PRACTICAL NO: 1

Date : 29/9/24

TITLE : To study the conversion of light into electricity.

AIM / OBJECTIVE: To determine how a solar cell converts sunlight or electric light into a different form of energy.

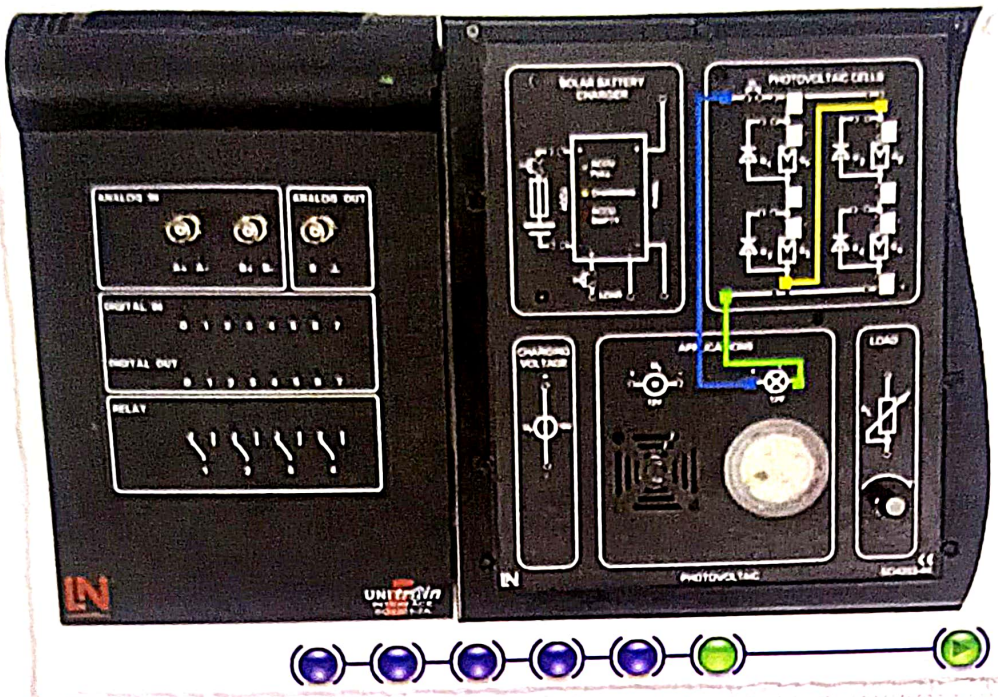
APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

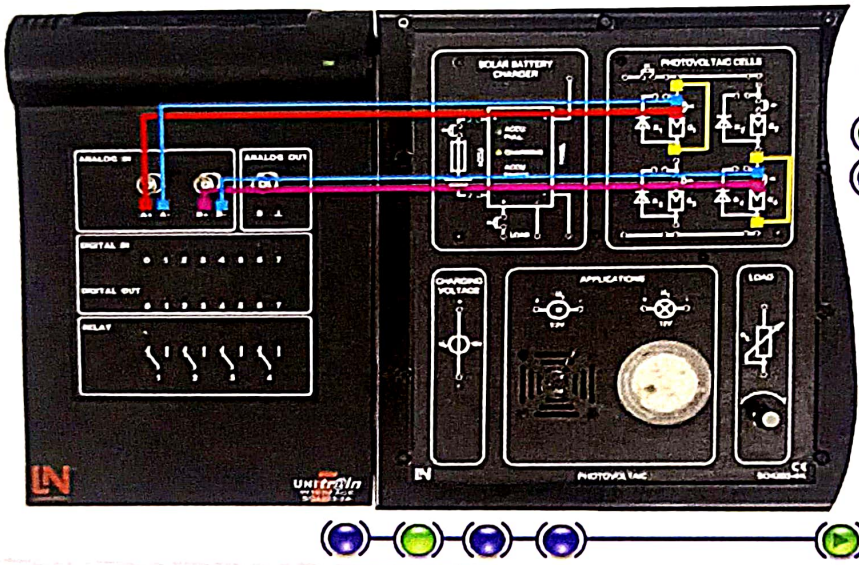
Solar Panel, Virtual Multimeter to measure the Voltage across the panel, DC load, Solar light Source.

CONCEPT / THEORY OF EXPERIMENT:

PROCEDURE :

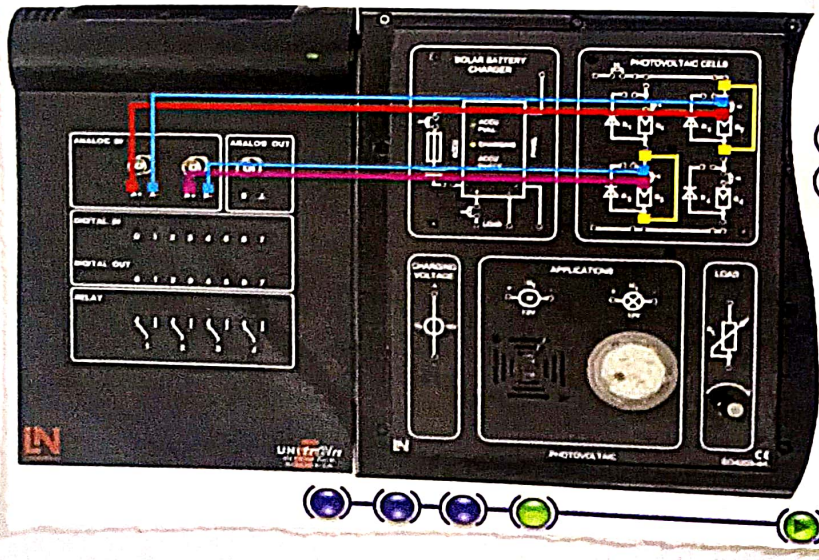
1. Set various irradiances using the dimmer and observe the LED response
2. Correctly align the radiator. Open the Ammeter A & Ammeter B Virtual B Virtual instrument via the menu path Instrument
3. Reperform the setting shown virtualy on Ammeter A & B
4. Connect Both Ammeter to the Solar Module
5. Set the radiator leftward or rightward to wait the both ammeters indicate the current of about 50mA
6. Slowly rotate the radiator leftward or rightward to until the both ammeter indicate the current of about 50mA
7. Check the current through Solar mode & realign the radiator
8. Repeat all the above procedure till the Solar module show current between 45 to 55 mA





short-circuit current measurement on modules:

- G1 and G4
- G2 and G3



short-circuit current measurement on modules:

- G1 and G4
- G2 and G3

OBSERVATIONS

Sr No.	Color module	Ammeter A	Ammeter B.
	Cr_2O_3		
1	High	36 mA	80 mA
2	mid	35 mA	35 mA
3	low	7 mA	7 mA.
	Cr_2O_3		
1	High	82 mA	8 mA
2	mid	42 mA	42 mA
3	low	9 mA	9 mA.

CALCULATIONS :

RESULTS :

Started the conversion of light into electricity and were able to observe required readings on the virtual ammeter.

CONCLUSION : Hence we are able to observe the conversion of light in electricity and observed the current using ammeter through solar module and verifying the radiation.

Assessment Parameters (To be filled by Instructor)

1. Successful completion of Practical (Y/N)
2. Time taken (hours / minutes) : 2.

3. List other Parameters & Outcomes :

Sr. No.	Parameter	Outcome (Achieved / Not Acheived)
1.	Observed the Virtual ammeter reading	✓
2.	Observed the variation in intensity of light	✓
3.	Observed the different in current by moving radiator leftward & Rightward.	✓

Remarks :

Total marks 7 out of 10.

Sign of Instructor
Date :

PRACTICAL NO: 2

Date : 5/9/24

TITLE : To measure the voltage Across the Solar Panel.

AIM / OBJECTIVE: To Convert the Solar energy into electricity

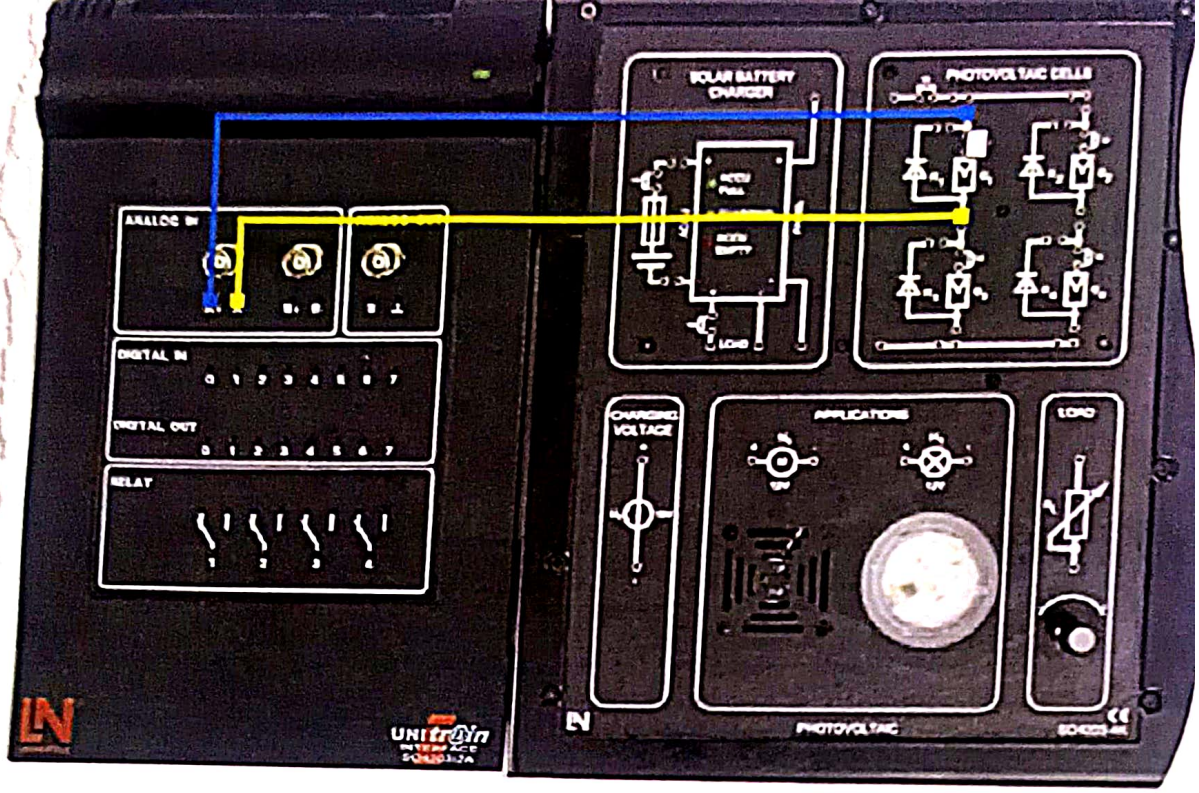
APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

Solar Panel 5-Watt, Multimeter to measure the voltage across the panel, DC load of 5-Watt solar Charge Controller, Light Source

CONCEPT / THEORY OF EXPERIMENT:

PROCEDURE :

1) Connect the positive and negative terminal of Solar Pannel to the positive & negative
2) Measure the voltage across the Connecting pin with the help of Multimeter
3) Take reading in diffuse radiation
4) Take reading with flashlight on
5) Take reading from light source low intensity.
6) Take Reading from light source Medium intensity
7) Take reading from light source High intensity.


SOLAR BATTERY CHARGER
PHOTOVOLTAIC CELLS
ANALOG IN
DIGITAL IN
DIGITAL OUT
RELAY
CHARGING VOLTAGE
APPLICATIONS
LOAD
PHOTOVOLTAIC

OBSERVATIONS

Sr No.	Condition	Voltage across Solar Panel
1.	Diffuse radiation.	3.78V.
2.	Radiation with flash light	2.2V
3.	Illumination from light source: low intensity	3.05V
4.	Illumination from light source: medium intensity	3.7V.
5.	Illumination from light source: High intensity	4V.

CALCULATIONS :

RESULTS :

Hence we were able to measure the voltage across the Solar panel and observe the change in voltage according the condition.

CONCLUSION : Able to measure voltage and observe. Variation in intensity of light w.r.t. Solar PV Panel voltage

Assessment Parameters (To be filled by Instructor)

1. Successful completion of Practical (Y/N)
2. Time taken (hours / minutes) : 2

3. List other Parameters & Outcomes :

Sr. No.	Parameter	Outcome (Achieved / Not Acheived)
1)	Measure Voltage across the panel	✓
2)	Observed the variation in intensity of light w.r.t Solar PV Panel Voltage.	✓

Remarks :

Total marks 7 out of 10.

Sign of Instructor
Date :

PRACTICAL NO: 3

Date : 5/9/24

TITLE : To Examine a Solar Cell's response to the radiated light angle of Incidence

AIM / OBJECTIVE: This Experiment is used to examine the Solar Cells response to the radiated light angle of incidence. The intensity of radiation is measured in W/m

APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

1) Solar Panel
2) Virtual Multimeter
3) DC Load
4) Light Source
5) Photovoltaic Board

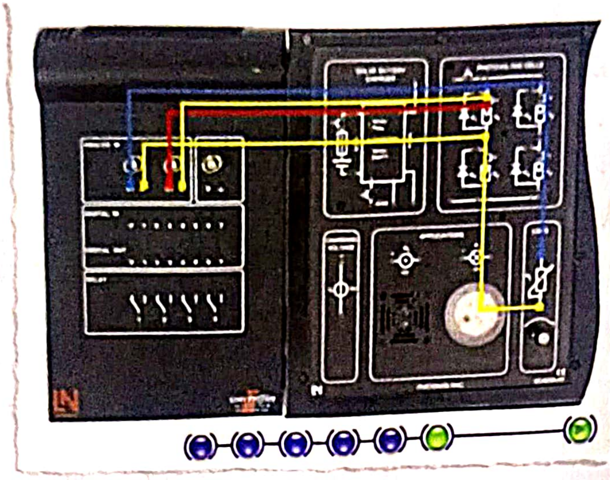
CONCEPT / THEORY OF EXPERIMENT:

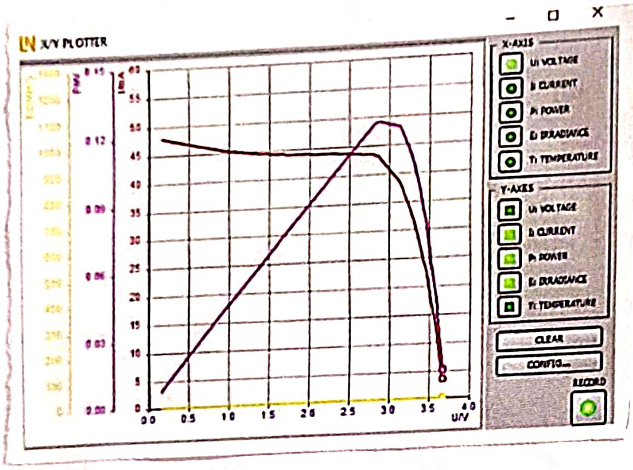
PROCEDURE :

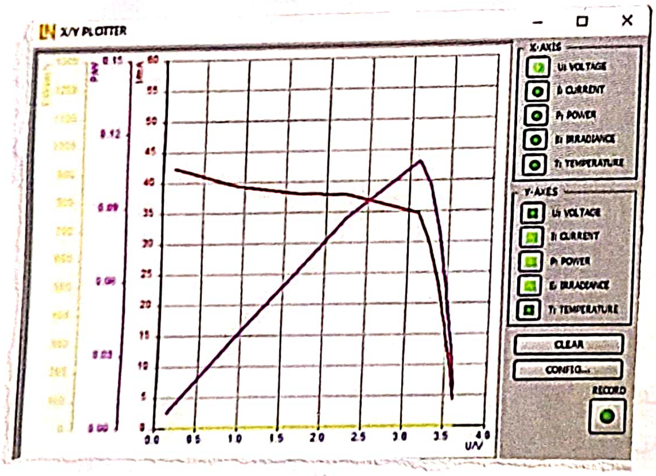
1) Open the Virtual instrument X/Y recorder via the menu path Instrument
2) Perform the settings indicate in the adjacent table

Axis	Parameter	Maximum	Division
X	U	40V	0.5V
Y	I	60mA	5mA
Y	P	0.15W	0.03W
Y	E	1300W/m^2	100W/m^2

3) Using the dimmer, set the radiator its maximum irradiance
4) Record the characteristic using the procedure described
5) Set the potentiometer to 0 Ω (short circuit.)
6) Commence recording with the "REC" button.




X/Y PLOTTER
X-AXIS
U: VOLTAGE
I: CURRENT
P: POWER
E: IRRADIANCE
T: TEMPERATURE
Y-AXES
U: VOLTAGE
I: CURRENT
P: POWER
E: IRRADIANCE
T: TEMPERATURE
CLEAR
CONFIG...
RECORD
U/V


X/Y PLOTTER
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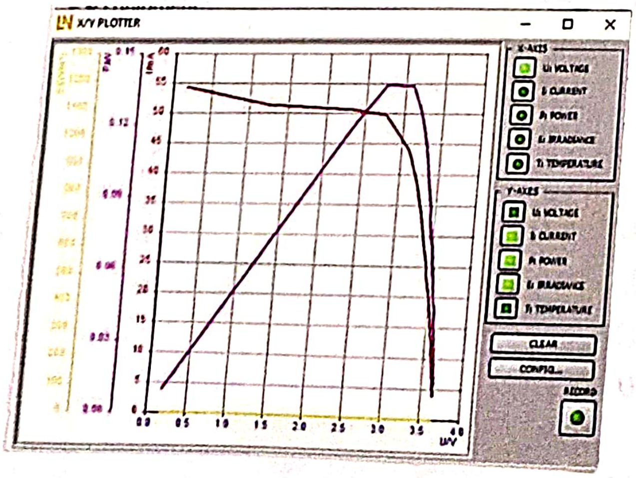
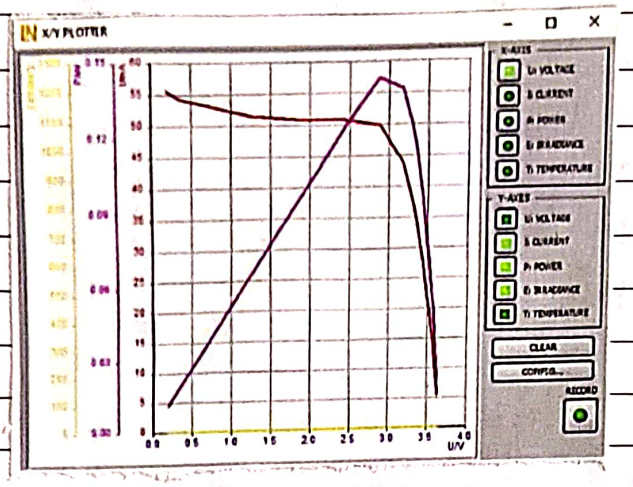
CLEAR
CONFIG...
RECORD
U/V

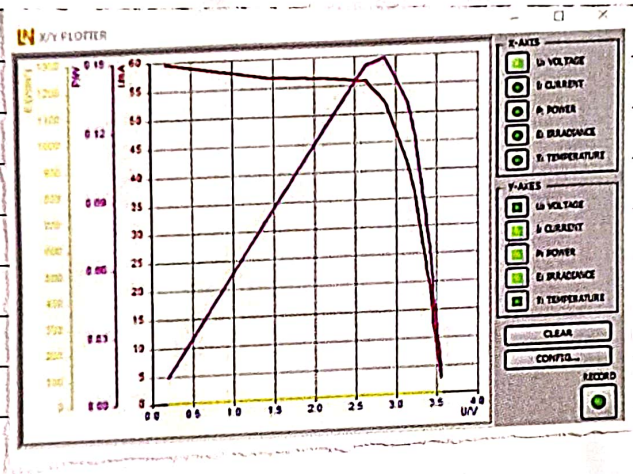

X/Y PLOTTER
X-AXIS
U: VOLTAGE
I: CURRENT
P: POWER
E: IRRADIANCE
T: TEMPERATURE
Y-AXES
U: VOLTAGE
I: CURRENT
P: POWER
E: IRRADIANCE
T: TEMPERATURE
CLEAR
CONFIG...
RECORD
U/V

OBSERVATIONS

7) Slowly turn the potentiometer to its Maximum resistance
8) Finish recording with "REC" button
9) Adjust the radiator angle to different values (30°, 60°, 90°, 120°, 150°) & record the Eh corresponding characteristic in each case as just described

CALCULATIONS :





RESULTS :

observed the variation in density of light w.r.t angle of incidence and observed the characteristics after doing the required necessary setting

CONCLUSION :

Hence we were able to Examine a Solar cells response to the irradiated light angle of incidence.

Assessment Parameters (To be filled by Instructor)

. Successful completion of Practical (Y/N)
. Time taken (hours / minutes) : 2

3. List other Parameters & Outcomes :

Sr. No.	Parameter	Outcome (Achieved / Not Acheived)
1)	Performed the Settings as required	
2)	Observed the variation in intesity of light wrt angle of incidence	
3)	Observed the X Y Characteristics	

Remarks :

Total marks 7 out of 10.

Sign of Instructor
Date :

PRACTICAL NO: 4

Date : 31/10/24

TITLE : To Examine the dependence of open circuit voltage on intensity of radiation & angle of incidence

AIM / OBJECTIVE: This Experiment is used to examine dependence open circuit voltage light's angle of incidence & intensity of Solar radiation. The intensity of radiation is measured in W/m2

APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

Solar panel, Virtual Multimeter, DC load, Light source, Photovoltaic Board

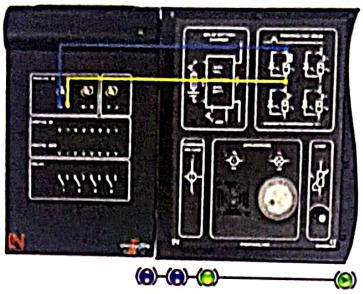
CONCEPT / THEORY OF EXPERIMENT:

Dependencies of open circuit voltage with angle of incidence

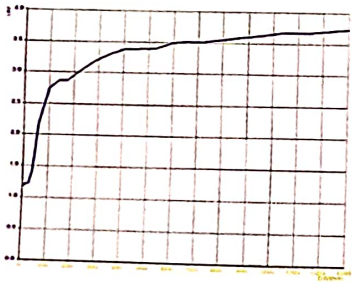
PROCEDURE :

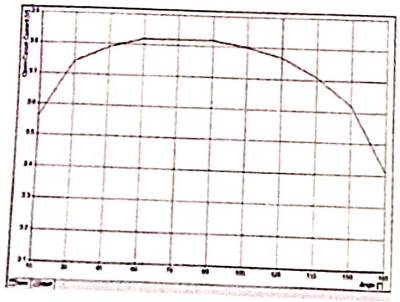
1. Open the Voltmeter A Virtual instrument via the menu path Instrument/Measuring devices
2. Voltmeter A or by clicking on the icon below, & perform the settings shown in the adjacent table
3. Measure the open-circuit voltage at various angle of incidence

	Voltmeter A Settings
Range	5V
Mode	DC



Angle [°]	U [V]
15	3.56
30	3.74
45	3.79
60	3.82
75	3.82
90	3.82
105	3.80
120	3.77
135	3.71
150	3.62
165	3.41





OBSERVATIONS

1) Align the radiator so that its legid frame Source perpendicular to the PV cell
2) Open the virtual instrument XY record via the menu path Instrumen
3) Perform the settings indicates in the adjacent table
4) Using the dimmer, set the radiator to its maximum irradiance
5) Record the characteristic using the procedure described
6) Slowly decrease the irradiance using the dimmer
7) Commence recording with the "REC" button
8) Once the minimum irradiance has been attained stop recording by actuating the button
9) Finish recording with the "REC" button

CALCULATIONS :

RESULTS :

We observed that 90° angle of incidence the voltage comes out to the maximum

CONCLUSION : Hence we were able to examine the dependence of open circuit voltage on intensity of radiation of ∠ incidence

Assessment Parameters (To be filled by Instructor)

1. Successful completion of Practical (Y/N)
2. Time taken (hours / minutes) : 2 hr

3. List other Parameters & Outcomes :

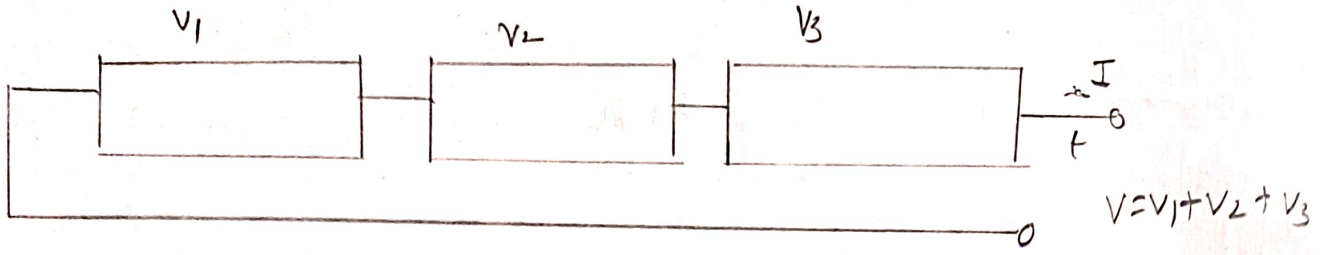
Sr. No.	Parameter	Outcome (Achieved / Not Acheived)
1.	Performed the Settings as required	✓
2.	Observed the variation in open Circuit Voltage w.r.t intensity radiation	✓
3.	Observed the xy characteristics open Circuit Voltage vs Intesity Radiation	✓
4.	Observed the xy characteristics open circuit Voltage Vs Angle Incidence	

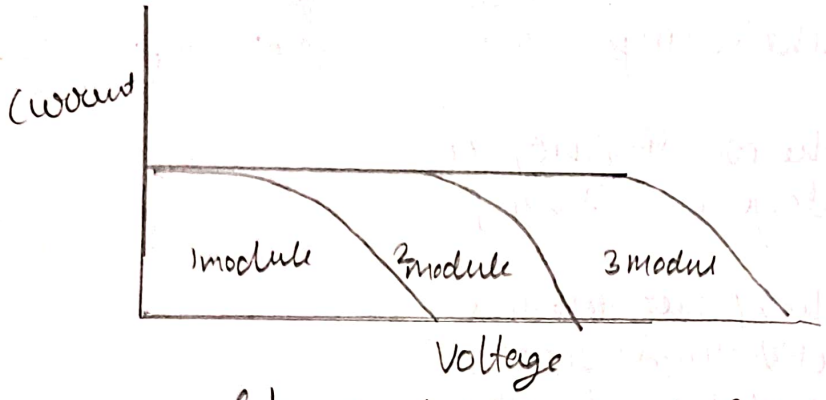
Remarks :

7

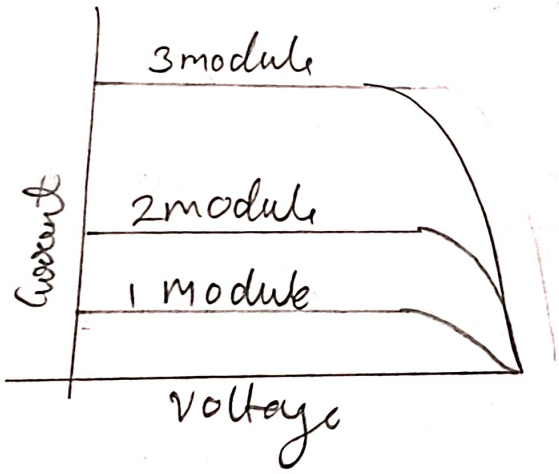
Total marks _____ out of 10.

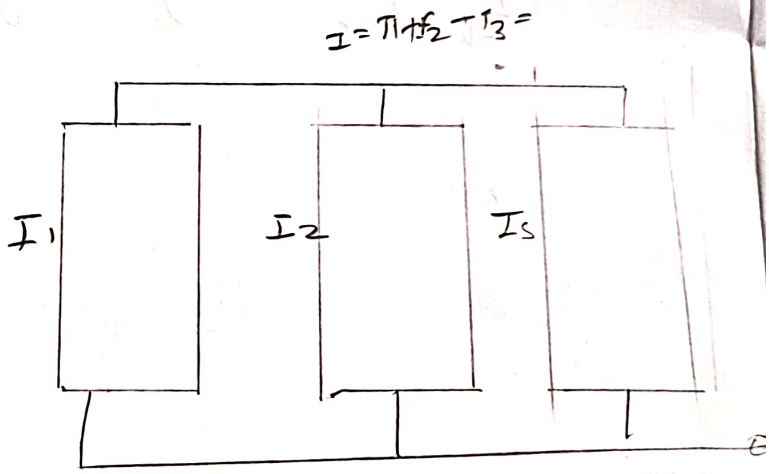
Sign of Instructor
Date :





Solar moduls in series connect.





Solar moduls in parallel connection

PRACTICAL NO: 5

Date : 3/10/24

TITLE : Series & parallel Connection of Solar Cells

AIM / OBJECTIVE: 1) Recording Voltage & Current Characteristics of a single Solar Cell
2) Recording Voltage & Current Characteristics of Solar Cells in Series
3) Recording Voltage & Current Characteristics of a Solar Cell in the

APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

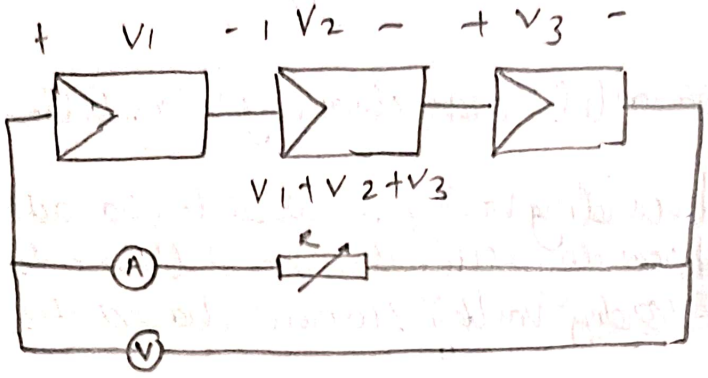
Solar Cells
potentiometer
Voltage meter
Current meter

CONCEPT / THEORY OF EXPERIMENT:

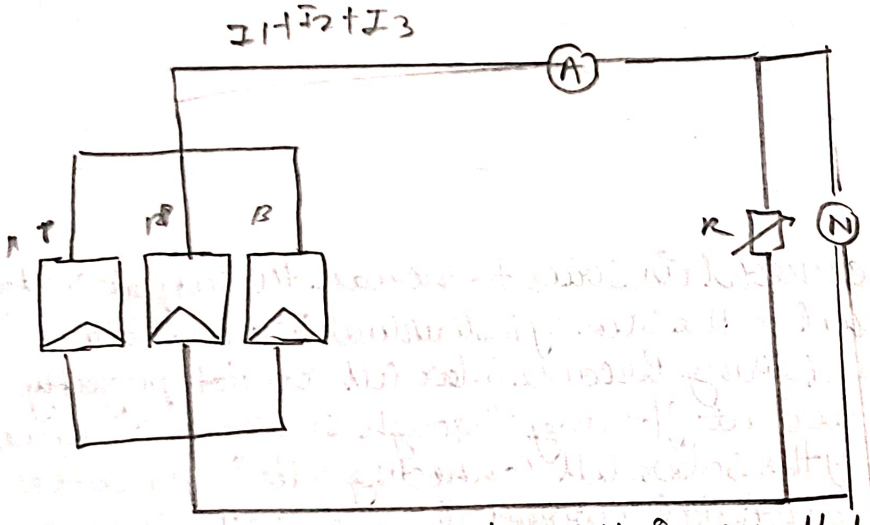
Solar Cells can be connected in series to increase the output voltage. Total voltage is equal to the sum of individual voltage. Solar Cells are connected are termed string. Because Solar Cell are not perfectly identical the total current flowing through a series is equal to the lowest values of the solar cell connecting cells in parallel increase the total current total current is equal to the sum of individual current

PROCEDURE :

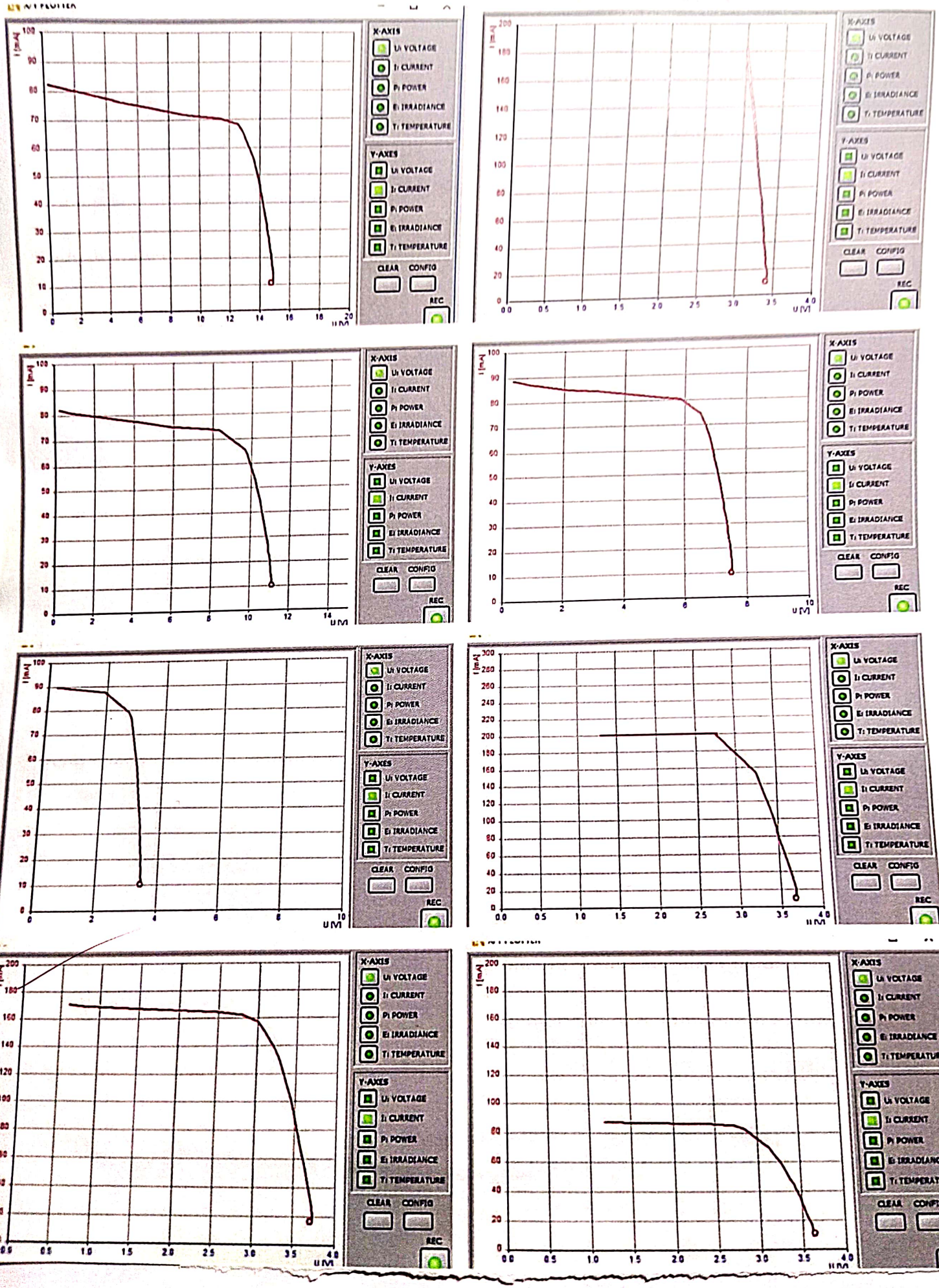
1) Connection three Solar Cells in series. Measure the open circuit voltage
2) Connect a potentiometer to the output of the series connected cells the voltage meter in parallel with the Solar Cell the current meter series to measure the output voltage & current respectively
3) the value of the potentiometer sequentially use the voltmeter ammeter to measure the output voltage & current with different potentiometer values
4) Record the voltage, current of power values
5) After complete recording the voltage & current values, Plot the Solar Cells in Series
6) Identify the maximum power point on the I/V curve
7) Recording voltage current characteristics on the plot



solar cells in series



solar cells in parallel


I [mA]
U [V]
X-AXIS
Ux VOLTAGE
Ix CURRENT
Px POWER
Ex IRRADIANCE
Tx TEMPERATURE
Y-AXES
Uy VOLTAGE
Iy CURRENT
Py POWER
Ey IRRADIANCE
Ty TEMPERATURE
CLEAR
CONFIG
REC

CALCULATIONS :

RESULTS :

We observed that cells connected in series increase output voltage total voltage is equal to the sum of individual volt & cell connected in parallel increase output current total current is equal to the sum of individual curr

CONCLUSION : We were able to connection & plot the IV graph pot Solar cells in series & parallel.

Assessment Parameters (To be filled by Instructor)

1. Successful completion of Practical (Y/N)
2. Time taken (hours / minutes) : 2hrs

3. List other Parameters & Outcomes :

Sr. No.	Parameter	Outcome (Achieved / Not Acheived)
1)	Reverted voltage & current Characteristics of solar cells in series	✓
2)	Reverted voltage & current Characteristics of solar cell in parallel	✓

Remarks :

8

Total marks _____ out of 10.

Sign of Instructor
Date :

PRACTICAL NO: 6

Date : 15/10/24

TITLE : Conversion of Biomass waste to find fuel & other products

AIM / OBJECTIVE: To investigate the process of converting solid biomass into fuel through pyrolysis and calculate the characteristics of the oil & other product produced

APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

1) Pyrolysis reactor.
2) Thermocouple
3) Condensers
4) Collector flask
5) Heating Mantle
6) Gas flow meter
7) Analytical balance
8) Biomass feedstock
9) Safety equipment

CONCEPT / THEORY OF EXPERIMENT:

Pyrolysis - It thermo couple decomposition of organic material at elevated temperatured in the absense of oxygen This process converts solid into bio oil, syngas & char The produced bio oil can further refined into liquid into liquid similar to diesel

PROCEDURE :

1) Preparation of biomass - Dry & grind the biomass feedstock to a uniform particle size
2) Setup - Assemble the pyrolysis reactor & connect it to the condenser & collection flask allow the system to cool
3) Collection - Monitor the process collect the gases safely after the process is complete
4) Collection : Monitor the process collect the boiled if condense into the collect
5) Analysis - Weight the bio oil produced & perform basic analysis (eg - density, viscosity, elementary composition,

CALCULATIONS :

RESULTS :

We observed that thermal pyrolysis of plastic waste effectively produces fuel oil & and in waste products, it is an efficient way to recycle plastic & make a good use of it pyrolysis is an effecent method where oil can be achieved at lower temperature high oil yields

CONCLUSION : Hence Summerized the findings regarding the efficiency & viability of converting solid biomass into liquid fuel emphasizing it potential for industrial applications

Assessment Parameters (To be filled by Instructor)

1. Successful completion of Practical (Y/N)
2. Time taken (hours / minutes) : _____

3. List other Parameters & Outcomes :

Sr. No.	Parameter	Outcome (Achieved / Not Acheived)
1	Summerized a research paper on conversion solid waste into liquid fuel	✓
2	Understood the proces taking place	✓
3	Assess the viability of industrial application	✓

Remarks :

8

Total marks _____ out of 10.

Sign of Instructor
Date :

PRACTICAL NO: 7

Date : 25/10/24

TITLE : optimizing wind energy generation for community power supply

AIM / OBJECTIVE: To effectively manage wind farm to maximize the benefits of optimal electricity in small town balancing the fluctuating power needs of community with variable output from wind turbine

APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

Virtual labs

CONCEPT / THEORY OF EXPERIMENT:

PROCEDURE :

1) Open Configuration page of the simulation Adjust the speed range No of turbine used selection set the power requirement Check the simulate speed -> How
2) Adjusting turbines - Adding or removing turbine to adjust
3) Monitoring output observe wind farm animation & process
4) Data Analyses - Access report chart page. Analyse benefits Comparing requirement of wind farm o/p
5) Adjustments Observation - make a changes if required
6) Documentation - Keep record different setting used Conclude the experiment

Simulation

Start / Restart | Pause Simulation | Reset Simulation | Add Turbine | Remove Turbine

Configuration settings

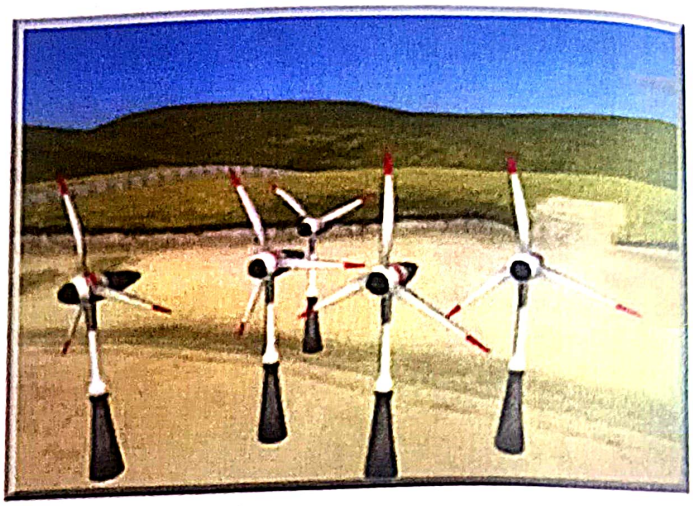
Wind Speed Range	8 - 8 m/s
Num Turbine Range	1 - 10
Power Range	6400 - 6400 kw
Sim speed	Normal speed

Current simulation values

Current Wind	8 m/s
Current Turbs	5
Current Output	7500 kw
Power Requirements	6400 kw

Simulation Status

Power Status	Correct Power
Sim Status	Paused
Time of Day	06:03



Configuration

For each of the three values - wind speed, number of turbines, and power requirements for the town drag the handles of the slides to change the range (minimum and maximum) that the simulation will use.

Wind Speed - range from 0 to 20 m/s
8 - 8

Number of Turbines - range from 1 to 10
1 - 10

Power Requirements of the Town - range from 1000 to 24000 kw - in steps of 200 kw
6400 - 6400

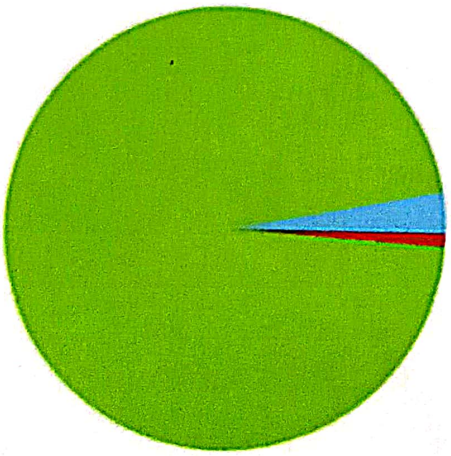
Use the buttons below to select the speed at which the simulation will run.

Select simulation speed.

Normal speed | Fast speed | Warp speed

Report Charts

Show power output report | Show values for current hour



Under Power 1%

Correct Power 96%

Over Power 3%

CALCULATIONS :

RESULTS :

By changing the Windspeed no. of turbine power requirement can get the correct power accordingly

Required output - 4000w

Current output - 7500w

No. of turbine - 5

Wind speed - 8m/s

CONCLUSION : The lab wind energy simulation emphasizes on managing wind farms challenges adapting to wind speed changes during energy storage optimizing turbine plan

Assessment Parameters (To be filled by Instructor)

1. Successful completion of Practical (Y/N)
2. Time taken (hours / minutes) : 2 hour

3. List other Parameters & Outcomes :

Sr. No.	Parameter	Outcome (Achieved / Not Acheived)
1)	Observed the variability of energy production in wind system	✓
2)	Integrating wind energy into power grids	✓

Remarks :

8

Total marks _____ out of 10.

Sign of Instructor
Date :

PRACTICAL NO: 8

Date : 14/4/24

TITLE : Fuel cell

AIM / OBJECTIVE: Study of fuel cell industry cell its working

APPARATUS / TOOLS / EQUIPMENT / RESOURCES USED:

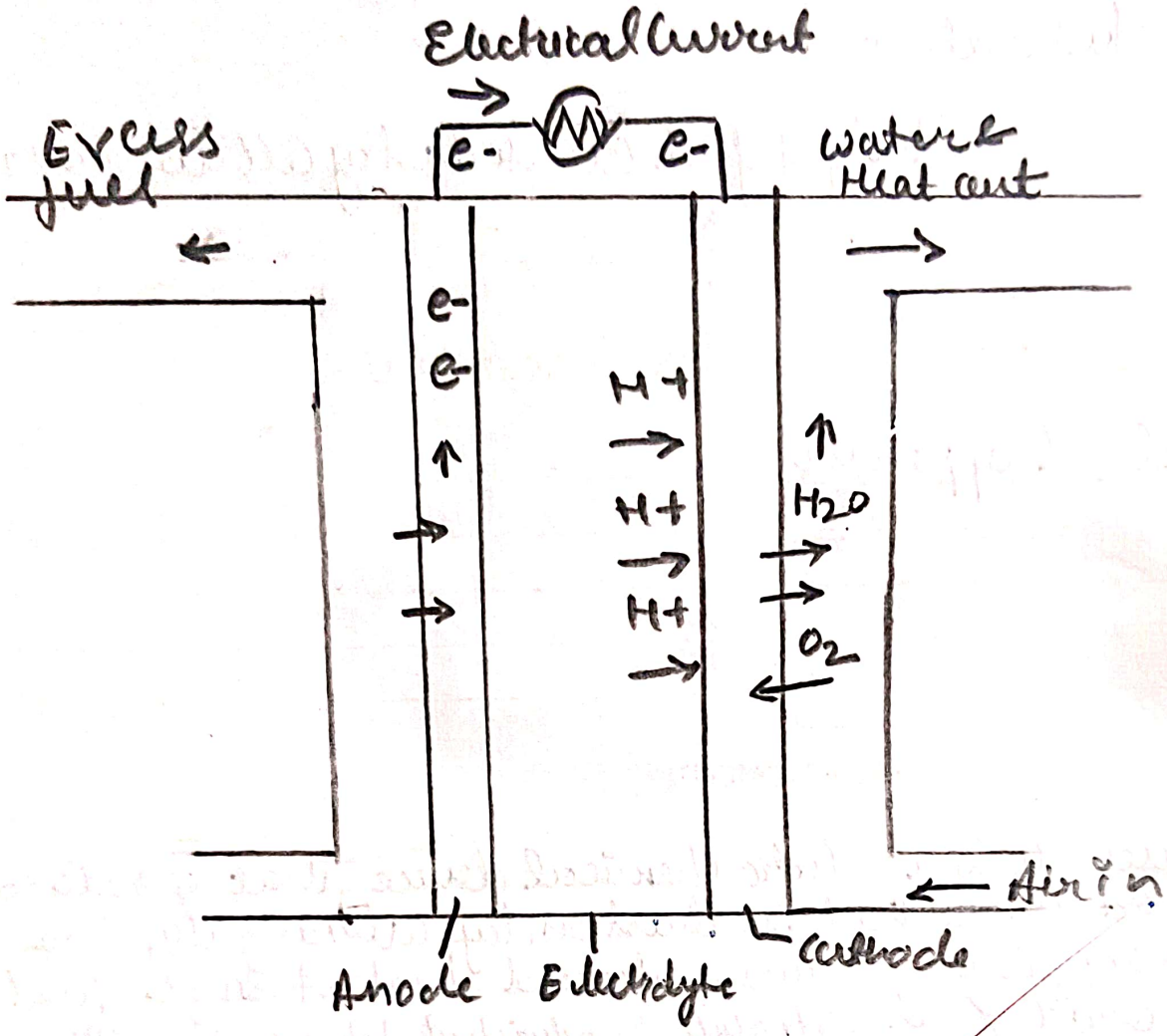
Fuel cell apparatus

CONCEPT / THEORY OF EXPERIMENT:

A fuel cell is a electro chemical device that produces electricity without combustion by utilising hydrogen and oxygen to produces water and heat. A single fuel cell consist of an electrolyte sandwiched between two thin electrode

PROCEDURE :

1.) open LW
2.) Start the apparatus.
3.) connect the required wires
4.) observe the readings of voltage & output.
5.) understand working



PAFC Fuel Cell

OBSERVATIONS

1) o/p of 1.5 to 2.5 v.

2) able to turn on fuel lamp.

Types of fuel cells :-

1.) Alkaline fuel cell (AFC)
2.) Phosphoric acid fuel cell (PAFC)
3.) Polymer Electrolyte membrane fuel cell (PEMFC)
4.) molten carbonate fuel cell (MFC)
5.) Solid Oxide fuel cell (SOFC)

CALCULATIONS :

RESULTS :

we were able to understand the working of fuel cell and it's efficiency.

CONCLUSION :

working & understanding of fuel cell.

Assessment Parameters (To be filled by Instructor)

1. Successful completion of Practical (Y/N)
2. Time taken (hours / minutes) : 2hrs

3. List other Parameters & Outcomes :

Sr. No.	Parameter	Outcome (Achieved / Not Acheived)
1.)	understand fuel cell working	
2)	efficiency of fuel cell	
3.)	types of fuel cell.	

Remarks :

7

Total marks _____ out of 10.

Sign of Instructor
Date :