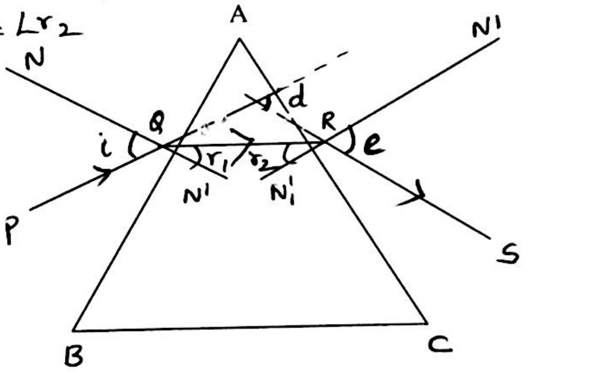
PQ and RS-incident and emergent rays

∠d-angle of deviation

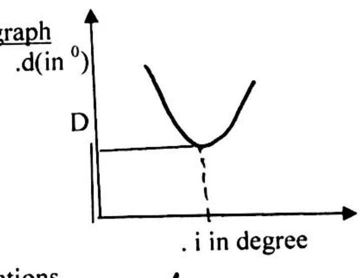
∠i- angle of incidence

NN' and N_1N_1'-normals

e - angle of emergence.



Model graph



Observations

Angle of prism A= ---60-----in degree

Tabular column

Sl.No.	Angle of incidence (i) in degree	Angle of deviation(d) in degree

1.	35^0	
2.	40^0	
3.	45^0	
4.	50^0	
5.	55^0	

Angle of minimum deviation from the graph D= ------------------ degree

Result

Angle of minimum deviation from the graph D= ------------------ degree

Precautions

1. Angle of incidence should lie between 30^0 to 60^0
2. The pins should have sharp tips and be fixed vertically

Sources of error

1. Angles may not be measured properly
2. The tips of the pins may not be on the same line

EXPERIMENT NO:9 RESISTANCE PER CM (OHM'S LAW)

AIM

To determine resistance per cm of a given wire.

APPARATUS

A battery eliminator, a key, a rheostat, an ammeter, a voltmeter, resistance coil and few connecting wires etc.

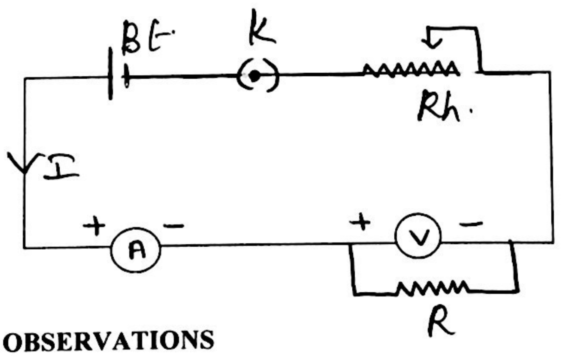
FORMULAE

1.R=V/I (in ohm)

Where R—Resistance of the conductor(in Ω)
V—Potential difference across the conductor(in volt)
I—current through the conductor(in A)

2. Resistance per cm of the wire = R/*l* (in Ωcm^{-1})

CIRCUIT DIAGRAM



Bt – Battery, A – ammeter,
V- voltmeter
K – key, I - current
Rh – rheostat,
R- resistance coil

OBSERVATIONS

Length of the wire *l* =..............................cm.

TABULAR COLUMN

Sl. No.	Voltmeter reading(V) In volt	Ammeter reading(I) in A	Unknown resistance R=V/I(in Ω)
1			
2			
3			
4			
5			
6			

Mean R= ohm.

Calculation Unknown resistance $R = \frac{V}{I}$ in ohm.

1
2
3
4
5
6
7. mean R = ------ohm
8. Resistance /cm = R/cm = ----------ohm/cm

PRECAUTIONS:

1. The connections should be made neat and tight
2. The key should be plugged in only while taking reading to avoid heating.

SOURCES OF ERROR

1. Error may arise due to carelessness of experimenter.
2. Length of the resistance wire taking part in the circuit may be significant.

RESULT

The resistance per cm of the given coil R=-------------- Ωcm^{-1}

Experiment : 3 **METER BRIDGE—SERIES COMBINATION**

Aim

To verify laws of series combination of resistances by using meter bridge

Apparatus required

Meter bridge, two resistance wires, standard resistance box, key, jockey, galvanometer, battery eliminator, thick connecting wires

Theory/formula

X1 and x2 in series

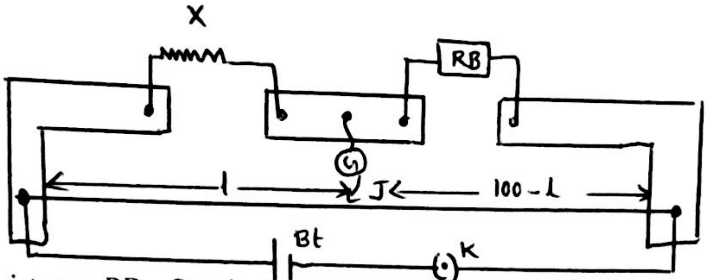
$$X_s = x1 + x2$$

Unknown resistance

$$X = \frac{Rl}{(100-l)} \text{ in ohm}$$

Where l ------ the balancing length (in cm)
R------known resistance(in Ω)
X --- Unknown resistance in ohm.

Circuit diagram



X - unknown resistance, RB – Standard resistance box (Known) , G- galvanometer, Bt – battery Eliminator, P & Q – left and right gaps.

Tabular column

Sl.No.	Known resistance (R)Ω	X in left gap Balancing Length L1 in cm	X in right gap Balancing Lengh L2 in cm	Mean l(cm)	(100-l)in cm	Unknown resistanceX =Rl/(100=l)	Mean resistance Ω
X_1 alone 1. 2.							Mean X_1
X_2 alone 1. 2.							Mean X_2
X_1 and X_2 In series 1. 2.							Mean X_s

Calculations

X_1= Rl/100-l

1.
2.
[illegible].
3. mean X_1=--------------------ohm

X2= Rl/100-l

1.
2.
[illegible].

Pg. 13.

3. Mean X2=-----------------------ohm

X_s= Rl/100-l

1.

2.

3.

3.mean X_s

Verification calculation

1. X_s=x1+x2

X_s = ______ Ohm.

1. Precautions

1. Electric circuit should connected tightly and neatly
2. Ammeter should be same for a pair of observations
3. The jockey should be pressed gently

Sources of error

1. The potentiometer wire may not be uniform
2. The null point may not be identified correctly
3. The used galvanometer may not be sensitive

Result

Individual resistances

X_1=--------------------------- Ω

X_2=------------------------------ Ω

Combination of resistances

Type of combination	Calculated values in X_S in ohm	Experimental values X_S in ohm
Series		

Calculated and experimental values are nearly equal

Experiment : 3 **METER BRIDGE—PARALLEL COMBINATION**

Aim

To verify laws of parallel combination of resistances by using meter bridge

Apparatus required

Meter bridge, two resistance wires, standard resistance box, key, jockey, galvanometer, battery eliminator, thick connecting wires

Theory/formula

X1 and x2 in parallel

$$1/X_p=1/x1+1/X2$$

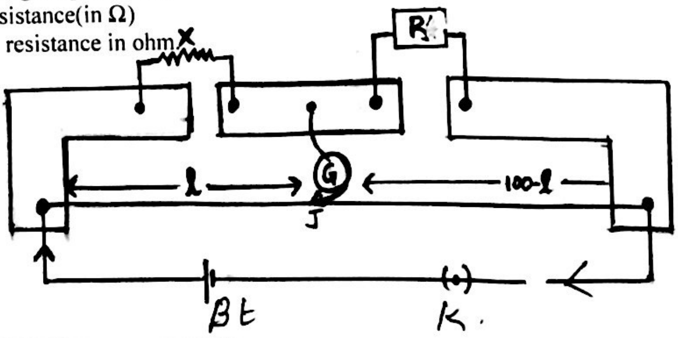
Unknown resistance

$$X= \frac{Rl}{(100-l)} \text{ in ohm}$$

Where l ------ the balancing length (in cm)

R------known resistance(in Ω)

X --- Unknown resistance in ohm



Circuit diagram

X - unknown resistance, R – Standard resistance box (Known), G- galvanometer, Bt – battery Eliminator, P & Q – left and right gaps.

Tabular column

Sl.No.	Known resistance (R)Ω	X in left gap Balancing Length L1 in cm	X in right gap Balancing Lengh L2 in cm	Mean l(cm)	(100-l)in cm	Unknown resistanceX =Rl/(100=l)	Mean resistance Ω
X_1 alone 1. 2.							Mean X_1
X_2 alone 1. 2.							Mean X_2
X_1 and X_2 In parallel 1. 2.							Mean X_p

5. Precautions
4. Electric circuit should connected tightly and neatly
5. Ammeter should be same for a pair of observations
6. The jockey should be pressed gently

Sources of error

4. The potentiometer wire may not be uniform
5. The null point may not be identified correctly
6. The used galvanometer may not be sensitive

Calculation: X_1 1) 2) 3) Mean X_1 = Ω X_2 1) 2) 3) Mean X_2 = — Ω X_p 1) 2) 3) Mean X_p = — Ω.

Result

Individual resistances

X_1=-------------------------- Ω

X_2=----------------------------- Ω

Combination of resistances

Type of combination	Calculated values in X in ohm p	Experimental values X in ohm p
parallel		

Verification:

$$X_p = \frac{X_1 X_2}{X_1 + X_2}$$

X_p = ____ in Ω

calculated & experimental values are nearly equal.