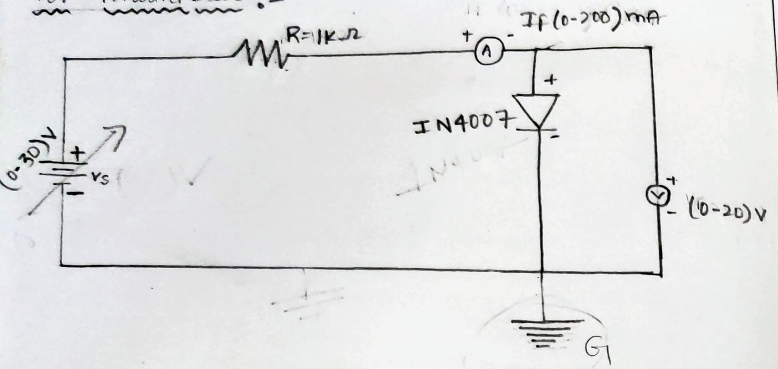
Circuit diagram :-

For forward Bias :-



Tabular form of forward bias :-

S.NO	Vs(V)	Vf(V)	If(mA)
1)	0.1	0.09	0
2)	0.7	0.48	0.2
3)	1.1	0.52	0.5
4)	1.5	0.55	0.9
5)	1.8	0.56	1.2
6)	2	0.57	1.4
7)	2.6	0.59	1.9
8)	3	0.6	2.3
9)	3.4	0.61	2.8
10)	4	0.61	3.1
11)	4.5	0.62	3.3
12)	5	0.63	3.8
13)	5.2	0.64	4.4
14)	5.6	0.64	4.6
15)	6	0.65	4.9
16)	[illegible]	0.65	[illegible]

forward static Resistance

$V_1 = 0.55$ $V_2 = 0.60$

$I_1 = 0.9\,mA$ $I_2 = 2.3\,mA$

① static resistance $= \frac{V_f}{I_f}$

$= 0.55 / 0.9 \times 10^{-3}$

$SR = 0.6 \times 10^3$

$= 0.61\,K\Omega$

② Dynamic resistance

$\frac{V_2 - V_1}{I_2 - I_1} = \frac{0.6 - 0.5}{(2.3 - 0.9)}$

$= 0.0357\,K\Omega$

$= 35\,\Omega$

EXPERIMENT 1

P-N JUNCTION DIODE CHARACTERISTICS

AIM :- To study the operation of P-N junction diode & to calculate forward and reverse bias characteristics of a P-N junction diode.

APPARATUS :- Bread board, Regulated power supply (0-30V), P-N junction diode (IN 4007), Resistor (1KΩ), voltmeter (0-20V), Connectivity wires.

THEORY :-

N- Type Semiconductor

When pure silicon is dropped with one of the elements from group V of the periodic table such as Ni, P, As etc. This element has five valence electrons.

P- Type semiconductor

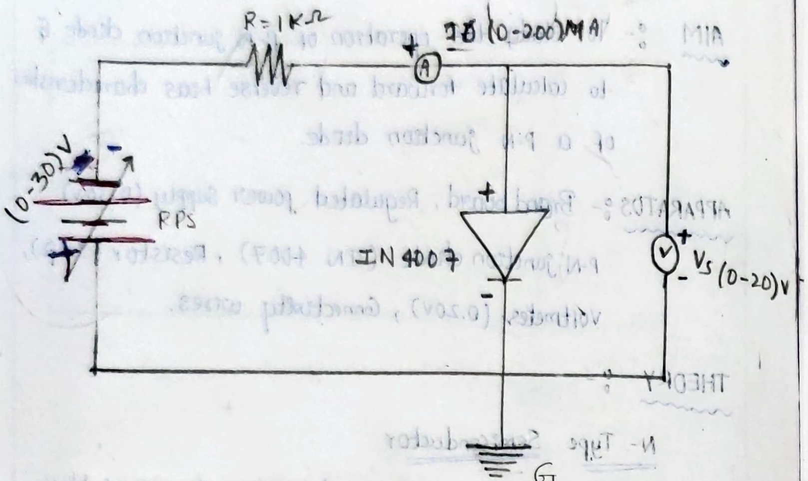
When intrinsic semiconductor silicon is doped with an electron elements such as N, S, Ga (or) a p-type semi conductor.

Since the trivalent atoms accept an extra electron into its valence bond. They are called Acceptors.

Forward bias :- The positive terminal of the external voltage source connected to the anode the negative terminal is connected to the cathode

Circuit diagram :-

Reverse bias :-



Tabular form of reverse bias

S.No	Vs(V)	VR(V)	IR(μA)
1)	0.9	-0.84	
2)	1.1	-1.02	-0.1
3)	1.7	-1.6	-0.1
4)	2.0	-1.89	-0.2
5)	2.3	-2.22	-0.2
6)	2.5	-2.40	-0.2
7)	2.7	-2.58	-0.2
8)	3.1	-2.96	-0.3
9)	3.3	-3.14	-0.3
10)	3.5	-3.32	-0.3
11)	4.1	-3.86	-0.4
12)	4.3	-4.13	-0.4
13)	4.5	-4.29	-0.4
14)	5.0	-4.80	-0.5
15)	5.3	-5.07	-0.5
16)	5.7	-5.43	-0.5

Reverse static resistance

$V_1 = 0.55 \quad V_2 = 0.6$

$I_1 = 0.9\,mA \quad I_2 = 2.3\,mA$

$SR = \frac{V_Y}{I_Y} = \frac{3.320}{0.3 \times 10^{-6}} = 11.06 \times 10^6\ \Omega$

$DR = \frac{V_2 - V_1}{I_2 - I_1}$

$= \frac{3.86 - 3.32}{0.1 \times 10^{-6}}$

$= 5.4 \times 10^6\ \Omega$

$= 5.4\ M\Omega$

Reverse bias :-

A P-N junction diode is said to be reversed bias when negative terminal of a battery is connected to the anode and positive terminal is connected to the cathode.

PROCEDURE :-

i) Connections are made as per circuit diagram

ii) for forward bias the positive is connected to the anode of the cathode of diode.

iii) Switch on power supply and increase input set up voltage in steps.

iv) Note down corresponding current flowing through diode voltage across the diode for each and every step of the V/p voltage.

v) The readings of the voltage and current is tabulate.

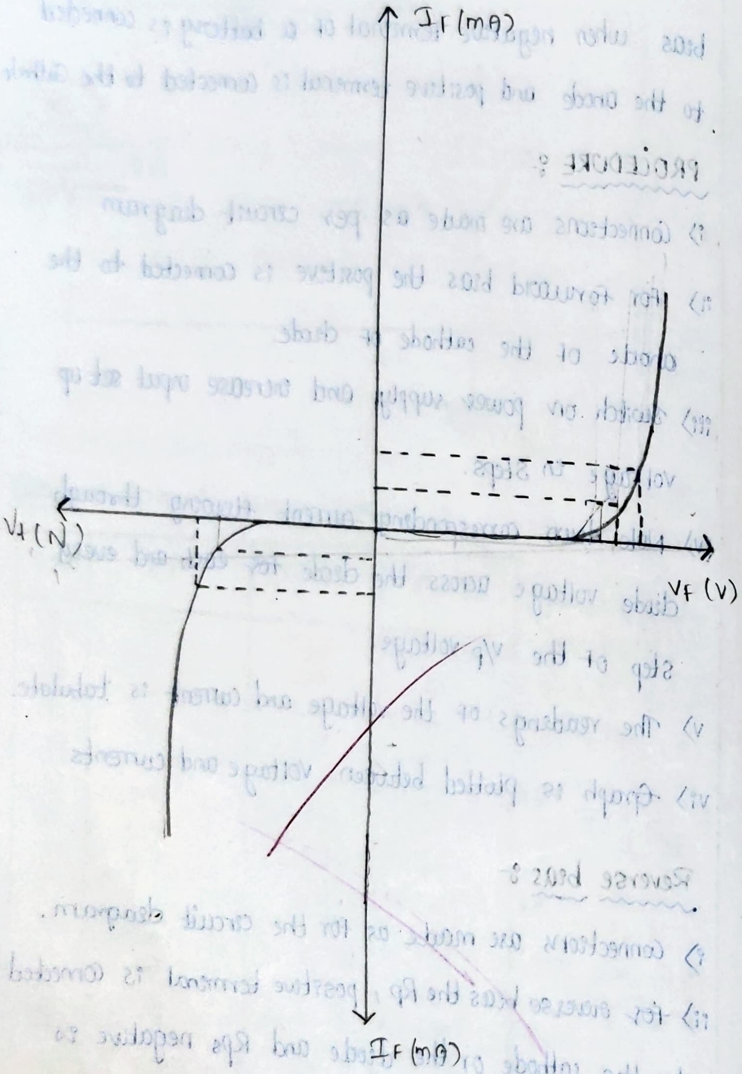
vi) Graph is plotted between voltage and currents.

Reverse bias :-

i) Connections are made as for the circuit diagram.

ii) for reverse bias the Rp, positive terminal is connected to the cathode or the diode and Rps negative is connected to the anode of the diode.

Model Graph VI characteristics :-



iii) Switch on the anode of the diode.

iv) Note down corresponding current flowing through diode voltage across diode for each and every step of input voltage.

v) step of input voltage and current flowing through

vi) Graph is plotted between voltage and current.

PRECAUTIONS :-

i) All the connections should be correct

ii) Parallel error should be avoid while taking the reading from the analgometer.

RESULT :-

V-I characteristics of P-N junction diode has been observed. In forward bias the current increases from 0.6V onwards. In reverse bias small current flows

Forward static resistance = 0.833 kΩ
Forward dynamic resistance = 0.25 kΩ
Reverse static resistance = 8 kΩ
Reverse dynamic resistance = 5 kΩ