BANGLADESH SCHOOL & COLLEGE, SAHAM

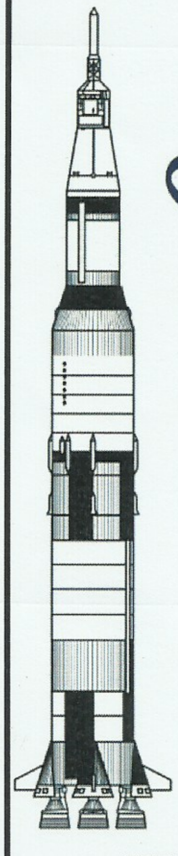
Sultanate of Oman

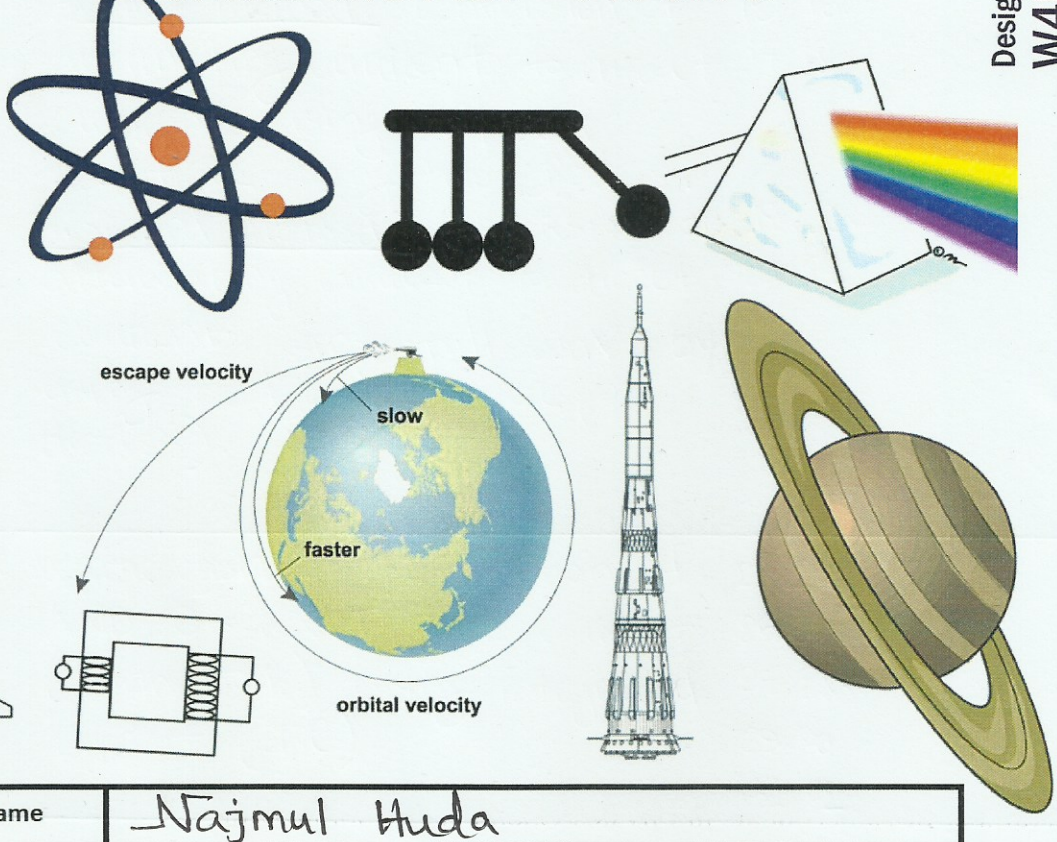
Physics 2nd Paper

Practical Notebook

Class: Eleven - Twelve

Designed by W4H1D





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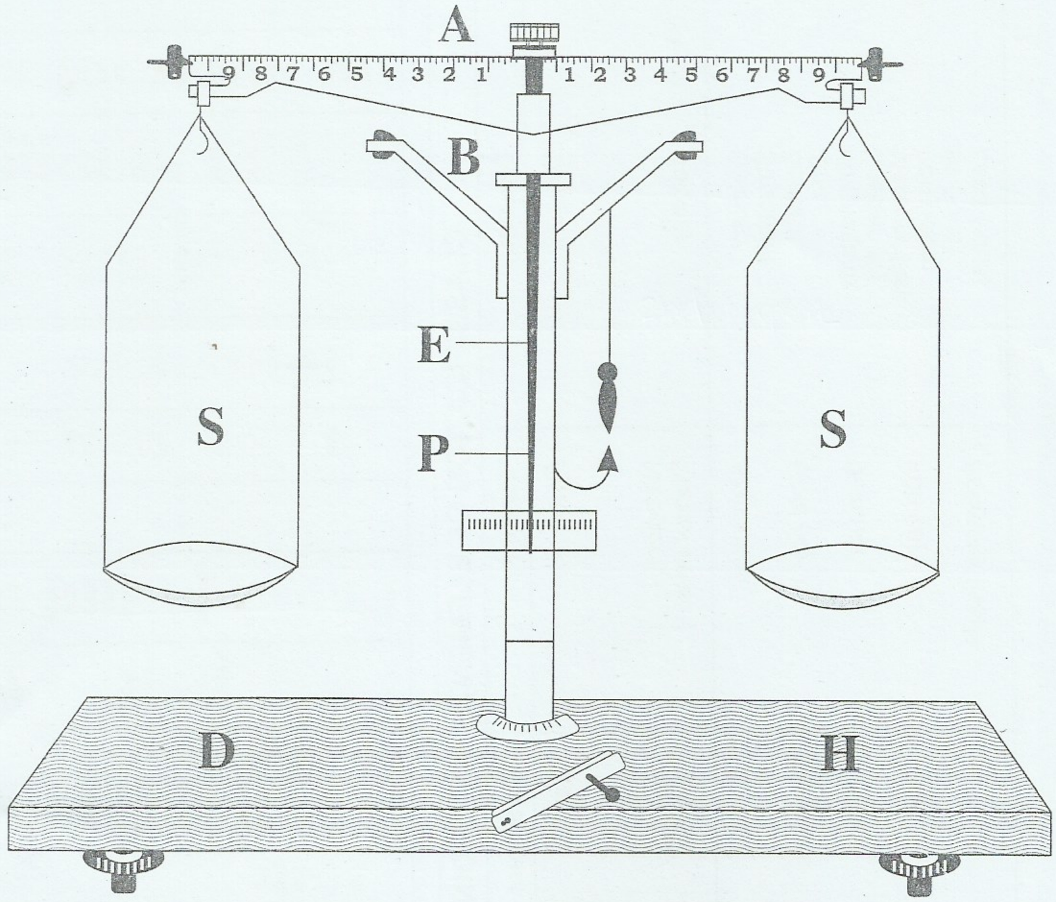
2558

BALANCE



A= METALLING BEAM
D= WOODEN FRAME
H= HANDLE

B= MOVABLE ROD
E= POINTER
P= PILLER, S= BALANCE PANS

NAME : Najmul Huda
SCHOOL/ COLLEGE : Bangladesh Sehod & College, Saham
SUBJECT : Physics 2nd papea
ROLL NO. : .... SESSION : 2020 - 2021
REGISTRATION NO. :

USEFUL DATA FOR PHYSICS

SI NO	NAME OF ELEMENTS	SPECIFIC GRAVITY	SPECIFIC RESISTANCE	SPECIFIC HEAT		LATENT HEAT		THERMAL CONDUCTIVITY	VALOCITY OF SOUND		REFRACTIVE		CRITICAL ANGLE	BREAKING STRESS	MODULLUS OF RIGIDITY	YOUNGS MODULLUS	CO-EFFICIENT EXPANSION	
		GM.C.C.	x 10-60HA -CM	SOLID Gm/ Cal	LIQUID Gm/Cal	FUSION L.CALS Gm	VAPORI SATION	CAL.Cm SEC/^{0}c	m/sec SOLID	m/sec LIQUID	SOLID	LIQUID	/oc	KILOS/Sq cm	DYNES/CM^2	'y' dynes/Cm^2	LINE Ar /^{0}C	VOLUME /OC
1	COPPER	8.93	1.78	0.091-0.094	-	50.6	-	0.920	3600.3970	-	-	-	-	30.000	3.9-40X10^{11}	12.4-12.9X10^{11}	0.0000167	-
2	BRASS	8.6	4.1-66	0.088-0.092	-	-	-	-.260	3600	-	-	-	-	34.000	3.5X10^{11}	9.9-10.2X10^{11}	0.0000189	-
3	IRON (OUS)	7.2	13.19-18.80	0.119	-	65.0	-	0.14	5000	-	-	-	-	6.000	7.7-8.3X10^{11}	10-13X10^{11}	0.0000102	-
4	IRON (IC)	7.86	12.0-16.80	-	-	-	-	-	-	-	-	-	-	-	7.9-8.9X10^{11}	19.9-20X10^{11}	-	-
5	STEEL	-	19.9-25-60	-	-	-	-	0.10800	5200	-	-	-	-	8.000	-	19.5-20.6X10^{11}	-	-
6	ALUMINIUM	26.27	3.21	0.21	-	93.0	-	0.480	-	-	-	-	-	-	-	70.5X10^{11}	0.000023	-
7	ZINC	7.1	6.10	0.033	-	24.1	-	0.265	-	-	-	-	-	-	-	-	0.0000258	-
8	LEAD	11.4	20.80	0.109	-	5.4	-	0.083	-	-	-	-	-	-	-	- -	0.0000291	-
9	NICKEL	8.9	-	0.056	-	-	-	0.14200	4900	-	-	-	-	-	-	-	0.0000128	-
10	SILVER	-	1.63	0.033	- -	21.0	-	-	-	-	-	-	-	-	-	-	-	-
11	GOLD	19.3	-	-	0.033	0.16		-	-	-	-	-	-	-	-	-	-	-
12	PLATINUM	21.5	1.63	0.055	-	-	2.8	-	-	-	-	-	-	-	-	-	0.000089	-
13	MERCURY	-	-	1.12	-	-	-	0.02000	-	-	-	-	-	-	-	-	-	18.2X10^{-5}
14	TIN	2.29	11.00	0.16	-	14.0	-	-	5000-5300	-	-	-	41.25	-	--	--	0.0000214	-
15	GLASS (FUNT)	2.9-5.9	-	-	0.42	-	-	0.002	-	-	1.53-1.960	-	41.45	-			-	-
16	GLASS (CROWN)	2.4-2.8	11.30	-	1.51	-	-	-	-	1370.0	1.48-16.10	1.47	43.15	-	-	-	-	-
17	TARPINTINE OIL	0.87	-	-	1.00	-	-	-	-	1260.0	- -	1.362	-	-	-	-	-	97.3X10^{-5}
18	ALCOHOL (ETHYL)	0.79	-	-	-	-	5.37	-	-	1410	-	1.33	48.5	-	-	-	-	-
19	WATER	-	-	0.502	0.58	-	-	-	-	-	-	-	-	-	-	-	-	-
20	ICE	0.92	-	-	0.64	80.0	-	-	-	-	131	1.47	-	-	-	-	-	-
21	GLYCERINE	1.28	-	-	-	-	-	-	-	-	-	1.44	-	-	-	-	-	50.5X10^{-5}
22	KEROSINE OIL	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	RUBBER	0.9-13	-	-	-	-	-	0.0045	30-40	-	-	-	-	-	-	-	-	-

CLASSIFICATION OF ELEMENTS ACCORDING TO THEIR VALENCY

Mono valent	Divalent	Trivalent	Tatravalent	Panta Valent	Hexavalent
Hydrogen Fluorine Chlorine Bromine Iodine	Oxygen Sulphur	Boron Nitrogen Phosphorus	Carbon Sillicon Sulphur	Nitrogen Phosphours	Sulpher
Potassium Sodium Mercury (ous) Copper (-ous) Silver	Calcium Strontium Barium Zinc Megnesium Copper (ic) Mercury (-ic) Iron (-ous) tin (-ous) Lead (-ous)	Aluminium Gold (ic) Bismuth Iron (ic) Antimony (-ous)	Tin (-ic) Platinum Lead	Arsenic Antimony (ic)	

PRACTICAL

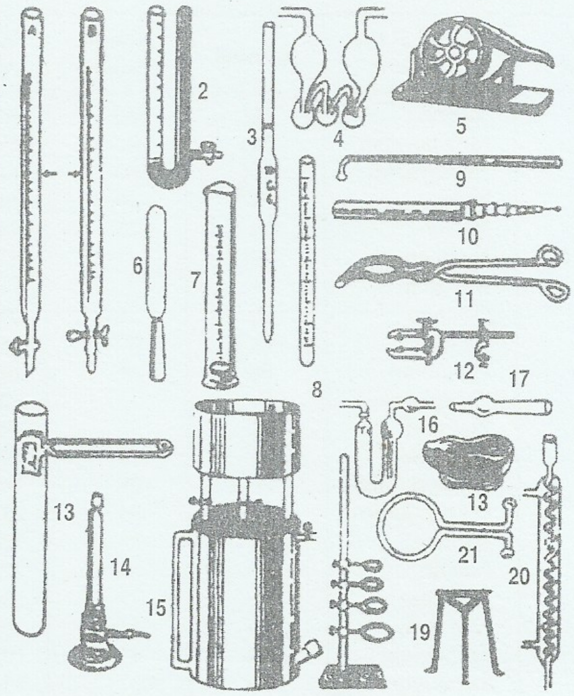
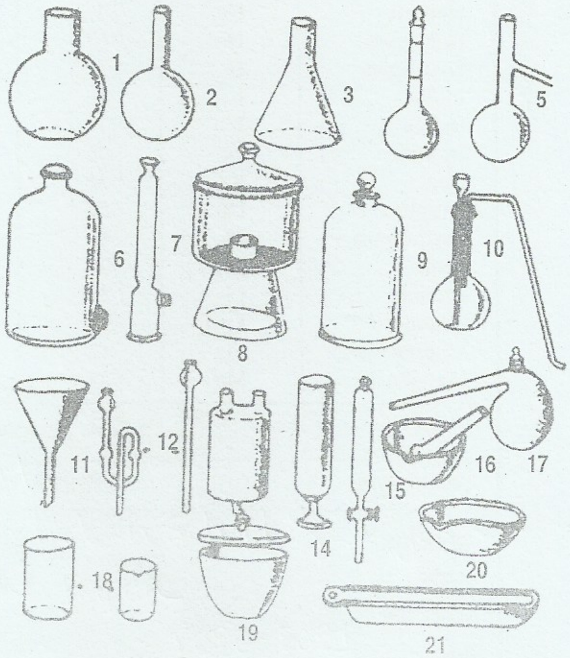


PLATE NO.1

1. BURETTE
2. EUDIOMETER
3. PIPETTE
4. POTASH BULES
5. CORK SQUEEZER
6. SPATULA
7. MEASURING CYLINDER
8. MEASURING TUBE
9. BLW PIPE
10. CORK BORER
11. TONGS
12. CLAMP
13. TEST TUBE WITH HOLDER
14. BUNSEN BUENER
15. GAS HOLDER
16 & 17. Ca C12-TUBE
18. MERCURY TROUGH
19. TRIPOD STAND
20. CONDENSER
21. CLIP
22. RETORT STAND

PLATE NO. 2

1. FLAT BOTTOM FLASK
2. ROUND BOTTOM FLASK
3. CONICAL FLASK
4. MEASURING FLASK
5. DISTILLING FLASK
6. ASPIRATOR
7. TOWER
8. DESICCATOR
9. BELL JAR
10. FLASK WITH THISTLE FUNNEL & DELIVERY TUBE
11. FUNNEL
12. THIST LE FUNNELS
13. WOULFE'S BOTTLE
14. TEST GLASS
15. SEPARATING FUNNEL
16. MORTAR & PESTLE
17. BETORT
18. BEAKERS
19. CRUCIBLE
20. BASIN
21. BOAT

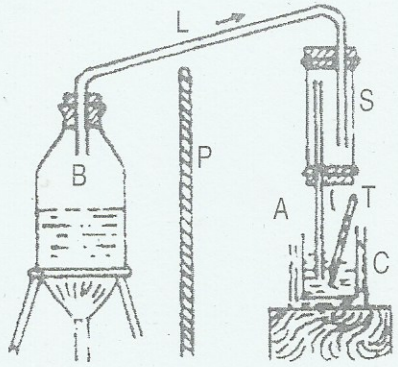


ATOMIC NUMBERS AND ATOMIC WEIGHTS WITH THEIR SYMBOLS

Name of the Element	Symbol	Atomic Number	Atomic Weight	Name of the Element	Symbol	Atomic Number	Atomic Weight
Actinium	Ac	89	227	Mercury	Hg	80	200.5
Aluminium	Al	13	6.97	Molybdenum	Mo	42	95.9
Amcricium	Am	95	243	Neodymium	Nd	60	144.2
Antimony	Sb	51	121.7	Neon	Ne	10	20.17
Arogon	Ar	18	39.94	Nickel	Ni	28	58.7
Arsenic	As	33	74.9216	Niobium	Nb	41	92.9064
Astatine	At	85	210	Nitrogen	N	7	14.0067
Barium	Ba	56	137.3	Osmium	Os	76	190.2
Berkelium	Bk	97	249	Oxygen	O	8	15.999
Beryllium	Be	56	137.36	Palladium	Pd	46	106.4
Bismuth	Bi	4	9.02	Phosphorus	P	15	30.97376
Boron	B	83	209.00	Platinum	Pt	78	195.0
Bromine	Br	5	10.82	Potassium	K	19	39.09
Cadnium	Cd	35	80	Praseodymium	Pr	59	140.9077
Calcium	Ca	48	11.24	Prtotactinium	Pa	91	231.0359
Carbon	C	20	40	Radium	Ra	88	226.0254
Cerium	Ce	6	12	Radom	Rn	86	222
Caesium	Cs	58	140.12	Rhenium	Re	75	186.2
Chlorine	C1	55	132.91	Rhodium	Rh	45	102.9055
Chromium	Cr	17	35.476	Ruthenium	Ru	44	101.75
Copper	Cu	29	63.5	Rubinium	Rb	37	85.43
Dysprocium	Dy	66	162.46	Samarium	Sun	62	150.4
Erbrium	Er	68	167.67	Seandium	Sc	21	44.9559
Europium	Eu	63	152.0	Sclenium	So	34	78.09
Fluorne	F	9	19.00	Sillcon	Si	14	28.08
Franeium	Fr	87	223	Silver	Ag	47	107.868
Gadolinium	Gd	64	156.9	Sodium	Na	11	22.98977
Gaflium	Ga	31	62.72	Stontlum	Sr	38	87.62
Germanium	Ge	32	72.62	Sulphur	S	16	32.06
Gold	Au	79	797.2	Tuntalum	Ta	73	180.947
Hafnium	Hf	72	178.6	Tellurim	Te	52	127.6
Helium	He	2	4.002	Terbium	Th	65	159
Hokmium	Ho	67	163.5	Thallium	Ti	81	20.39
Hydrogen	H	1	1.007	Thorium	Th	90	232.12
Indium	I	53	126.92	Thulium	Tm	69	169.04
Iodine	Ir	77	193.1	Tin	Sm	50	119
Iridium	Fe	26	55.84	Titanium	Ti	22	47.90
Iron	Kr	36	83.7	Tungstem	W	74	184.0
Krypton	La	57	138.9	Uranium	U	92	238.07
Ianthenum	Ph	82	207.22	Vonadium	V	28	50.95
Lead	Lm	3	6.940	Xenon	Xe	54	131.3
Lithium	Li	3	6.94	Ytterubim	Yb	70	178.0
Lutecium	Lu	71	174.97	Yttrium	Y	39	88.9059
Magnecium	Mg	12	24.305	Zunc	Zn	30	65.38
Manganese	Mn	25	54.9380	Zircontum	Zr	40	91.22

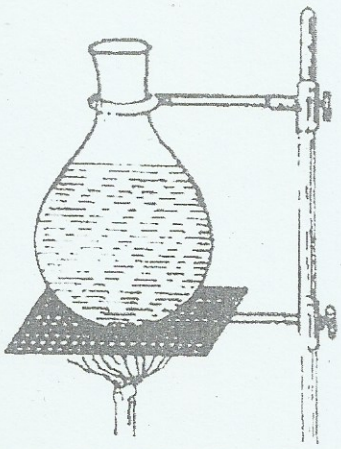
তড়িৎ কোষের বৈদ্যুতিক চাপ (E.M.F of Cells)

কোষের নাম	বৈদ্যুতিক চাপ ভোল্ট	কোষের নাম	বৈদ্যুতিক চাপ ভোল্ট
ড্যানিয়েল	1.07-1.08	ড্যানিয়েল	2.0000
বুনসেন	1.08-1.90	বুনসেন	1.8-1.9000
লেকল্যান্স	1.45	লেকল্যান্স	1.433
শুষ্ক	1.50	শুষ্ক	1.01830
সেকেন্ডারী		সেকেন্ডারী	
সীসা এডিস (সঞ্চয়ী)	1.9-2.20	সীসা এডিস (সঞ্চয়ী)	1.1-1.4000

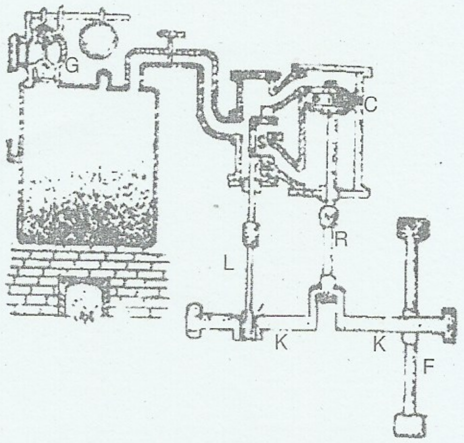


B- Water vessel
S- Steam trap
P- A screen
C- Calorimeter
T-Thermometer
A-Exit tube

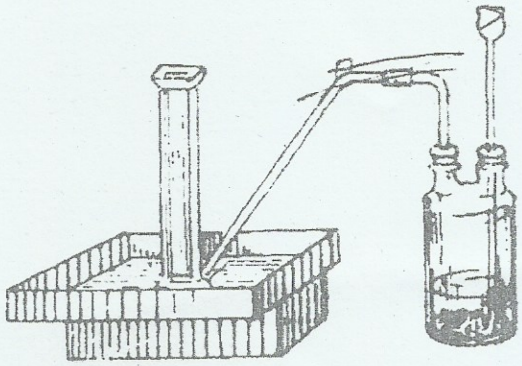
DETERMINATION OF LATENT HEAT
OF VAPORISATION OF WATER



TRANSMISSION OF HEAT



SECTIONAL DIAGRAM OF COMPLETE
STEAM OF ENGINS



LABORATORY METHOD PREP
OF HYDROGEN

Index

Index

Sl. No.	Date	Name of the Experiment	Page No.	Initials	Remarks

This is to Certify that Mr./Miss ....

A Student of ....Class Roll No. .... Has Performed the Required

Number of Experiments in Physics/Chemistry Laboratory of ....

School/College/University as per Syllabus During the Session ....

Head of the Department
Physics/Chemistry

NAME OF THE EXPERIMENT Determination of Mechanical equivalent of Heat.

DATE 22/04/2022

EXPT. NO. 01

Theory:

When a current of strength i flows for t second through a coil of wire of resistance R producing a drop of potential V across it, the work done, $W = Vit = i^2Rt$ Joule.

If all this work is converted into heat, then from first law of thermodynamics, we know, "Heat and work is proportional to each other". that is $W \propto H$ or $W = JH$; where J = a constant of proportionality. It is called mechanical equivalent of Heat.

$$\therefore J = \frac{W}{H} = \frac{Vit \text{ (or } i^2Rt)}{H} \text{ Joule/cal} \quad \dots\dots (1).$$

Let, the resistance coil be dipped in a liquid of mass m_1 and of specific heat s_1 contained in a calorimeter of mass m with stirrer, then

$$H = (ms + m_1s_1)(\theta_2 - \theta_1) \quad \dots\dots (2)$$

where, s = specific heat of the material of the calorimeter.

$$\therefore \text{From (1) and (2), we get, } J = \frac{Vit \text{ or } i^2Rt}{(ms+m_1s_1)(\theta_2-\theta_1)} \ \frac{\text{Joule}}{\text{cal}} \quad \dots\dots (3).$$

Apparatus:-

Joule's electrical calorimeter, ammeter, voltmeter, Thermometer, battery, key, stop-watch, rheost, tarpin oil (turpentine), balance, weight box, connecting wire, sand papere etc.

Procedure:

1) At first, the calorimeter was dried, cleaned and then was weighed with the stirrer. Let the mass was m.

FIGURE NO. 01

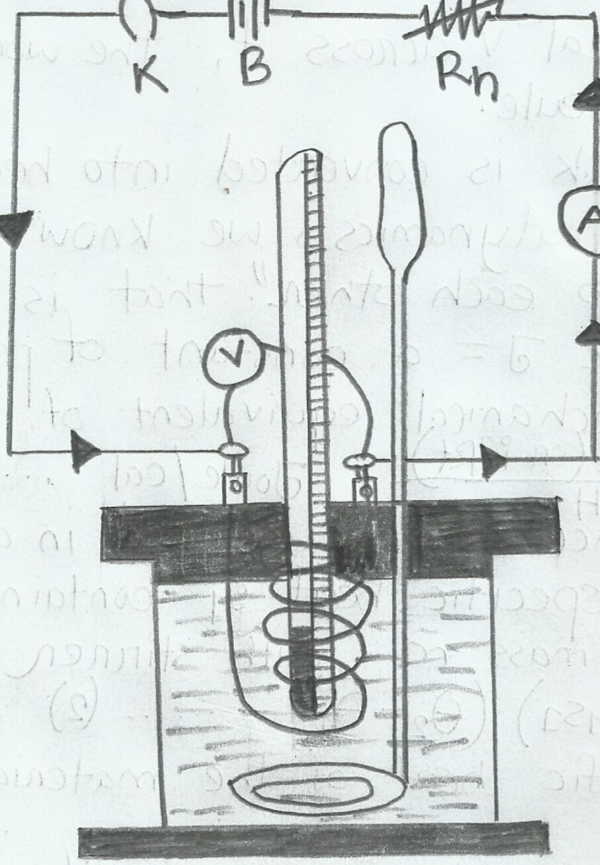


Figure - 01 (Exp-01): Determination of Mechanical Equivalent of Heat.

2) Now 2/3 rd of the calorimeter was filled with the liquid and then was weighed. Subtracting the weight m from this weight, the weight (mass) of the liquid (m_1) was obtained.
3) The initial temperature (θ_1) of the liquid was determined by a sensitive thermometer.
4) Now the calorimeter was included in the circuit and a key (K), a battery (B), a variable resistor (Rh), an ammeter - all were connected in series. Voltmeter (V) was connected in parallel with the coil of the wire.
5) Now the circuit was closed (ON) and instantaneously the stop-watch was started. When the temperature of the liquid was raised to about (5-8)°C [θ_2], then the circuit was opened (OFF). The ammeter and voltmeter readings were taken every minute.
6) Then the temperature of the liquid was allowed to come down during the same time and the final temperature (θ_3) was noted. This time always the stirrer was stirred and the temperature was noted every minute also.
7) To get the correct rise of temperature of the liquid of the calorimeter, correction of radiation was done. Let the fall of temperature,
$x = (\theta_2 - \theta_3) \therefore \frac{1}{2}x = \frac{1}{2}(\theta_2 - \theta_3)$.

$\therefore$ Actual rise of temperature (with radiation correction)
$$\theta = (\theta_2 - \theta_1) + \frac{1}{2}(\theta_2 - \theta_3)$$

NAME OF THE EXPERIMENT Determination of Mechanical equivalent of Heat.

DATE 23/04/2022

PAGE NO. 03

EXPT. NO. 01

Experimental data :-

Mass of calorimeter with stirrer, $m = 89.5$ gm.

Specific heat of the material of the calorimeter, $s = 0.21$ cal gm^{-1} C^{o-1}

Mass of liquid, $m_1 = 113.3$ gm

Specific heat of liquid, $s_1 = 0.41$ cal gm^{-1} C^{o-1}

Table (i) : Flow of the current was made ON/closed :-

No. of Observations	Time (min)	Ammeter readings i (Amp)	Voltmeter readings V (Volt)	Temperature ^{o}C
01	0			$29 = \theta_1$
02	1			29.9
03	2	1.6	3.2	30.8
04	3			31.7
05	4			32.5
06	5			33.3
07	6			$34 = \theta_2$

Table - (ii) :- Flow of current was made OFF/opened :-

08	7			36.6
09	8			33.1
10	9			32.7
11	10	0	0	32.2
12	11			31.7
13	12			31.2
14	13			$30.8 = \theta_3$

Calculations:-

$$\frac{1}{2}x = \frac{1}{2}(\theta_2 - \theta_3) = \frac{1}{2}(34 - 30.8) = \frac{1}{2} \times 3.2$$

$$= 1.6^\circ C$$

Actual temperature, $\theta = (\theta_2 - \theta_1) + \frac{1}{2}(\theta_2 - \theta_3)$

$$= (34 - 29) + 1.6 = 5 + 1.6 = 6.6^\circ C$$

$$J = \frac{Vit}{(ms + m_1 s_1)(\theta_2 - \theta_1)} = \frac{Vit}{(ms + m_1 s_1)\theta}$$

$$= \frac{3.2 \times 1.6 \times 6 \times 60}{(89.5 \times 0.21 + 113.1 \times 0.41) \times 6.6} = 4.29 \text{ Joule/cal}$$

$$\text{Percentage of error} = \frac{\text{Obtained result} - \text{Actual result}}{\text{Actual result}} \times 100\%$$

$$= \frac{4.29 - 4.2}{4.2} \times 100\%$$

$$= 2.14\% \text{ (Approx.)}$$

Result with Explanation:

$J = 4.29$ Joule/cal

We know, mechanical equivalent of heat is 4.2 Joule/cal. Experimental result is very near to actual result and percentage of error is 2.14%.

So, we can say that our experiment is correct.

Precautions:

1) The coil of wire should remain completely immersed in the liquid.

2) The voltmeter should be connected across the coil with its positive pole connected to the terminal where the current enters the coil.
3) The positive terminal of the battery should be connected to the positive pole of the ammeter.
4) The ammeter and voltmeter should be examined for any zero-error.
5) The liquid should be stirred slowly but thoroughly.
6) Correction should be made for loss of heat due to radiation from the calorimeter.
7) Rise temperature should not be larged.
8) All the connection should be tight.
9) The end of wire must be cleaned by sand paper.

Discussions:

1) The balance was old, so the weight was not correct.
2) There was no 10 gm, so the correct weight did not come.
3) The experimental liquid was mixed with other liquid, so the result did not come correct.
4) The thermometer was disturbed. So, the result did not come correct.
5) Stop-watch also disturbs to record time.

NAME OF THE EXPERIMENT Comparison of E.M.F. of two cells using potentiometer.

DATE 24/04/2022

PAGE NO. 06

EXPT. NO. 02

Theory:

If E_1 = E.M.F. of the first cell (E_1), E_2 = E.M.F. of the second cell (E_2), l_1 = distance of the balanced point measured from end A of the potentiometer with the cell E_1, l_2 = distance of the balanced point measured from end A of the potentiometer with the cell E_2, ρ = resistance per unit length of the wire and I = strength of current passes through the wire, then fall of potential per unit length for the cell, $E_1 = l_1 \rho I$.

$\therefore E_1 = l_1 \rho I$ and similarly, $E_2 = l_2 \rho I$.

Therefore, $$\frac{E_1}{E_2} = \frac{l_1 \rho I}{l_2 \rho I} = \frac{l_1}{l_2} \quad \text{......} (1).$$

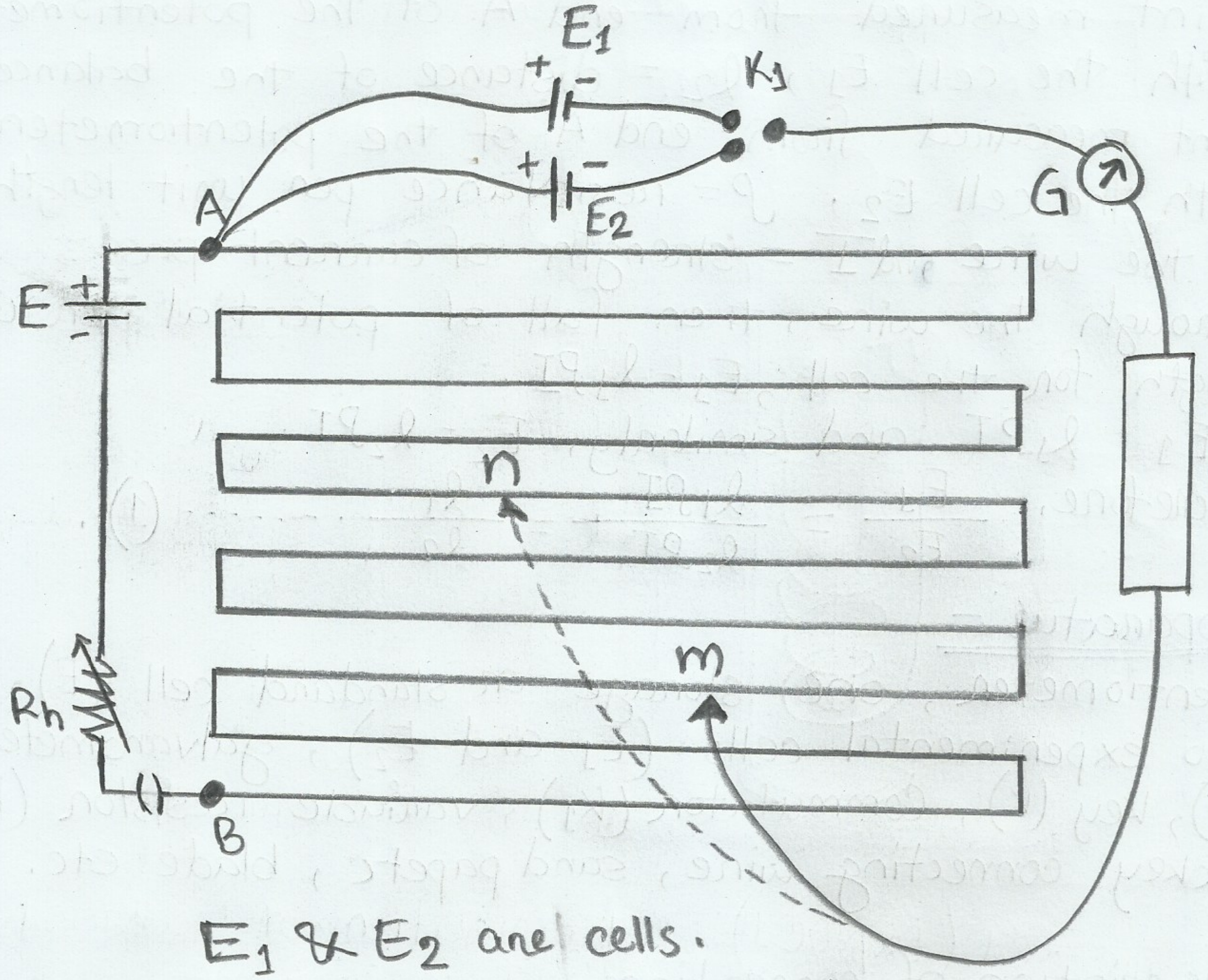
Apparatus:-

Potentiometer, one storage or standard cell (E), two experimental cells (E_1 and E_2), galvanometer (G), key (K), Commutator (K_1), variable resistor (R_h), jockey connecting wire, sand paper, blade etc.

Description of connections:

A storage cell (E) and variable resistor (R_h) is joined between A and B with a key (K). The positive terminals of the experimental cells (E_1 & E_2) are joined with A and negative terminals with two points of a commutator (K_1). One point of the galvanometer is joined to the third points of ~~the~~ commutator and other point of galvano--meter with a jockey.

FIGURE NO. 02



E_1 & E_2 are cells.

E = standard a storage cell

K_1 = Commutator

G = Galvanometer

K = key

Rh = Variable resistor (sometimes it is fixed inside the galvanometer)

m, n = balanced point by jockey

R = high resistance.

Figure - 02 (Exp-02) : Comparison of E.M.F. of two cells using potentiometer.

NAME OF THE EXPERIMENT

Comparison of E.M.F. of two cells using potentiometer.

DATE 24/04/202

PAGE NO. 07

EXPT. NO. 02

Procedure :-

1) All the connections were made as in the figure. At first, E_1 was connected in the circuit & E_2 was kept outside of the circuit. The current was passed by connecting K and K_1 and pressing jockey the balanced point was found somewhere at m (this time galvanometer showed on deflection). The distance A to m was measured from the scale with the potentiometer. Let the distance = l_1.

2) The cell E_1 was removed and E_2 was connected and similarly the balanced point n was found out and the distance A to n was measured. Let the distance = l_2.

3) The resistance in the variable resistor (R_h) was changed at least three times and in each case, the length l_1 and l_2 was measured.

4) In each case l_1/l_2 was determined and the average was taken.

Data and Table:-

No. of observations	Resistance in the variable resistor (Ω) ohm	Position of balanced point				$\frac{E_1}{E_2} = \frac{l_1}{l_2}$	Mean $\frac{l_1}{l_2}$
		Cell E_1		Cell E_2			
		l_1 cm	Mean l_1 cm	l_2 cm	Mean l_2 cm		
1	2	980.4	980.36	800.1	800.2	1.23	
		980.4		800.2			
		980.3		800.3			

2	4	965.2 965.3 965.2	965.23	713.4 713.5 713.4	713.43	1.35	1.313
3	6	842.2 841.1 842.1	841.8	617.8 617.7 617.7	617.73	1.36	

Calculations:

1) $\frac{E_1}{E_2} = \frac{l_1}{l_2} = \frac{980.36}{800.2} = 1.23 : 1$

2) $\frac{E_1}{E_2} = \frac{l_1}{l_2} = \frac{965.23}{713.43} = 1.35 : 1$

3) $\frac{E_1}{E_2} = \frac{l_1}{l_2} = \frac{841.8}{617.73} = 1.36 : 1$

Result with Explanation:

The mean ratio of $E_1/E_2 = 1.313 : 1$.
Generally, E.M.F. of dry cell is 1.5 volt. But for long days the batteries are in the laboratory; so their E.M.F. will reduce. So, the ratio of two cells will not be 1 : 1, it will be less than that. So, our experimental value is approximately correct.

Precautions:

1) All the positive terminals of cells should be connected to A.
2) The readings should be taken when the needle of the galvanometer was completely at rest.

NAME OF THE EXPERIMENT Comparision of E.M.F. of two cells using potentiometer.

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EXPT. NO. 02

3) The key (K) and commutator (K_1) should be ON only when the reading was taken.
4) A high resistance (R) should be inserted in the galvanometer circuit.

Discussions:-

1) One cell (E_1) was not properly working. So the result was not correct.
2) The galvanometer sometimes disturbed, so some error come in the result.

NAME OF THE EXPERIMENT Determination of specific resistance of a wire using meter bridge.

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EXPT. NO. 03

Theory:

The arrangement shown in the figure, if known resistance R is connected to the left gap DE and an unknown resistance X is connected to the right gap HI and for the point N if the distance of null point AN = l and LN = (100-l) then by the principle of wheatstone's network, we get, $\frac{R}{X} = \frac{l\sigma}{(100-l)\sigma} = \frac{l}{(100-l)}$

$$\text{or, } X = \frac{R(100-l)}{l} \ \Omega \quad \text{.....} (1)$$

where, ρ = resistance per unit length of the material of the wire of the bridge.

Now, knowing l and R, X can be calculated.

Again, from laws of resistance, we get, $X = \frac{\rho L}{A}$

$$\text{or, } \rho = \frac{XA}{L} \quad \text{...} (2)$$

Where, L = length of the wire, A be the cross section of the wire X and $A = \pi r^2$, r = radius of the wire.

Therefore, knowing X, L and A, we can calculate the specific resistance ρ.

Apparatus:

A meter bridge, cell or battery, commutator, a resistor, unknown resistance, key, connecting wires, screw gauge, meter scale, sand paper, blade etc.

FIGURE NO. 03

Sh = shunt

G = Galvanometer

DE = Known Resistance R

HI = Unknown Resistane X

Battery = B   K = Key

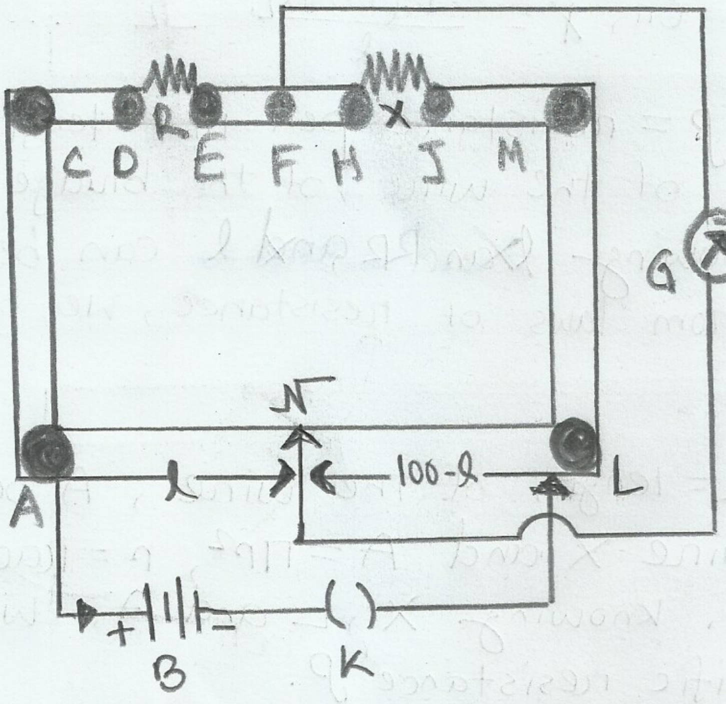

Figure - 03 (Exp-03) : Determination of specific resistance (ρ) of a wire by meter bridge.

NAME OF THE EXPERIMENT Determination of specific resistance of a wire using meter bridge.

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EXPT. NO. 03

Description of the connections:-

A battery or cell B and a key K is joined in series and is connected to the point D and I. A known resistor R is connected between D & E and an unknown resistor X is connected between H & I. One end of the galvanometer G is connected to the binding screw F and the other end with jockey. A shunt (Sh) is connected with the galvanometer in parallel to save the galvanometer from destroying. Thus, we get four resistances namely AN, NL, R and X as in wheatstone's network. Now if the circuit is completed by tapping the key K, the current will come to the point N and it will divide in to DE & DN and again will meet at the point I and will go to the battery.

Procedure:

1) All the terminals and the ends of the connecting wires were cleaned by sand paper.

2) All the connections were made as shown in the figure. A suitable resistance is placed in the resistor R and pressing the jockey on the bridge wire a null point was obtained near about the middle of the wire. By removing the shunt the null point was determined more accurately. The current was now reversed and proceeding as before the null point was again obtained and the mean was taken.

NAME OF THE EXPERIMENT Determination of specific resistance of a wire using meter bridge.

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EXPT. NO. 03

3) Several sets of readings were taken similarly and X was determined and the mean value was taken.

4) The length (L) of the unknown resistance (X) was determined by a meter scale and the radius (r) by a screw gauge & $A = \pi r^2$ was calculated and hence ρ was calculated from equation no. (2).

Data and Table:-

Determination of radius by screw gauge:-

Pitch, $p = 1$ mm ; Total number of circular scale division, $n = 100$.

$\therefore$ Least count $(L.C) = \frac{p}{n} = \frac{1m}{100} = 0.01$ mm $= 0.001$ cm

Instrumental error $= 0$.

Table-01: Determination of radius:

No. of observations	Linear scale reading a cm	Circular scale reading x	Least count c cm	Value of circular scale reading $b = x.c$ cm	Total observed reading $d' = a + b$ cm	Average observed reading d' cm	Instrumental error $\pm e$ cm	Corrected diameter $d = d' - (\pm e)$ cm	Corrected radius $r = \frac{d}{2}$ cm
1	0	33	0.001	0.033	0.033				
2	0	32	0.001	0.032	0.032	0.032	0	0.032	0.016
3	0	31	0.001	0.031	0.031				

NAME OF THE EXPERIMENT Determination of specific resistance of a wire using meter bridge.

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EXPT. NO. 03

Table-02: Determination of resistance:

Length of the wire, $L = 56$ cm

No. of observations	Null point, l Direct current cm	Null point, l Reversed current cm	Av. null point, l cm	Resistance, R Ω	Resistance X Ω	Average resistance X Ω
01	47.6	47.6	47.6	09	9.91	
02	52.8	52.8	52.8	11	9.96	9.89
03	57.0	57.2	57.1	13	9.80	

Calculations:-

1) Resistance, $X = \frac{R(100-l)}{l} = \frac{9 \times (100-47.6)}{47.6} = 9.91\ \Omega$

Similarly, resistance of no. 2 and 3 are calculated.

$\therefore$ Specific resistance, $\rho = \frac{X \pi r^2}{L} = \frac{9.91 \times 3.1416 \times (0.016)^2}{56}$

$$= \frac{7.97 \times 10^{-3}}{56}$$

$$= 1.423 \times 10^{-4}\ \Omega\text{-cm}$$

$$= 1.423 \times 10^{-6}\ \Omega\text{-m}$$

Result with Explanation:

Specific resistance of an unknown wire $= 1.423 \times 10^{-6}\ \Omega$-m.

Wire is unknown of resistance and specific resistance.

So, it is not possible to find percentage of error.

NAME OF THE EXPERIMENT Determination of specific resistance of a wire using meter bridge.

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EXPT. NO. 03

Precaution :-

1) The null point should be nearer to the middle of the bridge.
2) Current should be passed through the circuit only when readings are taken.
3) The connection should be tight and the terminals of the instrument and the ends of the wires must be cleaned by sand paper.
4) The radius should be determined very carefully.
5) Plugs of resistance box should be tighted.

Discussions:-

1) The galvanometer was very old, so the correct result was not obtained.
2) Due to old screw gauge, the diameter was not correctly measured.

NAME OF THE EXPERIMENT A. First Method: Convension of AC to DC using full wave rectifien using two diodes.

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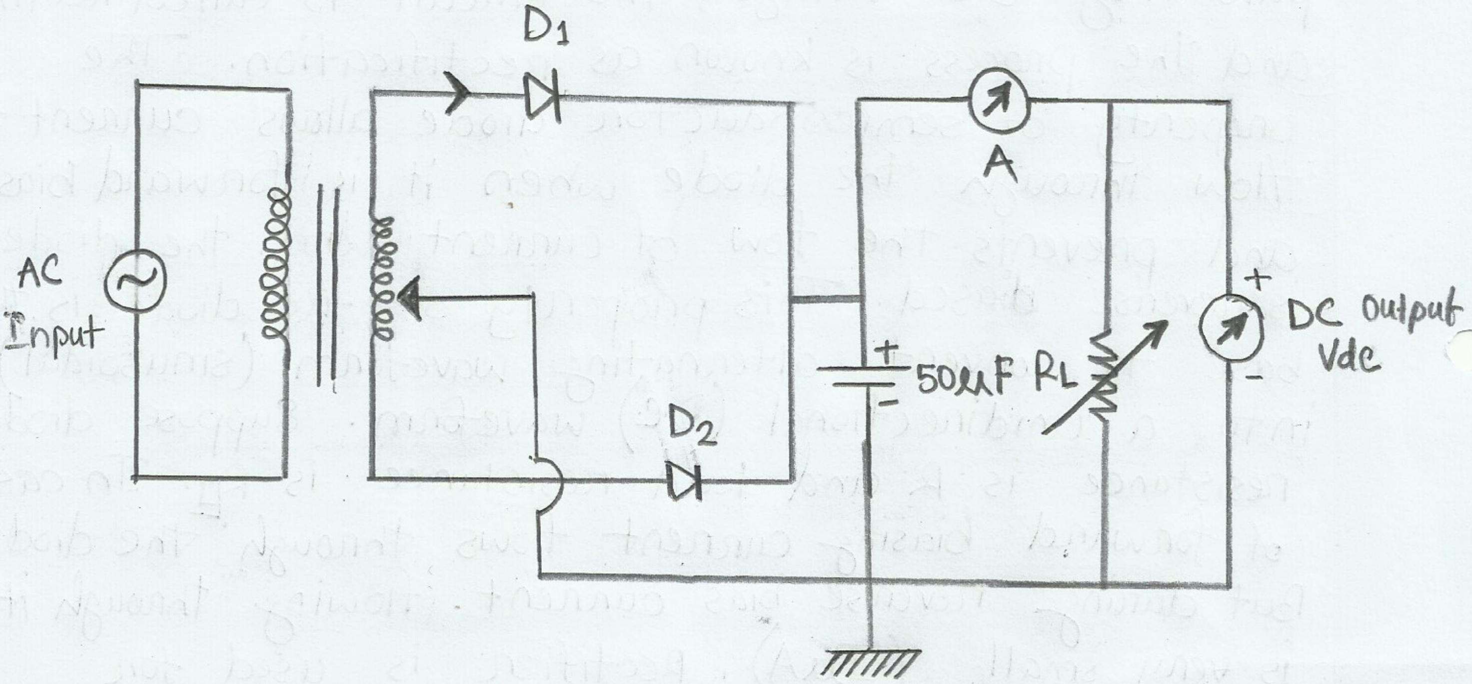
EXPT. NO. 04

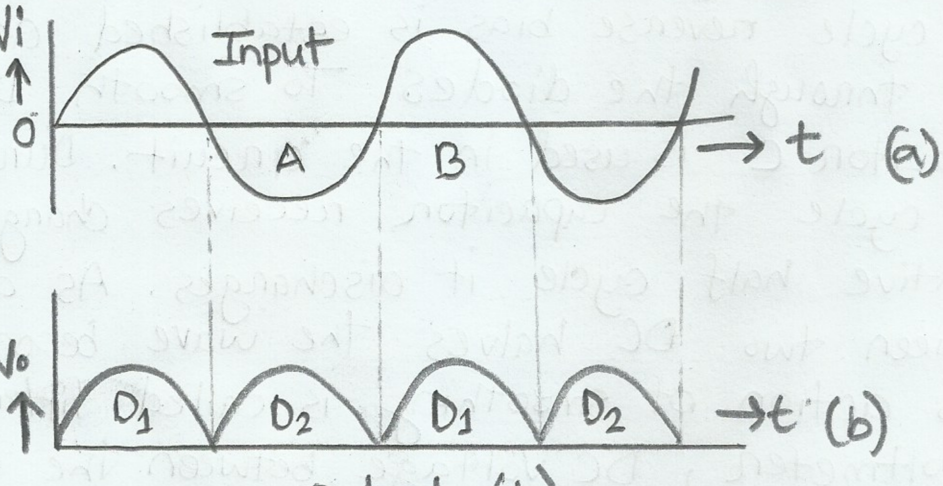
Theory:

When one on mone diodes convent A.C. voltage into pulsating D.C. voltage, the cincuit is called rectifien and the process is known as rectification. The propenty of semiconducton diode allows cunnent to flow through the diode when it is fonwand biased and prevents the flow of cunnent when the diode is reverse biased. This propenty of the diode is the base to convent altennating waveform (sinusoidal) into a unidinectional (D.C) waveform. Suppose diode resistance is R and load resistance is R_L. In case of forward biasing cunnent flows through the diode. But during reverse bias cunnent flowing through it is veny small (IμA). Rectifien is used for converting AC flow into DC flow. During the positive half cycle ~~eunnent~~ cunnent flows and during negative half cycle reverse bias is established and no cunnent flows through the diodes. To smooth DC wave, capaciton C is used in the cincuit. During positive half cycle the capaciton receives changes and in negative half cycle it dischanges. As as a result, between two DC halves the wave becomes smooth. This action of smoothing is called filtening. By a DC voltmeter, DC voltage between the resiston R_L is measuned and cunnent is measuned by DC ammeten. In oscilloscope screen between the two teminals of the resistance, DC flow is obsenved. Cincuit, connecting tenminal, and input and output signals etc are shown in figunes a and b.

FIGURE NO. 04



(a)



Output (b)

Figure - A (Exp-04): Full wave rectifier.

NAME OF THE EXPERIMENT A. First Method: Conversion of AC to DC using full wave rectifier using two diodes.

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EXPT. NO. 04

Instruments and Materials Required:-

Secondary / step down transformer, two diodes (D_1, D_2), load resistor ($R_L = 10-100\,\Omega$), connecting wires, soldering wires and heater/iron, soldering board, oscilloscope, DC voltmeter, AC millimeter, capacitor ($C = 50\,\mu F$), project boards etc.

Full Wave Rectifier:

Procedure:

1) Two diodes were connected with the upper and lower output terminals of the transformers as per the diagram.
2) Negative terminals of the two diodes were connected combinedly.
3) A capacitor (c), a load resistor (R_L), a DC voltmeter were connected in parallel and an ammeter was connected in series and central point the transformer was connected to R_L, C and lower terminal of the voltmeter. The lower terminal of C and R_L were connected to the ground.
4) The mid-point of the negative terminal of the diode was connected to the capacitor by a wire.
5) By flowing current in the circuit, current and output are measured.
6) Output DC voltage and current were observed by oscilloscope.
7) A graph of Vdc versus Idc was plotted and it was a straight line that passes through the origin.

NAME OF THE EXPERIMENT A. First Methed: Conversion of AC to DC using full wave rectifier using two diodes.

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EXPT. NO. 04

Experimental data & Table:-

1) Capacitance of the capacitor, C = 50 μF.
2) Resistance of the diode, R = 1.5 Ω
3) $I_{dc} = \frac{2I_m}{\pi}$, I_m = peak value of current.

Table:-

No. of Observations	Load Resistance R_L Ω	Input Voltage V_{in} Volt (AC)	Peak value of current I_m Amp (AC)	$I_{dc} = \frac{2I_m}{\pi}$	V_{dc} Volt
01	2	7.4	8.0	5.1	7.4
02	4	9.4	10.36	6.6	9.4
03	6	10.5	11.15	7.1	10.5
04	8	12.1	12.87	8.2	12.1

Observation:

Output voltage has been observed by the oscilloscope and Vdc is measured by voltmeter.

Result:

AC wave is converted to DC wave in rectifier.

Precautions:

1) Circuit elements should be connected carefully.
2) Positive terminals of capacitor, millimeter and voltmeter should be jointly connected.
3) Resistance of the resistor should be chosen carefully to fulfil the experiment.

FIGURE NO. 04

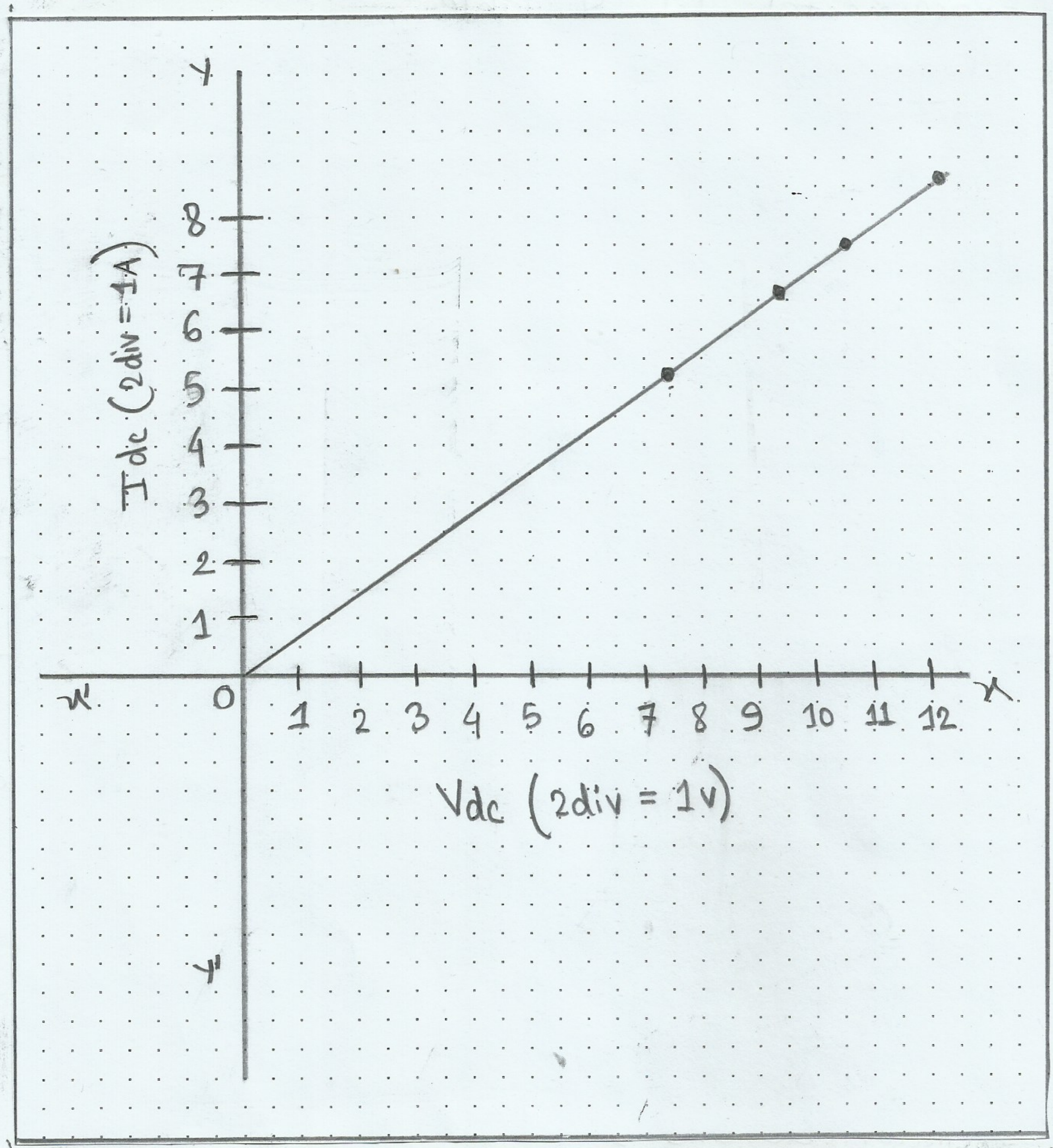

Figure - A (Exp-04): Vdc vs Idc graph.

NAME OF THE EXPERIMENT A: First Method: Conversion of AC to DC using full wave rectifier using two diodes.

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EXPT. NO. 04

4) Secondary / step down transformer should be taken carefully.
5) At the time of biasing, care should be taken also.
6) Input voltage should be kept 8-12 volt.
7) Capacitor should be used to get smooth DC output.
8) secondary/ step down transformer must be used otherwise you may be shocked.
9) D_1 and D_2 should be taken of same value.

Discussions:

Output resistor (R_L) was connected in parallel between the two terminals A, B. If AC voltage is more than 8V to 12V, the oscilloscope may be damaged. Toys can be run with this rectifier.

NAME OF THE EXPERIMENT B. Second Method: Conversion of AC to DC using full wave by bridge rectifier (4 Diodes).

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EXPT. NO. 04

Theory:

When one or more diode converts AC voltage into pulsating DC voltage, the circuit is called rectifier and the process is known as rectification. There are two types of rectifiers; viz- half wave and full wave rectifier.

In full wave, rectification for both half of the input AC voltage current flows through load resistance in one direction. For one half of the input voltage, a pair of diodes become forwardly biased, when the other pair of diodes remain in reverse biased. Again for the second half of AC input voltage, the first two diodes become reverse biased and the second two diodes become forward biased. So, the current flows through the load in one direction. In this way, in both halves of the AC input voltage across the load is produced in one direction. This DC output is not smooth DC but pulsating DC i.e. both AC and DC components are present in the output. In order to get pure DC voltage, the output is smoothed by a filter circuit.

Instruments and Materials Required:

Step down transformer, bridge rectifier (4 diodes), capacitor (300 or 50 μF), resistor ($R_L = 10\text{-}100\ \Omega$), multi-meter or oscilloscope, connecting wires, AC power supply, project board etc.

FIGURE NO. 04

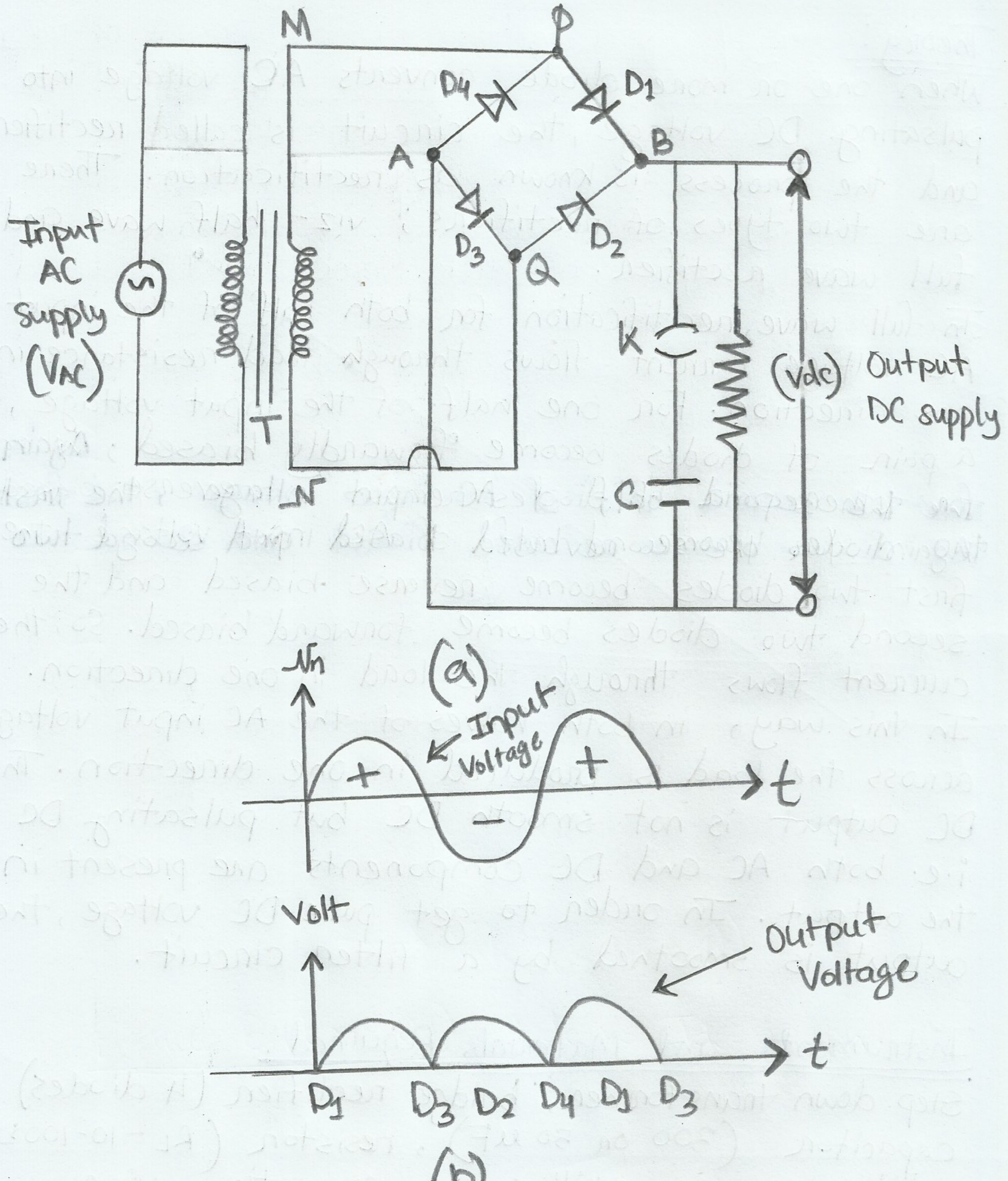

Figure- B (Exp-04): Full wave bridge rectifier.

Connection of circuit:-

To construct a full wave bridge rectifier, we need four diode. Four diodes D_1, D_2, D_3 and D_4 are connected to form a bridge as shown in figure. The AC supply to be rectified is applied diago-nally to opposite ends of the bridge through the transformer. Between other two ends of the bridge, the load resistance R_L is connected.

Procedure:

1) During positive half cycle of the secondary voltage M terminal of the transformer becomes positively charged and N terminal becomes negatively charged. In this situation, diodes D_1 and D_3 becomes forward biased and diodes D_2 and D become reverse biased. So, long MPD_1BAD_3QN current flows and across R_L potential drops. Again during negative half cycle terminal M becomes negatively charged. So, along NQD_2BAD_4PM path current flows will be seen that current through load R_L flows always in the same direction.
2) Wave shapes of the input and output are observed through the oscilloscope. Input and output will be observed as in figures (a) and (b).
3) Voltage across R_L measured by the help of oscilloscope. If oscilloscope is not available, AC/DC voltage can be measured by a voltmeter.
4) A graph of Vdc versus Idc was plotted and it was a straight line passes through the origin.

FIGURE NO. 04

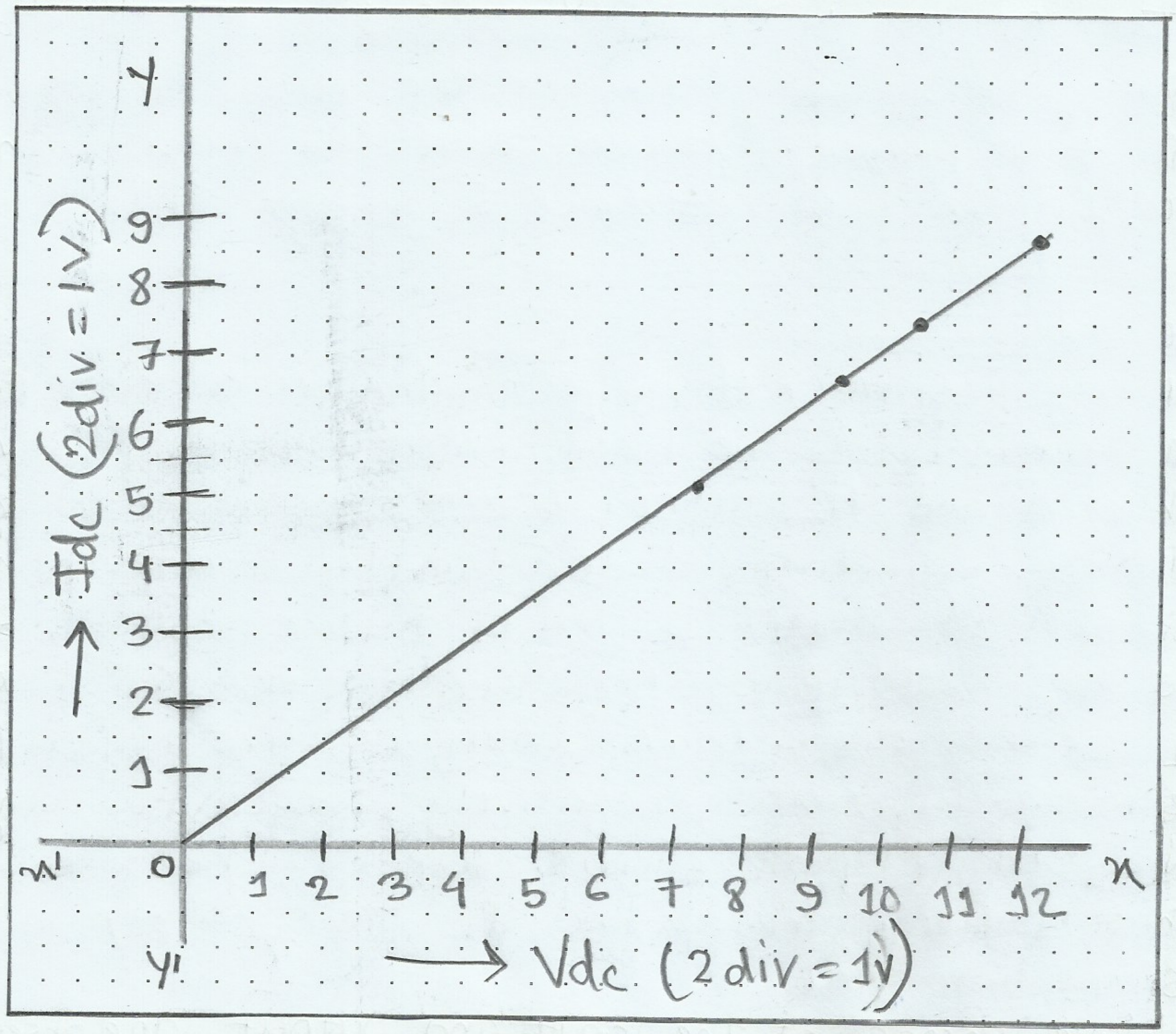

Figure-B (Exp-04): Vdc vs Idc graph.

NAME OF THE EXPERIMENT B. Second Method: Conversion of AC to DC using full wave by bridge rectifier (4 diodes).

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EXPT. NO. 04

Experimental Data and Table:-

1) Capacitance of the capacitor, C = 50 μF
2) Resistance of the diode, R = 1.5 Ω
3) Load resistance, R_L = 2, 4, 6, 8 Ω
4) $I_{dc} = \frac{2I_m}{\pi}$, I_m = peak value of current.

Table:-

No. of observations	Load Resistance R_L Ω	Input Voltage V_{in} Volt (AC)	Peak value of current I_m Amp (AC)	$I_{dc} = \frac{2I_m}{\pi}$	Vdc Volt
01	2	7.4	8	5.1	7.4
02	4	9.4	10.36	6.6	9.4
03	6	10.5	11.15	7.1	10.5
04	8	12.1	12.87	8.2	12.1

Observation:-

Output voltage been observed by the oscilloscope and Vdc is measured by Voltmeter.

Result:-

AC wave is converted to DC wave; so wave is rectified.

Precautions:

1) Connection of the diode should be correct.
2) Terminals of the wires should be made tight.

NAME OF THE EXPERIMENT B: Second Method: Conversion of AC to DC using full wave by bright nectifien (4 diodes).

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EXPT. NO. 04

4) Step down transfonmen should be used.

Discussions:

1) Between the othen two end of the bridge, the resistance R_L is connected. If R_L voltage is more than 12 V, the oscilloscope may be damaged. Toys and whene dny cells ane used, this bridge neetifiens ane connect.

NAME OF THE EXPERIMENT Verification of the function of AND, OR and NOT gate circuit (Truth table) using integrated circuit (I.C) DATE 25/04/2022

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EXPT. NO. 05

Theory:-

A digital circuit having one or more input signal but only one output signal is called gate. These circuits are designed to process digital signals and there are a number of standard unit "logic gates" are available. There are 7 logic gates viz.- AND, OR, NOT, NAND, NOR, X-OR and X-NOR gate. Among them, there are only 3 basic gates viz. AND, OR and NOT gate. In most cases, diodes and transistors are used to construct logic gates. Using integrated circuit (i.e. semiconductors), we will describe working procedure of three gates (AND, OR and NOT gate).

A. Verification of AND gate activity (Truth table) using integrated circuit (IC) objectives:-

Verification of the operation of an AND gate by IC 7408.

Theory:

The special electronic circuit by which Boolean algebra can be materialized is known as logic gate. The logic gate which has got two or more inputs but one output and if high voltage is given to both of its inputs, the output voltage will also be high otherwise the output voltage is low, this logic gate is called AND gate. If inputs of AND gate be A & B and output is C, then $C = A \cdot B$

FIGURE NO. 05

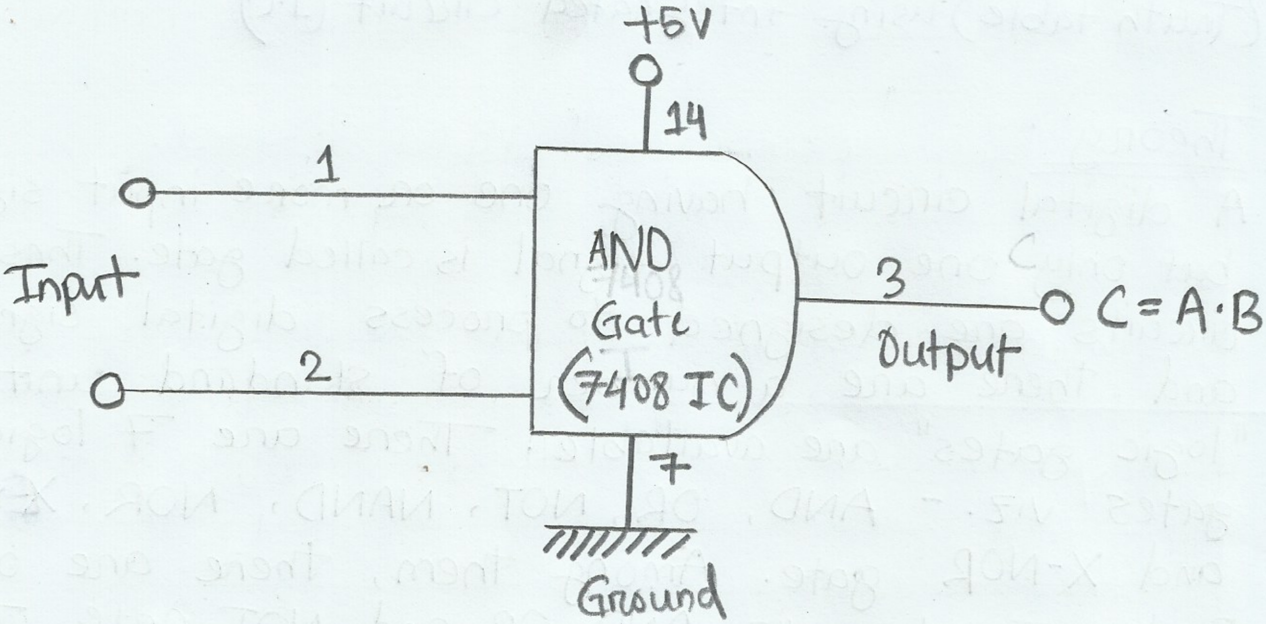

Figure - 1(A): I.C. connection of AND gate
(Fundamental figure of AND gate)

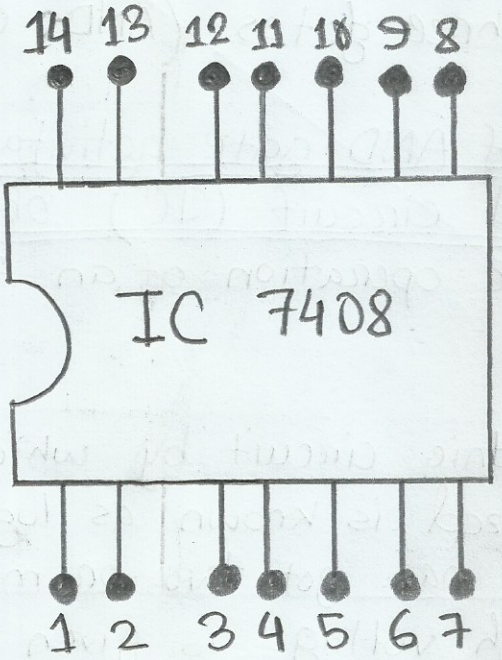

Figure - 2(A): Pin view of I.C. 7408

NAME OF THE EXPERIMENT Verification of the function of AND, OR and NOT gate circuit (Truth table) using integrated circuit (I.C). DATE 26/04/2022

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EXPT. NO. 05

Apparatus and Materials :-

Digital trainer board - 1 piece, two input AND gate, 7408 I.C - 1 piece, LED lamp or voltmeter, switch, digital multimeter, connecting wires, power supply +5V etc.

Circuit Connection :-

The IC (7408) figure and truth table of AND gate has been shown in figure-03. In an IC (7408) of AND gate, there are four AND gates each having two input and one output. The IC has 14 pins, seven on each side. Pin no. 14 is connected with +5V power supply and pin no. 7 is grounded. The input s of first AND gate are connected with pin no. 1 and 2 and the output with pin no. 3, inputs of second AND gate are connected with pin no. 4 and 5 and output with pin no. 6. The inputs of third AND gate are connected with pin no. 9 and 10 and the output with pin no. 8. Similarly, the inputs of the fourth AND gate are connected with pin no. 12 & 13 and the output with the pin no. 11. Here, we shall use the first AND gate only.

Procedure :-

1) IC was placed on the trainer board according to the pin connection. Switch A and B were connected with pin 1 and 2 and pin 7 was connected

FIGURE NO. 05

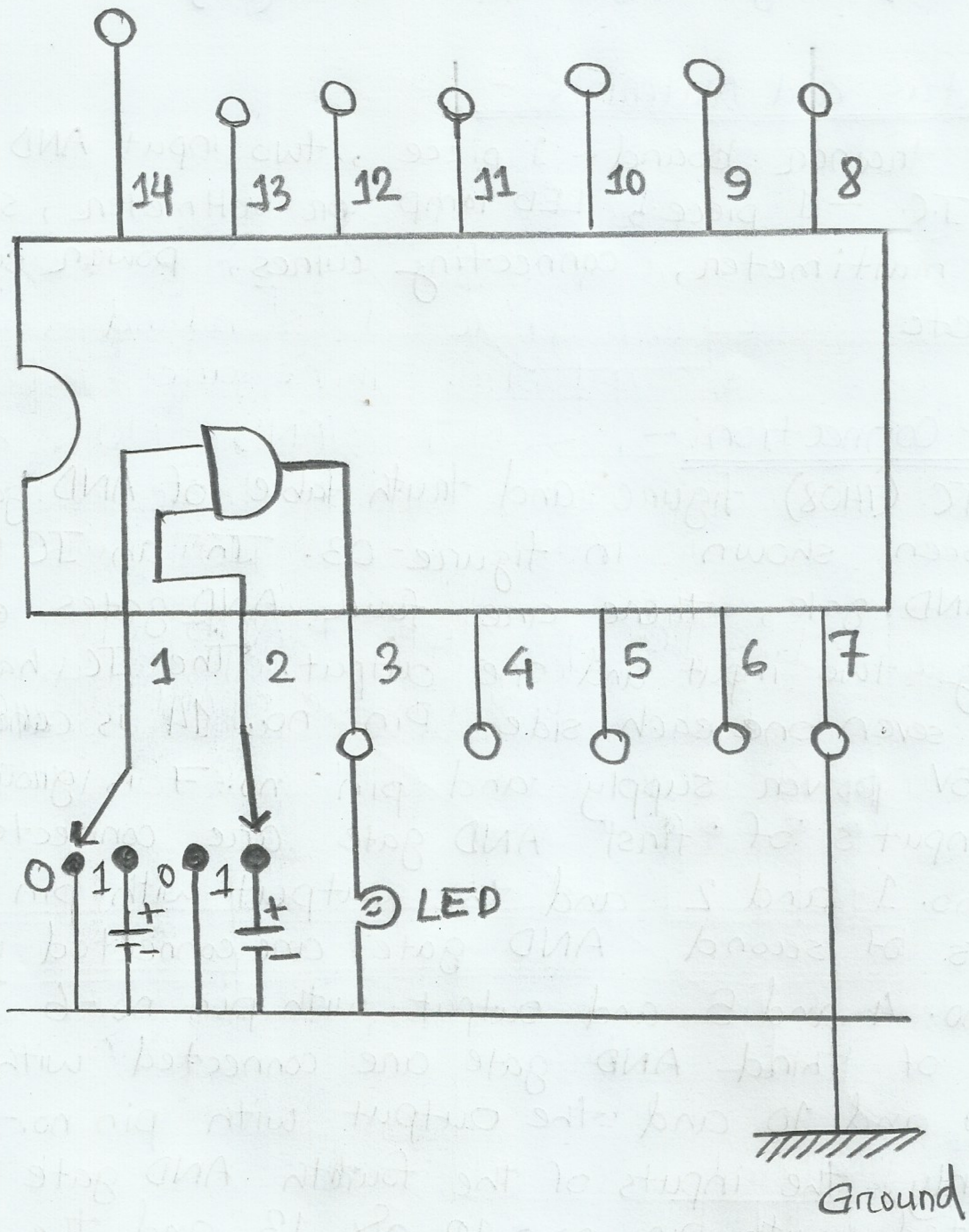

Figure - 3(A): Function of AND gate in I.C. (7408).

to the base (ground) and pin 14 was connected with +5V. Pin 3 was connected to the LED or voltmeter.
2) Electric connections in the trainer board were made.
3) Now according to the truth table, in case of IC connections, states of switches i.e. ON-OFF states were made and output i.e. state of LED was observed.

Logic conditions:-

'0' = 0 V and '1' = +5 V.

Observation:

AND Gate Activity		
A	B	C = A·B
Low	Low	LED does not illuminate
Low	High	LED does not illuminate
High	Low	LED does not illuminate
High	High	LED illuminates

Truth Table		
A	B	C = A·B
0	0	0
0	1	0
1	0	0
1	1	1

Result:

The AND gate truth table was verified.

Precautions:

1) All the connections should be made carefully and firmly in the trainer board.
2) Care should be taken while putting the I.C to the trainer board so that the pins of the the do not bend or break.

3) Care should be taken so that the voltage from the power supply should not cross +5 V.
4) Pin no. 14 should be connected with +5 V in the trainer board.
5) Switches should be made OFF and ON slowly.

Discussions:-

Observing the function of AND gate i.e. seeing the ON and OFF of LED, it can be said that the I.C 7408 is correct. So, we can say that the truth table of I.C. 7408 AND gate is fulfilled.

B. Verification of OR gate activity (Truth table) using integrated circuit (I.C.) objectives:-

Verification of the operation of an OR gate by I.C 7432.

Theory:

The logic gate which has got two or more inputs but one output and if any of the input voltage is high. the output will also be high, otherwise the output voltage is low, this logic gate is called OR gate. If the input of OR gate be A & B and output is C then, C = A + B. Here, + sign does not mean addition. The meaning of this + sign is OR operation.

FIGURE NO. 05

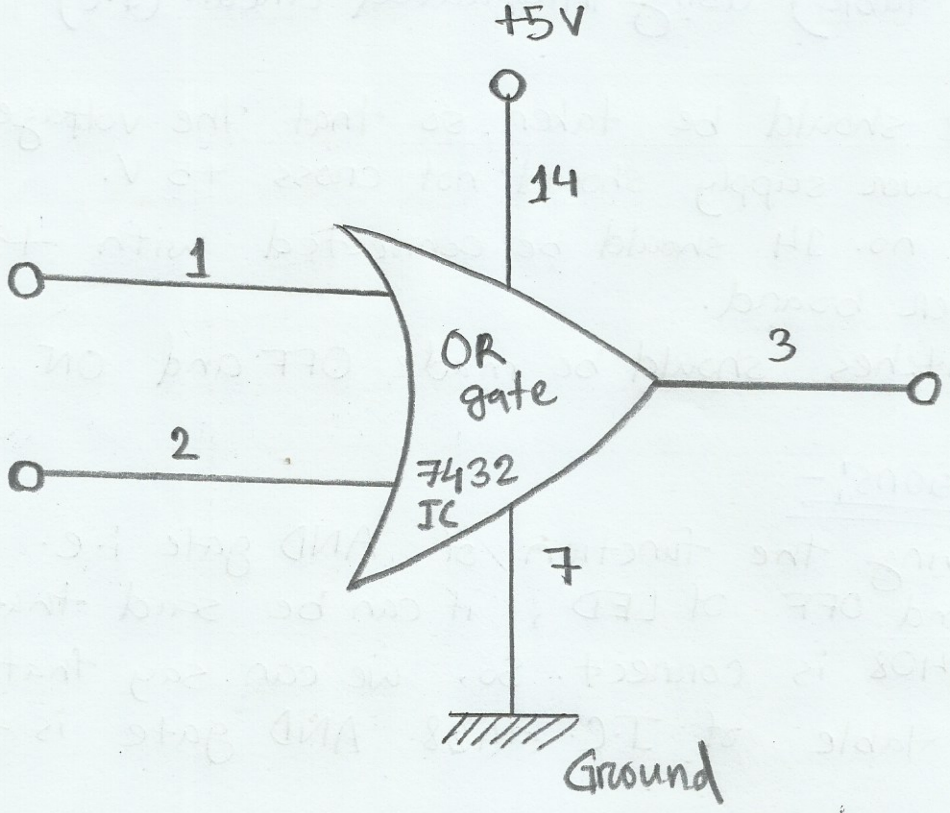

Figure - 1 (B): I.C. connection of OR gate.
(Fundamental figure of OR gate)

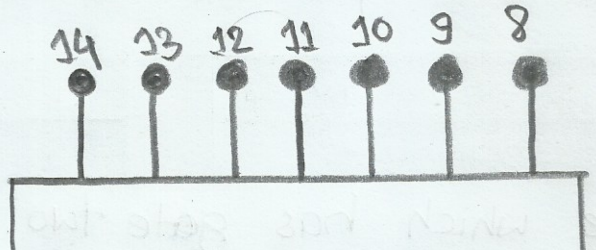

Figure - 2 (B): Pin view of I.C. 7432.

Apparatus & materials:-

Digital trainer board -1 piece, 2 input OR gate, 7432 I.C. - 1 piece, LED lamp or voltmeter, switch, digital multimeter, connecting wires, power supply +5V etc.

Circuit connections:-

The IC (7432) figure and truth table of OR gate have been shown in figure-3. In an IC (7432) of OR gate, there are four OR gates each having two inputs and one output. The IC has 14 pins, seven on each side. Pin no. 14 is connected with +5V power supply and pin no. 7 is grounded. The inputs of first OR gate are connected with pin no. 1 and 2 and output is connected with pin no. 3. Inputs of second OR gate are connected with pin no. 4 and 5 and output with pin no. 6. The inputs of third OR gate are connected with pin no. 9 and 10 and output with pin no. 8. In a similar way, the inputs of fourth OR gate are connected with pin no. 12 and 13 and the output with pin no. 11. Here, we shall use the first OR gate only.

Procedure:

1) 7432 IC is placed on the trainer board according to the figure.

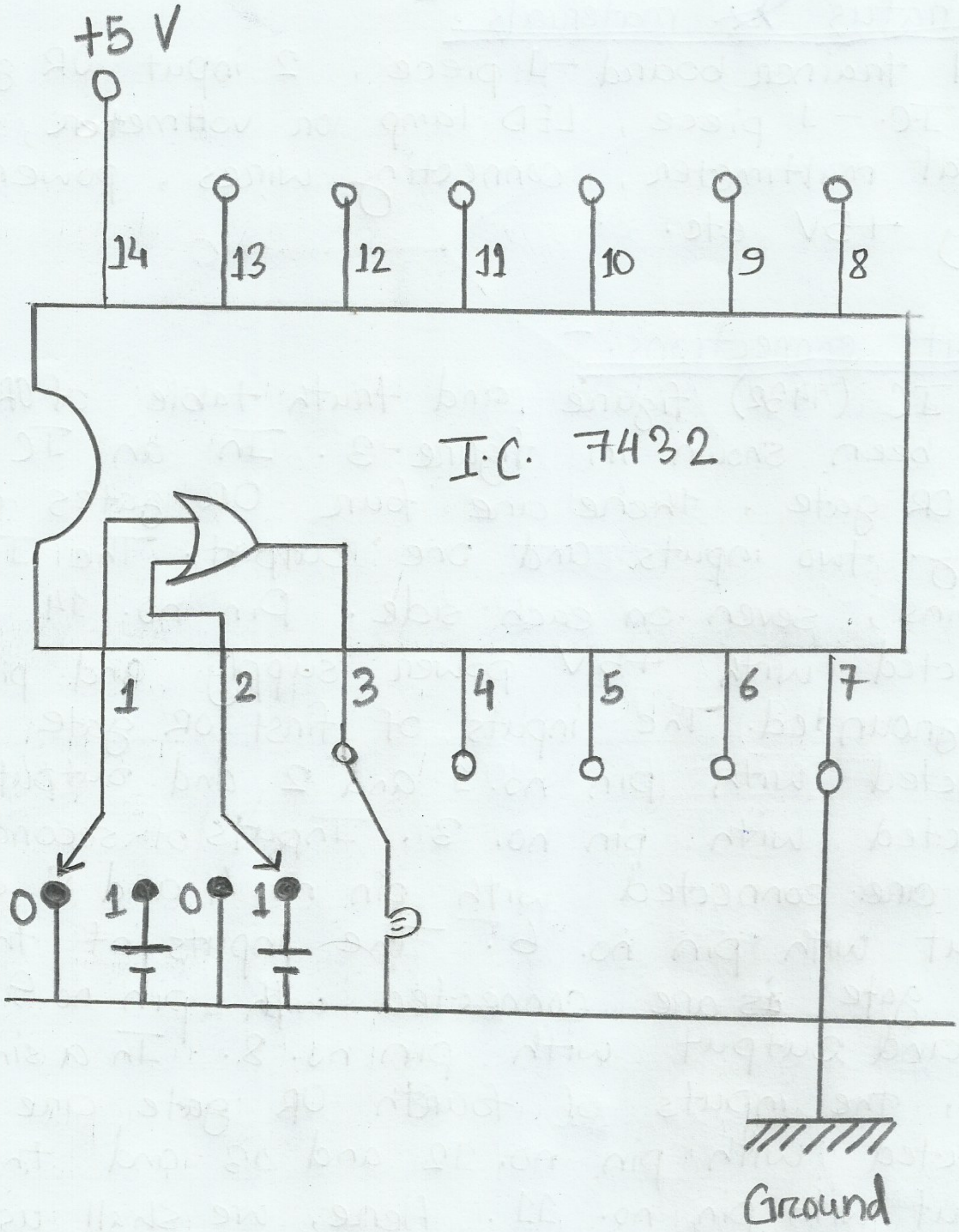

Figure - 3(B): Function of OR gate in I.C. 7432.

NAME OF THE EXPERIMENT Verification of the function of AND, OR and NOT gate circuit (Truth table) using integrated circuit (I.C). DATE 26/04/2022

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2) Pin no. 1 and 2 were connected with A and B, pin no. 7 was connected with the base (ground), pin no. 14 was connected with +5 V. Pin no. 3 was connected with LED which was on the trainer board or Voltmeter.

3) By making the switch OFF and ON, verification of output was made.

4) In I.C., there are four sets (A, B) inputs and four output (C). For any one set, the operation of OR gate was noted by observing the state of LED lamp.

Logical conditions:

'0' = 0 V and '1' = +5 V.

Observation :-

OR Gate Activity		
A	B	C= A+B
Low	Low	LED does not illuminate
Low	High	LED illuminates
High	Low	LED illuminates
High	High	LED illuminates

Truth Table		
A	B	C=A+B
0	0	0
0	1	1
1	0	1
1	1	1

Result:

The OR gate truth table was verified.

NAME OF THE EXPERIMENT Verification of the function of AND, OR and NOT gate circuit (Truth table) using integrated circuit (I.C).

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Precautions:-

1) All the connections should be made carefully and firmly in the trainer board.
2) Care should be taken while putting the I.C. to the trainer board so that the pins of the I.C. do not break or bend.
3) Care should be taken so that voltage from the power supply should not cross +5 V.
4) Pin no. 14 should be connected with +5 V in the trainer board.
5) Switches should be made OFF and ON slowly.

Discussions:-

Observing the function of OR gate i.e. seeing the ON and OFF of LED, it can be said that the I.C. 7432 is correct. So, we can say that the truth table of I.C. 7432 OR gate is fulfilled.

C. Verification of NOT gate activity (Truth table) using integrated circuit (I.C) objective:-

Verification of the operation of a NOT gate by I.C. 7404.

Theory:

The special electronic circuit by which boolean algebra can be materialized is known as logic gate. The logic gate which has one input and one output and if high voltage is given to the input, low voltage is obtained at the output and supply of low

FIGURE NO. 05

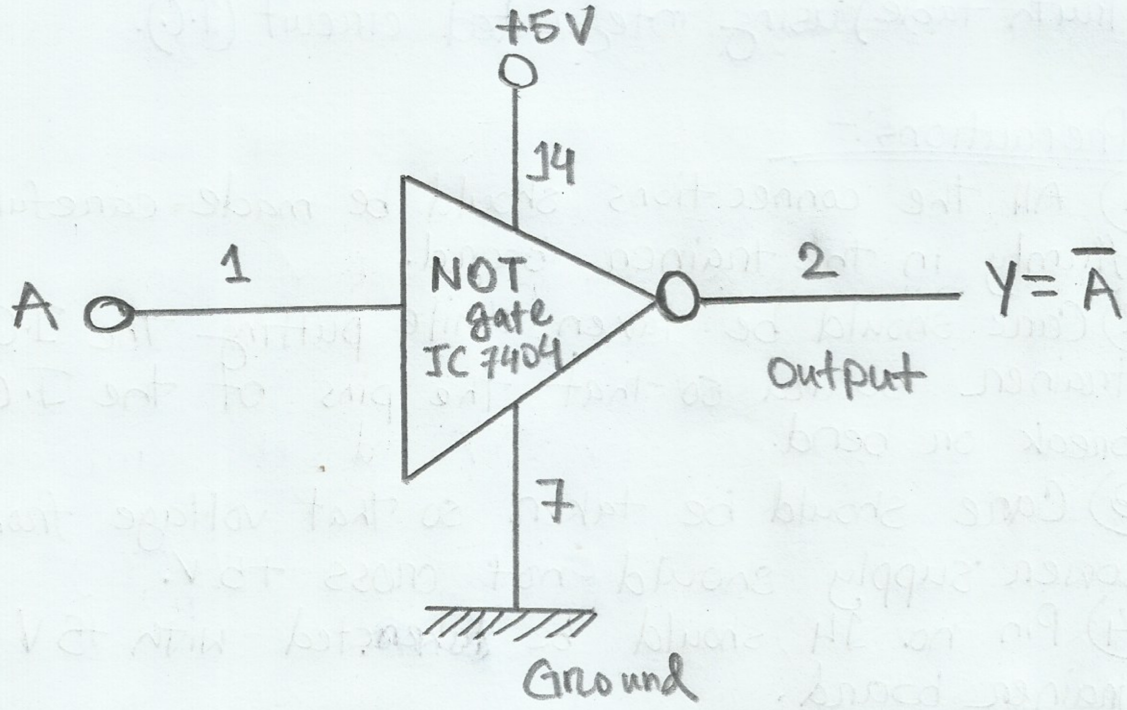

Figure - 1 (C): I.C. connection of NOT gate.
(Fundamental figure of NOT gate.)

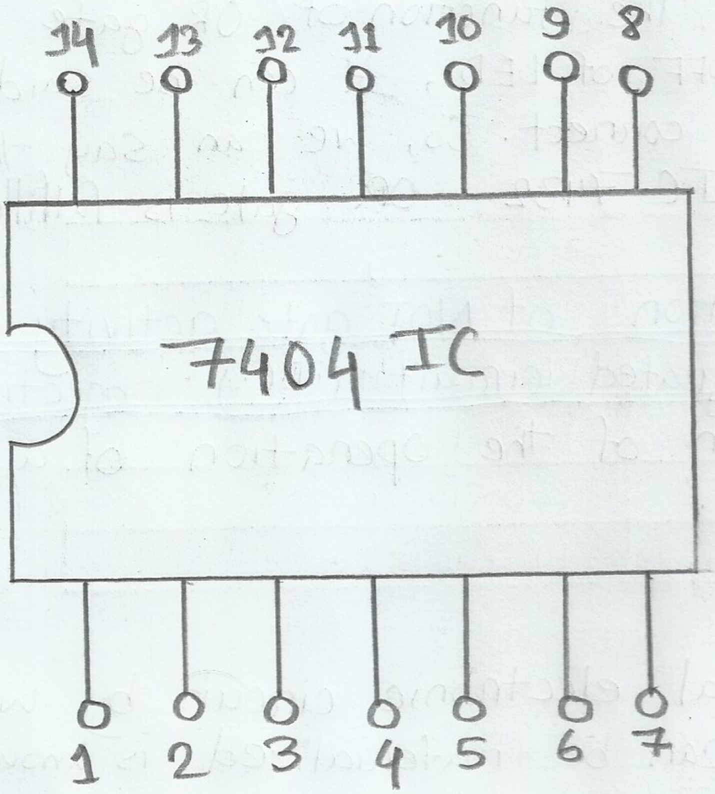

Figure - 2 (C): Pin view of I.C. 7404.

voltage at input results in high voltage at the output, this logic gate is called NOT gate or inverter. If input of a NOT gate is A and output is Y then, $Y = \overline{A}$.
Here, $\overline{A}$ is not mathematical mean, it means the NOT operation.

Apparatus & Materials:-

Digital trainer board – 1 piece, 1 input NOT gate, I.C 7404 – 1 piece, LED lamp or voltmeter, switch, Digital multimeter, connecting wires. power supply +5 V etc.

Circuit connections:-

The I.C. (7404) figure and Truth table of NOT gate have been shown in figure-3. In a I.C (7404) of NOT gate, there are six NOT gates each having one input and one output. IC has 14 pins, seven on each side. Pin no. 14 is connected with +5 V power supply and pin no. 7 is grounded. Inputs are connected to pin no. 1, 3, 5, 9, 11 and 13 respectively and the outputs are connected to the pin no. 2, 4, 6, 8, 10 and 12 respectively. Here, we shall use only input pin 1 and output pin 2. One LED is connected to the output pin no. 2.

FIGURE NO. 05

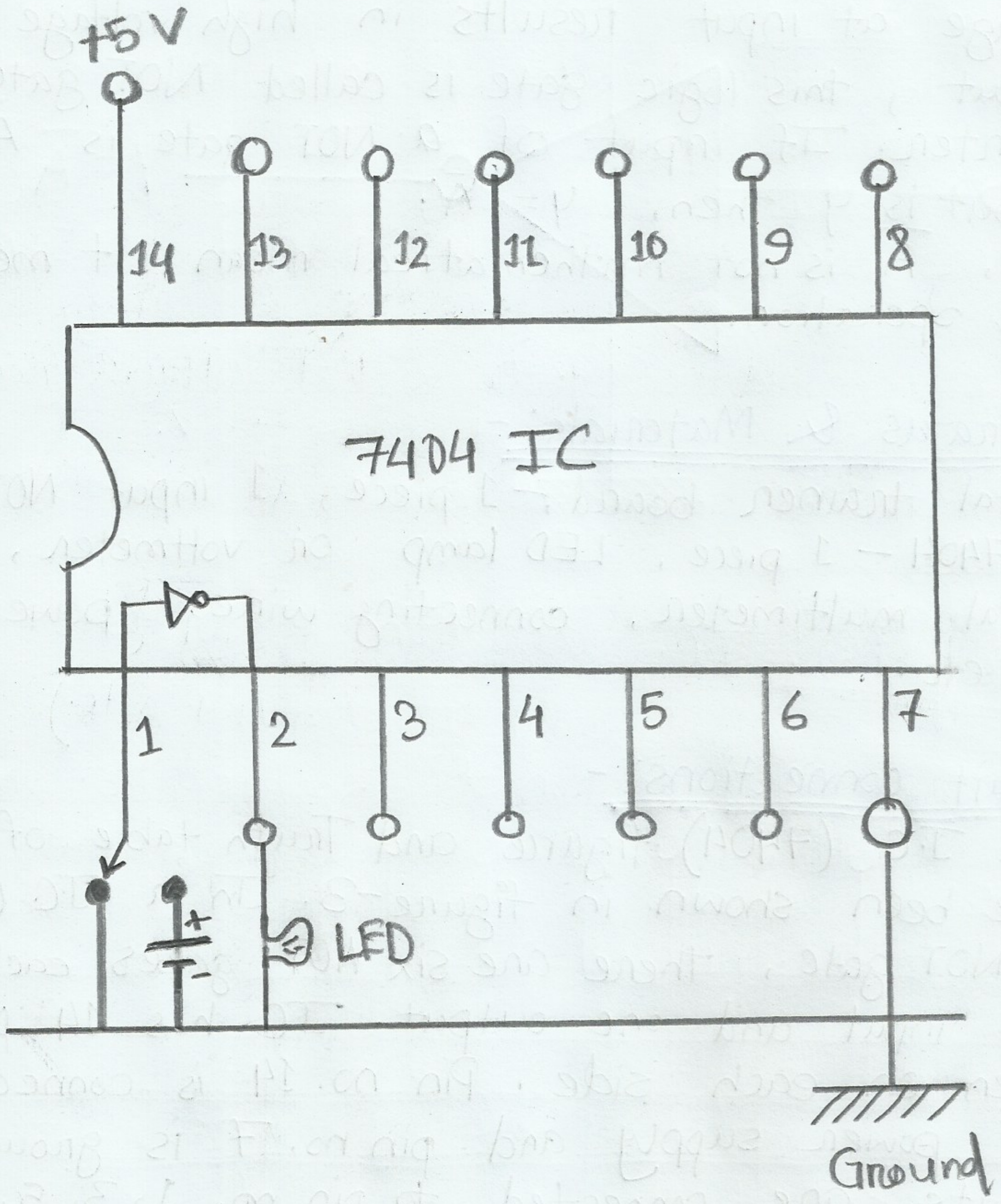

Figure - 3(c): - Function of NOT gate in I.C. 7404.

NAME OF THE EXPERIMENT Verification of the function of AND, OR and NOT gate circuit (Truth table) using integrated circuit (I.C). DATE 27/04/2022

EXPT. NO. 05

Procedure:

1) 7404 IC was placed on the trainer board according to the pin connection.
2) Pin no. 1 was connected with a switch, pin no. 7 was connected with base (ground) and pin no. 14 was connected with +5V. Pin no. 2 was connected with the LED on the trainers board or voltmeter.
3) Now, in case of IC connected, following the truth table, switch was made OFF-ON and state of the LED lamp was observed.

Logical Conditions:

'0' = 0 V and '1' = +5 V.

Observation:

NOT Gate Activity	
A	Y
Low	LED illuminates
High	LED does not illuminate

Truth Table	
A	Y
0	1
1	0

Result:

The NOT gate truth table was verified.

Precautions:

1) All the connections should be made carefully and firmly in the trainer board.

2) Care should be taken while putting the I.C. to the trainer board so that the pins of the I.C. do not break or bend.
3) Care should be taken so that the voltage from the power supply should not cross +5V.
4) Pin no. 14 should be connected with +5V in the trainer board.
5) Switches should be made OFF and ON slowly.

Discussions:-

Observing the function of NOT gate i.e. seeing the ON and OFF of LED, it can be said that the I.C. 7404 is correct. So, we can say that the Truth table of I.C. 7404 NOT gate is fulfilled.