SOLAR MOBILE CHARGER

PROJECT REPORT

Submitted by

RESHMA S Register no. AB20PHY023

Under the guidance of

Ms Minu Pius

Department of Physics, St. Teresa's College (Autonomous), Ernakulam

Kochi-682011

Submitted to

Mahatma Gandhi University, Kottayam

In partial fulfilment of the requirements for the Award of

BACHELOR'S DEGREE OF SCIENCE IN PHYSICS

ST. TERESA'S COLLEGE (AUTONOMOUS)

ERNAKULAM, KOCHI-682011

ST. TERESA'S COLLEGE (AUTONOMOUS)

ERNAKULAM

CERTIFICATE

This is to certify that the project report entitled 'SOLAR MOBILE CHARGER' is an authentic work done by RESHMA S St. Teresa's College, Ernakulam, under my supervision at the Department of Physics St. Teresa's College for the partial requirement for the award of Degree of Bachelor of Science in Physics during the academic year 2022-2023. The work presented in this dissertation has not been submitted for any other degree in this or any other university

Ms Minu Pius
Assistant Professor
Supervising guide

Dr Priya Parvathy Ameena Jose
Assistant professor
Head of Department

PLACE: Ernakulam

DATE : 25/04/2023

ST. TERESA'S COLLEGE (AUTONOMOUS)

ERNAKULAM

BSC PHYSICS

PROJECT REPORT

KAVYA LEENUS

Register no. AB20PHY004

Year of work: 2022 – 2023

This is to certify that this project work entitled "SOLAR MOBILE CHARGER" is an authentic work done by RESHMA S.

Staff member in-charge

Head of the department

Smt. MINU PIUS

Assistant Professor

Dr. PRIYA PARVATHY AMEENA JOSE

Associate Professor

Submitted for the university examination held at St. Teresa's College, Ernakulam.

Date: 24/04/23

Examiners:

Department of Physics
St. Teresa's College (Autonomous)
Ernakulam

DECLARATION

RESHMA S final year B.Sc. Physics student, Department of Physics, St. Teresa's College, Ernakulam do hereby declare that the project work entitled 'SOLAR MOBILE CHARGER' has been originally carried out under the guidance and supervision of Ms MINU PIUS, Assistant Professor, St. Teresa's College (Autonomous), Ernakulam in partial fulfilment for the award of the degree of Bachelor of Physics. I further affirm that this project is not being presented in part or entirely for any other purpose and that the data provided in the project is accurate to the best of our knowledge.

Place : RESHMA S

Date :

ACKNOWLEDGEMENT

I would want to offer our heartfelt gratitude to everyone who assisted us in reaching this point of fulfilment. First and foremost, I thank the Lord Almighty for His abundant mercy throughout this project. I am grateful to Ms MINU PIUS, St. Teresa's College (Autonomous), for her invaluable direction and regular monitoring, as well as for supplying vital project information and assistance in finishing the project. I want to thank all of the teachers and non-teaching staff for their helpful advice and suggestions in completing the project. My gratitude and appreciation also go to everyone who has freely assisted us.

ABSTRACT

In this project, we attempted to build a solar mobile charger powered by a solar panel. Solar energy is employed in solar mobile chargers to generate the voltage required to charge the mobile battery. Because solar energy is one of the primary sources of renewable energy, an abundance of solar energy can be ensured everywhere. In this project, we measured the V-I characteristics of several solar panels of different voltage and current under various lighting conditions and assembled a solar mobile charger. The panel's performance is evaluated by comparing its charging time up to 1% on AC mains and under direct sunlight. The charging of mobile phones is explored for varied tilt angles and light intensities.

SOLAR MOBILE CHARGER

CONTENTS

INTRODUCTION

Today, the major challenge faced by our society is the energy crisis. The energy crisis refers to the concern that the world's demands on the limited natural resources used to power industrial society are vanishing as demand increases. Natural resources are in limited supply. In this developing world, the need for energy has been increasing dramatically, because of transportation, industrial sectors and infrastructure etc. To prevent the energy crisis unlike fossil fuels, some energy sources are towable and can be used, it does not emit greenhouse gasses. This clean and sustainable alternative energy, hydropower, wind energy, geothermal energy, biomass energy etc.

NON RENEWABLE ENERGY

Non-renewable energy cannot be economically extracted at a steady pace over realistic human time scales. They can be found underground. These materials come in set quantities, and finding them can be challenging. They are neither restored nor renewed, nor do they come back. They consist of the fossil resources we use to generate electricity (natural gas, coal, and oil). Non-renewable natural resources include minerals, which are used to produce metals. Natural resources that cannot be replenished within a human lifetime are known as non-renewable resources. I t millions of years for them to develop.

RENEWABLE ENERGY

Sustainable energy, also known as clean energy, is derived from renewable natural resources or processes. The wind has been used to propel ships across the oceans and power crop machines. solar energy makes up more than 12% of the nation's energy production, green energy is becoming a more significant source of power. The use of green energy is growing on both big and small stages, starting with rooftop solar cells in houses that can transfer electricity back to the system.

SOLAR ENERGY

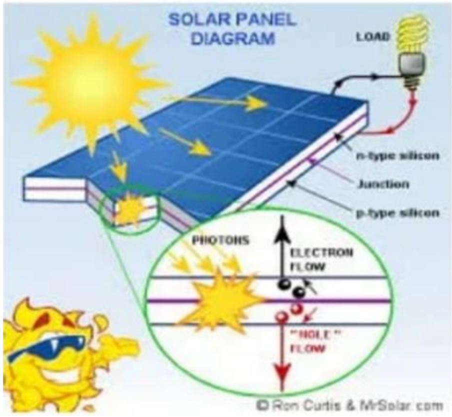
Solar energy is one of the renewable energies and is defined as the transformation of energy present in the sun. The majority of sunlight that enters the Earth’s atmosphere is in the form of visible light and infrared radiation. Photosynthesis is the process by which plants convert carbon dioxide into sugar and starches. This energy is converted into electricity using solar cell panels. The United States has some of the world's most plentiful and cleanest solar resource bases. Solar energy is the most numerous and clean renewable energy source currently accessible. Solar technology can capture this energy for a range of purposes, such as electricity generation, interior lighting, and water heating for residential, business, and industrial use.

The sun emits more energy into the atmosphere in one hour than the entire planet does in a year. Sunlight is converted into useful energy for buildings using several ways. Solar photovoltaics for electricity, passive solar architecture for space heating and cooling, and solar water heating are the most widely utilised solar technologies for residences and commercial buildings.

SOLAR CELL

A solar cell is a type of electrical device that uses the photovoltaic effect, a natural physical and chemical process, to transform light energy directly into electricity. A device whose electrical properties, such as current, voltage, or resistance, change when exposed to light is a type of photoelectric cell. The foundation of photovoltaic modules, sometimes referred to as solar panels, are solar cells.

WORKING OF SOLAR CELL



The solar cell works on the principle of the photovoltaic effect. Sunlight is composed of photons, or "packets" of energy. These photons contain various amounts of energy corresponding to the different wavelengths of light. When a photon is absorbed, the energy of the photon is transferred to an electron in an atom of the cell.

The same principle that produces electricity from a standard battery's chemical reaction also produces electricity from solar panels. The semiconductor property of silicon is essential to how solar panels function. The way electronic appliances function has been revolutionised by the special substance known as silicon. The solar panels on this property are used to produce electricity. We must comprehend how silicon functions at the atomic level to comprehend how solar panels function. A silicon atom is bonded to another silicon atom when silicon is in its purest state, or when all impurities have been eliminated. Since the silicon atom has an 8 valency, its outermost orbit contains 8 electrons. However, there are only 4 electrons bound in the outermost orbit in its natural state. As a result, these 4 electrons can form a bond with another 4 electrons that are surrounded by 4 silicon atoms. the four unpaired electrons that are free to move about the substance. These free electrons have a trend close to their parent atoms when there is no electric potential, which keeps their energy levels low. However, these free electrons receive energy and move in the direction of the applied potential difference, producing electric current, when the electric potential is applied across the substance. A flow of electric current from the positive plate to the negative plate is started using solar radiation from the sun as a trigger. The material is a photon. This photon scatters free electrons on the solar panel's negative plates when it strikes them. This electron, which is only loosely bound to its parent atom, is now free to move about the plate. However, the positively charged plate attracts this electron, which then becomes bound once more. Electricity is produced in the same way that more photons knock off electrons.

DIFFERENT TYPES OF SOLAR CELL

Monocrystalline solar cell

Single-crystalline silicon is used to make monocrystalline solar cells. Since the cells have a cylindrical shape and are frequently coloured, they have a very distinctive appearance. Manufacturers remove the four sides of the monocrystalline cells to keep costs low and performance at its peak. They get their recognisable appearance from this.

Polycrystalline solar cell

In 1981, the first polycrystalline solar panels were made available to the general public. Polycrystalline cells don't need to have all four sides cut, in contrast to monocrystalline ones. As an alternative, melted silicon is poured into square moulds. Thus, they create square cells that are precisely shaped.

Thin film solar cell

To create the module for thin film solar cells, several thin photovoltaic layers are stacked on top of one another. Thin film solar cells come in a number several varieties, and what sets them apart from one another is the substance employed for the PV layers. There are different types of thin-film solar cell

SOLAR PANEL

Solar cells are arranged in a solar panel. Together, a huge number of tiny solar cells can provide enough energy to be useful. A cell generates more power the more light it receives. Solar panels, which are commonly made up of arrays of photovoltaic cells, utilise direct solar energy from the sun to create power for our everyday needs. To control the variable energy produced by a light source, such as the sun or artificial lighting, they are nearly usually employed in conjunction with storage batteries. The surface area of the photovoltaic cell array, the orientation towards the source of light, the spectrum spectral of the light, as well as the time of day and latitude in the case of sunlight, all have a role in solar cell power.

COMPONENTS OF SOLAR PANEL

The six primary components are used to construct solar panels.

1**) PV cell solar**: Solar PV cells convert sunlight directly into direct current (DC) electricity. An extremely thin wafer, approximately 0.1mm thick, that is either positive p-type silicon or negative n-type silicon serves as the foundation of the photovoltaic cell. Half-cut or split cells, multi-busbar (MBB) cells, and more recently shingled cells employing thin, overlapping wafer strips are just a few of the many diverse cell sizes and configurations that are available and offer various degrees of efficiency and performance.

2**) Glass**: The PV cells are shielded by the front glass sheet from the elements, including hail and flying debris. The glass is normally high-strength tempered glass, which is 3.0 to 4.0mm thick and made to withstand significant temperature fluctuations as well as mechanical stresses.

3) **Aluminium frame**: To instal the solar panel in place and to protect the edge of the laminate part holding the cells, the aluminium frame performs a crucial function.

4) **EVA**: The name "EVA" refers to "ethylene vinyl acetate," a specifically created, very transparent polymer (plastic) layer that is used to enclose the cells and hold them in place during manufacturing. Extreme durability and resistance to high and low humidity and temperatures are requirements for the EVA material. The PV cells' two layers of lamination assist to cushion shocks and protect the cells' interconnecting wires from vibrations and the unexpected impact of hailstones and other things.

5) **Back sheet:** The back sheet, which serves as a moisture barrier and final exterior shell to give mechanical protection and electrical insulation, is the layer at the back of typical solar panels.

6) **Junction box and connector**: On the back side of the panel, there is a tiny weatherproof container called the junction box. The wires used to connect the panels must be fastened firmly.

ASSEMBLING

In advanced manufacturing facilities, solar panels are assembled using automated robotic equipment and sensors to precisely position the components. To prevent contamination during assembly, manufacturing plants must be extremely clean and controlled. The panels and cells are checked and inspected using advanced optical/imaging sensors throughout the manufacturing process to ensure that all components are correctly located and that the very delicate cell wafers are not damaged or cracked during the assembly process.

SOLAR DEVICES

Solar inverter

In modern manufacturing facilities, solar panels are constructed utilising automated robotic equipment and sensors to precisely place the components. Advanced optical/imaging sensors are used to monitor and examine the panels and cells throughout the production process to make sure all the parts are in the right places and that the delicate wafers used for the cells are not cracked or damaged during assembly. Depending on the manufacturer, the completed panel assembly is carefully examined using a variety of tests, such as electroluminescent or flash testing, to find any cell flaws that can cause failure after being exposed to sunlight and high temperatures for a protracted period.

Solar cooker

A solar cooker is a gadget that uses heat directly extracted from the sun to prepare meals. Due to the rapidly rising costs of traditional fuels, a growing number of people are now cooking their meals in sun cookers. Additionally, food prepared in a solar oven rarely burns and retains all of its nutrition.

Solar water heater

Solar water heaters are solar-powered devices that heat water for domestic or commercial use. Every year, a conventional solar water heater can save up to 1000 units of electricity. These rooftop heaters absorb solar energy, heat water, and then store the heated water in large enclosed tanks.

MOBILE CHARGER

There are several situations when you may run out of battery while on the road, even if you have a high-end smartphone with a sizable battery inside. Numerous other mobile and smart gadgets may also need to be charged while you are away from home.

You may get a variety of portable power solutions for charging your smartphone and other mobile devices for the same purpose. And among all of these solutions, solar chargers and power banks stand out as the most practical choices.

Normal mobile charger

A switched-mode power supply, often known as a mobile battery charger, is a type of power source. It provides the battery with the energy necessary to charge it by giving it a Constant Voltage and a Constant Current. A portable charger known as a mobile charger enables customers to recharge their electronic gadgets.

Solar mobile charger

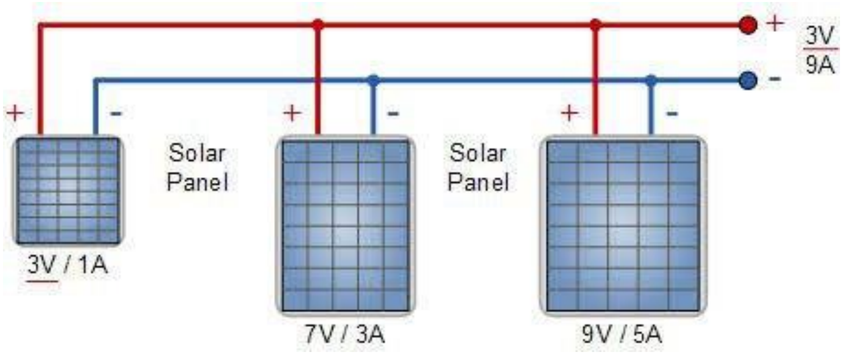
A portable solar mobile charger for mobile phones can be charged with sunlight and electrical power. It stores power from the sun and charges mobile phones, iPods etc. It makes use of the sun as a clean, renewable source of energy. A convenient backup energy source in case electricity is unavailable

SOLAR PANELS CONNECTED IN PARALLEL

Understanding how parallel-linked solar panels can offer increased current production is vital because one of the primary operating aspects of a solar PV panel is its current-voltage (I-V) characteristics. A solar panel's (or cell's) current production is highly dependent on its surface area, efficiency, and the amount of irradiance (sunlight) falling onto its surface.

Photovoltaic solar panels are semiconductor devices that convert solar energy into direct current electricity. Connecting PV panels in parallel increases current and thus power output, because electrical power in watts equals power output.

The positive terminals of all the panels are connected in this configuration, and the negative terminals are also connected. The end result is a solar panel system that has a higher amperage rating (the total of the individual amperages in the parallel array) but a constant total voltage. So, for example, by wiring four solar panels in parallel, each rated at 3V,7V,9V and 1A,3A,5A respectively . The system's overall voltage stays at 3V (its the least voltage) and its output current is increased to 9A, as illustrated below.



AIM OF THIS PROJECT

In this project, we will acquire the characteristics of a polycrystalline solar panel, under various illumination conditions (sunlight, mercury lamp) and assemble a solar-powered mobile charger using that solar, and determine the time taken for charging 1% and compare it with a parallelly connected solar panel.

CHAPTER 2

VI CHARACTERISTICS

V-I CHARACTERISTICS OF SOLAR CELL

A specific photovoltaic (PV) cell, module, or array's current and voltage (I-V) traits are displayed in the solar cell I-V characteristic curves. It provides a thorough explanation of its capacity and effectiveness for converting solar energy. The output performance and solar efficacy of a solar cell or panel are greatly influenced by its electrical I-V properties, particularly its Pmax. The maximum electrical output that a solar cell is capable of producing under normal test conditions. Maximum power will be present at the turning point of the characteristic curve if we plot the v-i characteristics of a solar cell. It is demonstrated in Pmax's analysis of the V-I properties of solar cells and also we determine,

I_{sc} = short circuited current

V_{oc} = open circuit voltage

I_m = maximum current

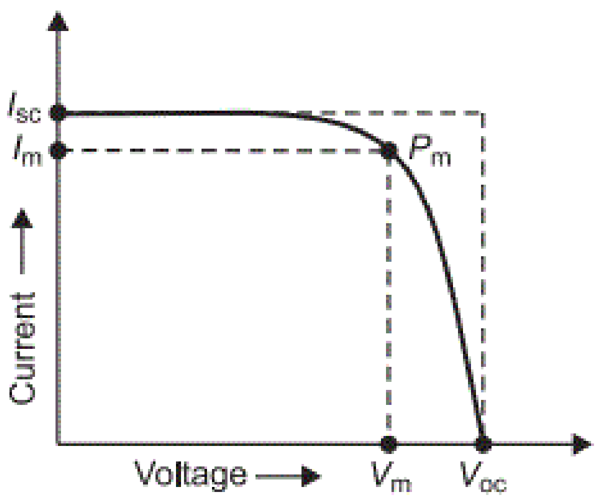
V_m = maximum voltage

In order to find the efficiency of solar panrl we need to find fill factor

Fill factor :- It is the ratio of maximum possible power to the actual power output

$$\text{Fill factor} = \frac{Imax \times Vmax}{Voc \times Isc}$$

$$\text{Efficiency} = \frac{Imax \times Vmax}{L(m) \times B(m) \times 10}$$

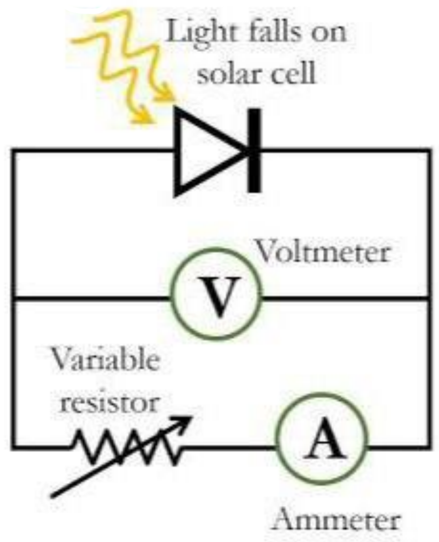


AIM:- Using V-I characteristics, determine which solar has the highest current output from a 6v solar panel, a 9v solar panel, and two panels connected in parallel and also determine their fill factor and efficiency.

APPARATUS:-

- Polycrystalline solar
- Voltmeter:- A voltage metre, also referred to as a voltage metre, is a device that gauges the voltage or potential difference existing between two points in an electrical or electronic circuit.
- Ammeter:- A tool called an ammeter is used to measure either direct current or alternating current.
- Resistance box:- instrument for measuring and comparing electrical resistances.

CIRCUIT DIAGRAM



PROCEDURE

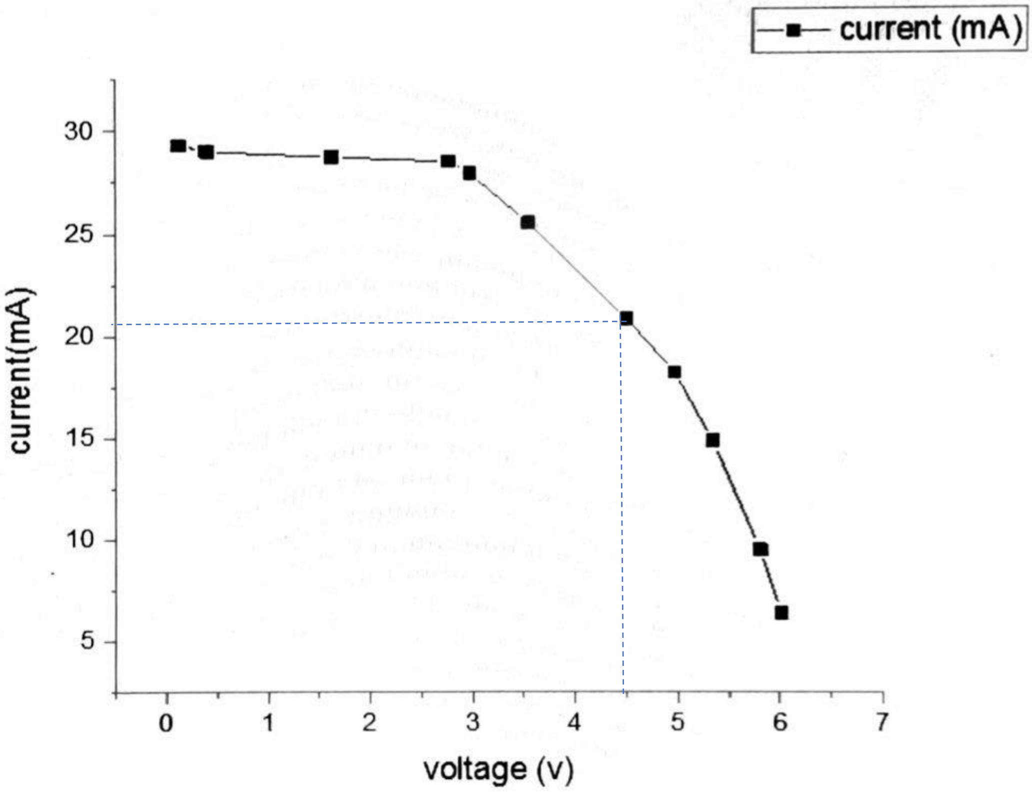
The diagram above shows how connections are made. The solar cell is biased forward in its connection. The positive and negative poles of the cell are connected to the positive and negative terminals of the voltmeter and ammeter, respectively. The voltmeter is connected across a load resistance. By changing the resistance values, the experiment is conducted. Readings are taken from the ammeter and the voltmeter for each step. The cell is kept in the position of maximum intensity. Voltage and current are plotted along the X- and Y-axes of a graph. The graph is used to calculate the parameters for the V-I characteristics.

OBSERVATION

Characteristics of 6V solar panel (sunlight)

Load resistance (Ω)	**Voltage (V)**	**Current (mA)**	Power P= V×I
10	0.12	29.32	3.518
50	0.39	29.02	11.317
100	1.61	28.73	46.25
200	2.75	28.51	78.40
300	2.95	27.94	81.58
400	3.52	25.52	89.83
500	**4.48**	**20.81**	**90.98**
600	4.95	18.19	90.04
700	5.33	14.81	78.93
800	5.80	9.49	55.38
900	6.01	6.37	38.28
1000	6.01	5.08	30.10

GRAPH



CALCULATION

Maximum current, I_{max} = 20.81 mA

Maximum voltage, V_{max} = 4.48 V

Ideal power P_{max}, = I_{max} x V_{max} = 20.81×4.48 = 90.98 mW

Open circuit voltage V_{oc} =6.01V

Short circuit current I_{sc} = 29.32mA

Maximum useful power = $V_{oc} \times I_{sc} = 29.32 \times 6.01 = 176.213$mW

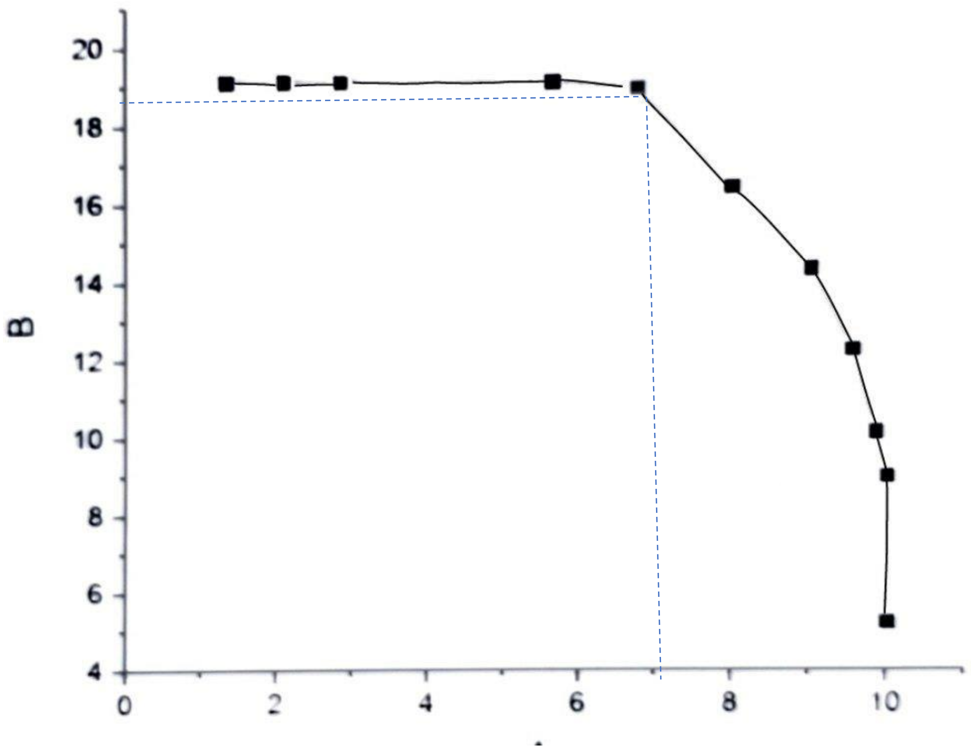
Fill factor = $\frac{I_{max} \times V_{max}}{V_{oc} \times I_{sc}} = \frac{90.98}{176.213} = 0.516$

Efficiency = $\frac{I_{max} \times V_{max}}{L(m) \times B(m) \times 10} = \frac{90.98 \times 100}{0.17 \times 0.85 \times 1000} = 0.63\%$

Characteristics of 11V solar panel (sunlight)

Load resistance (Ω)	Voltage (V)	Current (mA)	Power P= V×I
10	1.33	19.13	25.44
50	2.08	19.13	39.79
100	2.83	19.12	54.19
200	5.61	19.05	110.06
300	**6.72**	**18.86**	**133.45**
400	7.97	16.34	130.22
500	9	14.22	127.98
600	9.54	12.18	115.83
700	9.86	10.06	99.19
800	10.00	8.94	99.4
900	10.01	5.23	52.3

GRAPH



CALCULATION

Maximum current, I_{max} = 19.86 mA

Maximum voltage, V_{max} = 6.72 V

Ideal power P_{max}, = I_{max} x V_{max} = 6.72x19.86 = 133.45 mW

Open circuit voltage V_{oc} =10.01V

Short circuit current I_{sc} = 19.13mA

Maximum useful power = $V_{oc} \times I_{sc} =$ 19.13 × 10.01 = 191.49mW

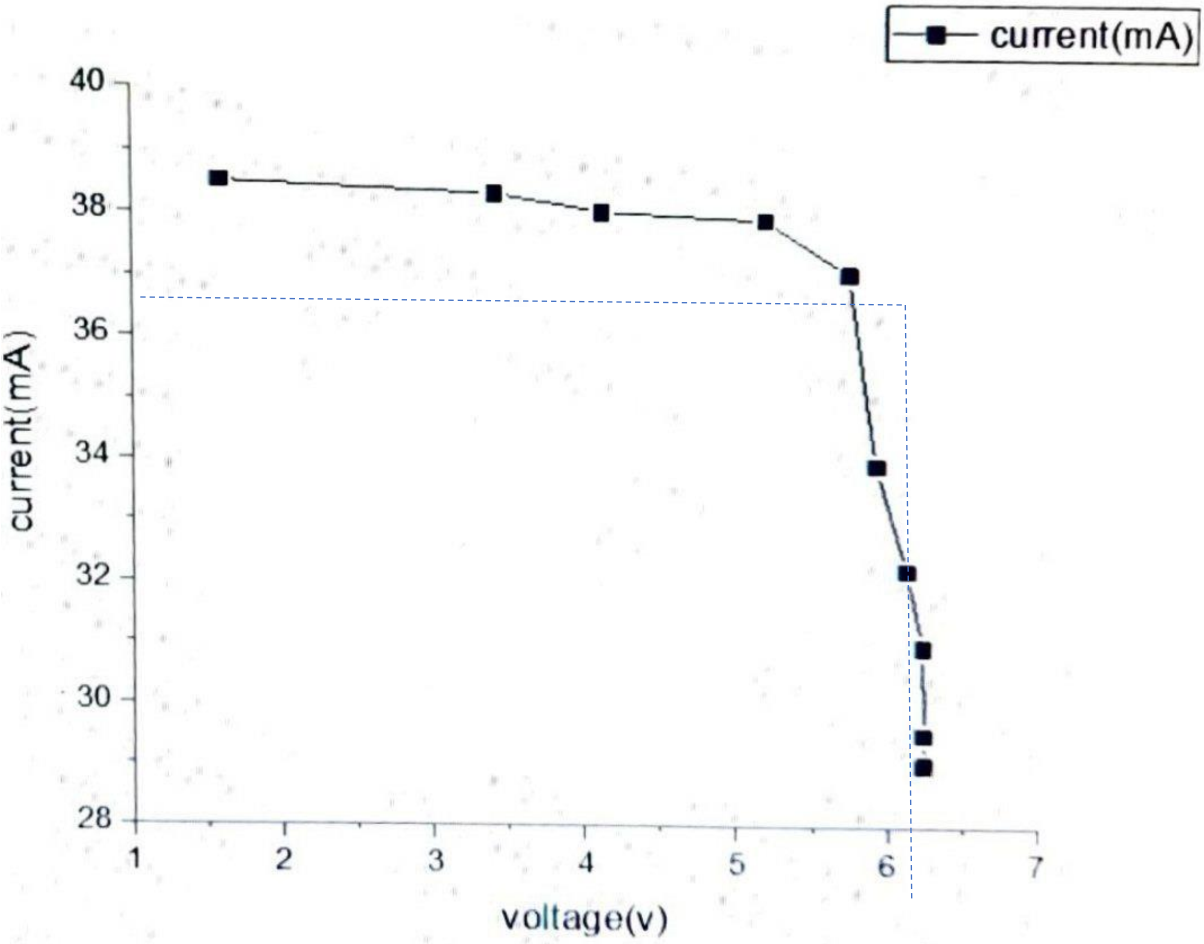
$$\text{Fill factor} = \frac{I_{max} \times V_{max}}{V_{oc} \times I_{sc}} = \frac{133.45}{191.49} = 0.696$$

$$\text{Efficiency} = \frac{I_{max} \times V_{max}}{L(m) \times B(m) \times 10} = \frac{133.45 \times 100}{0.26 \times 0.13 \times 1000} = 0.56\%$$

Characteristics of 11V and 6V solar panels connected in parallel

Load resistance (Ω)	Voltage (V)	Current (mA)	Power P= V×I
10	0.58	38.51	60.84
50	3.39	38.32	129.90
100	4.10	38.03	157.11
200	5.17	37.89	195.89
300	**5.72**	**37.03**	**211.81**
400	5.91	33.93	200.52
500	6.12	32.21	197.12
600	6.23	30.95	192.81
700	6.24	29.52	184.39
800	6.24	29.02	181.52

GRAPH



CALCULATION

Maximum current, I_{max} = 37.03mA

Maximum voltage, V_{max} = 5.72V

Ideal power P_{max}, = I_{max} x V_{max} = 37.03×5.72= 211.81mW

Open circuit voltage V_{oc} =6.24V

Short circuit current I_{sc} = 38.51mA

Maximum useful power = $V_{oc} \times I_{sc}$ = 6.24 × 38.51 = 240.30mW

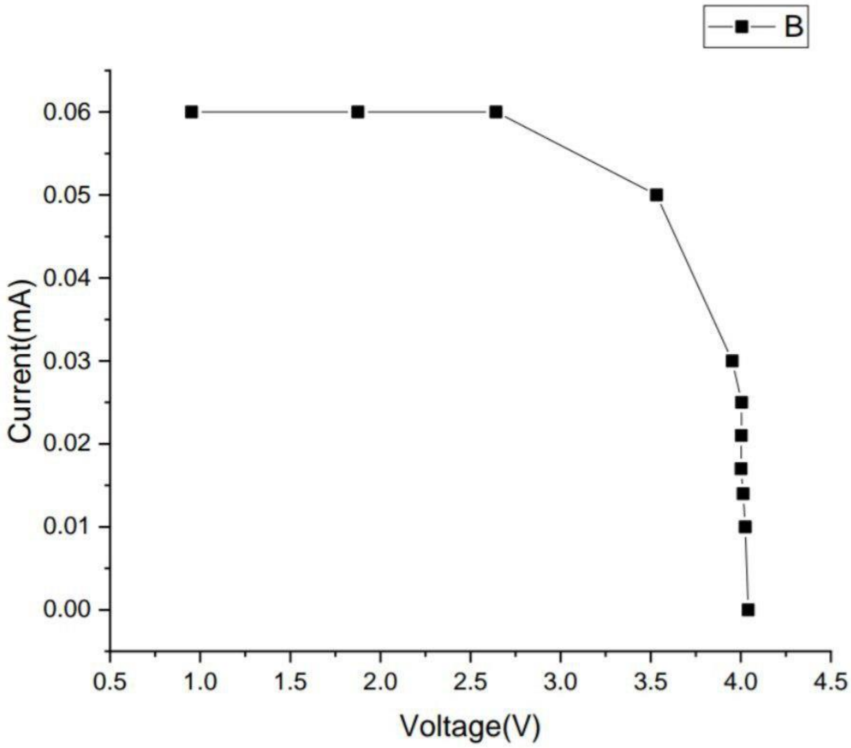
Fill factor = $\frac{I_{max} \times V_{max}}{V_{oc} \times I_{sc}} = \frac{211.81}{240.30} = 0.881$

Efficiency = Efficiency = $\frac{I_{max} \times V_{max}}{L(m) \times B(m) \times 10} = \frac{211.81 \times 100}{0.174 \times 1000}$ =0.12%

Characteristics of 6V solar panel (mercury lamp)

Load resistance (Ω)	Voltage (v)	Current (mA)
100	0.952	0.060
200	1.875	0.060
300	2.641	0.060
400	3.532	0.050
500	3.953	0.030
600	4.005	0.025
700	4.003	0.021
800	4.001	0.017
900	4.013	0.014
1000	4.025	0.010
1100	4.041	0.000

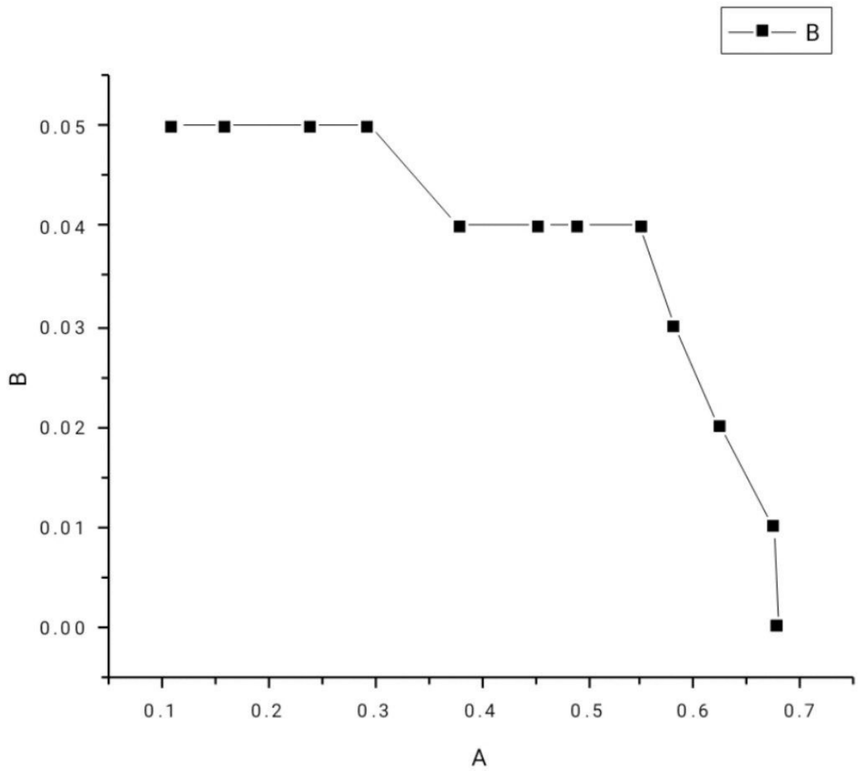
GRAPH



UNDER ILLUMINATION OF A MERCURY LAMP

Load resistance (Ω)	Voltage (v)	Current (mA)
20	0.109	0.05
50	0.159	0.05
100	0.239	0.05
200	0.294	0.05
300	0.379	0.04
400	0.455	0.04
500	0.491	0.04
600	0.55	0.04
700	0.580	0.03
800	0.623	0.02
900	0.675	0.01
1000	0.678	0.00
1100	0.679	0.00

GRAPH



CONCLUSION

Based on these findings, we concluded that the PARALLEL CONNECTION of 6V AND 11V Solar panels have the highest output current. These solar panels are then used for subsequent processes.

CHAPTER 3

CONSTRUCTION OF SOLAR MOBILE CHARGER

SOLAR MOBILE CHARGER

COMPONENTS

Polycrystalline solar panel

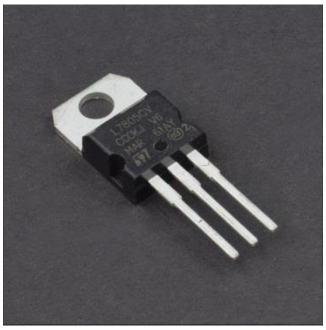
Polycrystalline solar panels have PV cells that are blue in colour and have straight edges. They are less efficient than monocrystalline cells, requiring more panels to achieve the same power output. Polycrystalline panels, on the other hand, are less expensive because their manufacturing process is simpler. Polycrystalline panels are extremely durable, but their lifespan is slightly shorter than that of monocrystalline panels. They are also more susceptible to high temperatures, which reduces their productivity on hot days.

Capacitor (100µf)

The 100µF cap (the bulk capacitor) is primarily to support the supply during temporary battery disconnection during physical shock.

IC7804

7804 IC use can also be seen in fixed output regulators and adjustable output regulators. voltage regulators are current regulators, dual-regulated power supplies, phone charger build-up circuits, UPS power supply circuits, etc



USB module

A Universal Serial Bus (USB) is a common interface that allows devices to communicate with a host controller, such as a personal computer (PC) or smartphone. It interfaces with peripheral devices like digital cameras, mice, keyboards, printers, scanners, media players, external hard drives, and flash drives. Because of its wide range of applications, including support for electrical power, the USB has largely replaced interfaces such as parallel and serial ports.

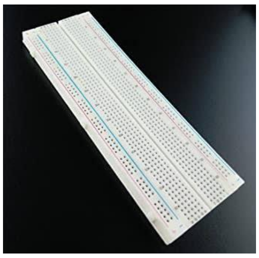
Soldering device

A hand tool used in soldering is a soldering iron. It is an insulated body with a tip that melts solder at a high temperature and is used to join various kinds of metals. It is created by fusing metal, also referred to as solder, into the gap between two metal parts.

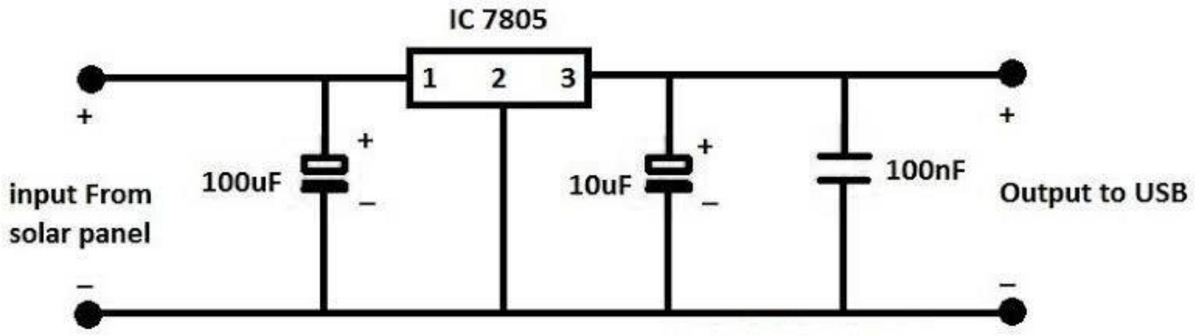
Multimeter

A volt/ohm metre, also referred to as a multimeter or multitester, is an electronic measuring device that combines multiple measurement functions into a single unit. A typical multimeter might have the capability to measure voltage, current, and resistance, among other things.

Breadboard



CIRCUIT DIAGRAM

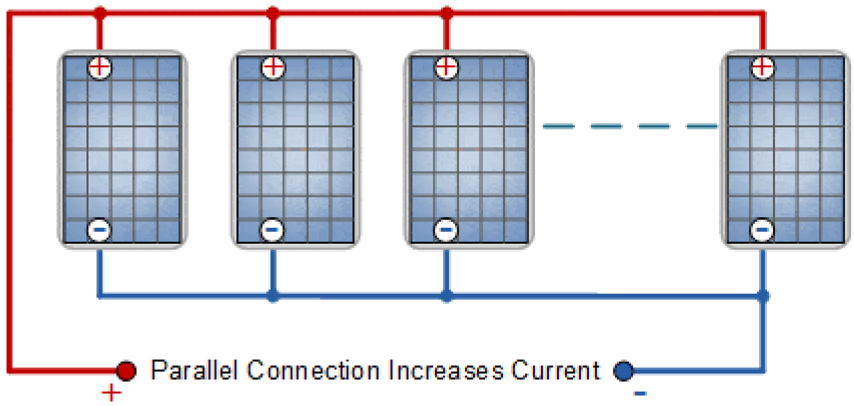


CONSTRUCTION

The positive terminal of a 100 µF capacitor is connected to the input terminal of the IC7805. The output voltage will be regulated at 5V by the IC7805. The positive terminal of the other capacitor, a 100 F capacitor, is connected to the output terminal of the IC7805. Here, the capacitor is employed to reduce the small voltage spikes that may occur inside the phone. When the voltage fluctuates up and down, it aids in maintaining a constant voltage. The capacitor assists in giving the mobile phone a temporary boost in power when it is almost ready to discharge. These capacitors' negative terminals are grounded. The solar panel is used to provide the input voltage. The solar panel's positive and negative terminals are connected across the corresponding terminals of the 100-F capacitor. The USB port receives the output. The mobile phone is connected to this USB port. After connections have been made, the solar panel may now receive sunlight. This is then transformed into electrical energy, the voltage associated with it is controlled with capacitors and voltage regulators, and it is used to charge the mobile device.

PARALLEL CONNECTION

When PV panels are electrically wired in parallel, the positive (+) terminals of all the panels are connected (positive to positive), and the negative (-) terminals of all the panels are connected (negative to negative) until all the panels are wired in parallel and you are left with one single positive and one single negative terminal to connect to your regulator and batteries. It should be noted that PV panel series strings can also be connected in parallel (multi-strings) to improve current and therefore power production.



CHAPTER 4

EXPERIMENTATION AND RESULT

Using the designed solar mobile charger several experiments are performed by exposing the solar panel to sunlight and using a mercury lamp to understand how the brightness of the light affects the amount of time it takes to charge the phone. In each scenario, the amount of time needed to charge the phone by 1% is recorded.

DETERMINATION OF INTENSITY OF LIGHT

A lux metre is used to measure the intensity of sunlight and a mercury lamp.

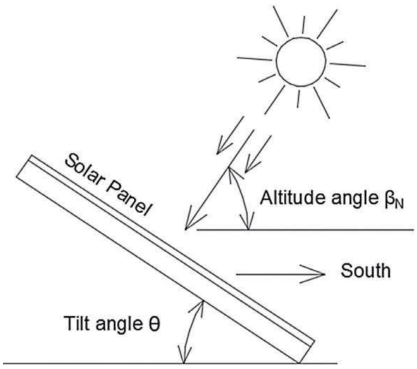
RESULT

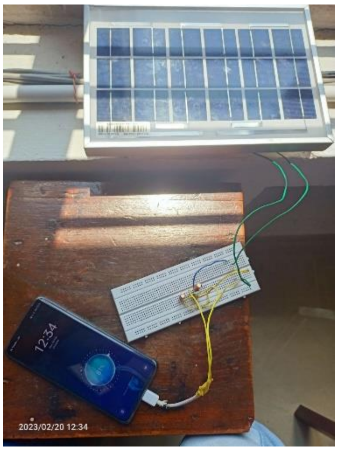
The intensity of light from the sun – 3245 lux

The intensity of light from the mercury lamp – 1618 lux

DETERMINATION OF TILT ANGLE FOR MAXIMUM EFFICIENCY USING A LIGHT SOURCE SUNLIGHT

First, the solar mobile charger is placed in direct sunlight. Initially, the solar panel is positioned at 0˚ from the ground, and the phone is allowed to charge. The time it takes to charge 1% is noted. The experiment is then repeated, increasing the angle from the ground in each step, and the time taken to charge 1% is recorded. And also tilt angle is obtained using a software





OBSERVATION:-

The vertical distance from the ground (cm)	The angle between a ground and solar panel (degree)	Time is taken for charging 1 %
0	0˚	5min 48 sec
4	8˚	5min 36sec
8	17˚	5 min 8 sec
10.4	23˚	4 min 11sec
16.5	39˚	4 min 65 sec
24.6	71˚	6 min 30 sec

$\theta = \sin^{-1} h/l$

h = 8 cm

l = 26 cm

$\theta = \sin^{-1} 8/26 = 17^\circ$

h = 10.4 cm

l = 26 cm

$\theta = \sin^{-1} 10.4/26 = 23^\circ$

h = 16.5 cm

l = 26 cm

$\theta = \sin^{-1} 16.5/26 = 39^{\circ}$

h = 24.6 cm

l = 26 cm

$\theta = \sin^{-1} 24.6/26 = 71^{\circ}$

RESULT

This experiment shows that 4 min 11 sec is the shortest time required to charge to 1% and that it is at a 21-degree angle.

The tilt angle for maximum efficiency is a 21degree angle

DETERMINATION OF CHARGING AND DISCHARGING TIME FROM VARIOUS POWER SOURCES

PROCEDURE:-The mobile phone is charged using an AC power source, an 11 V and 6 V solar panel, and an 11V and 6 V solar panel connected in parallel. And the time taken for charging of 1% and 100% is tabulated.

OBSERVATION:-

Source	**Time is taken for charging 1%**	**Time is taken for charging 100%**
AC main 240 V	58 seconds	1 hour 33 minutes
6 V solar panel	31 minutes 5 seconds	52 hours

11V solar panel	4 minute 11 seconds	6 hours
11 Vand 6 V panel connected in parallel	3 minutes 45 seconds	5 hours

RESULT:

From these observations, we understood that the connected in parallel 11 v and 6v solar panels have taken a minimum charging time of 1%, it’s about 3 minutes and 45 seconds.

CHAPTER – 5

COMPARISON

EXPENDITURE

COMPONENTS		EXPENDITURE
1. Solar panel	-	500 ₹
2. Capacitor (100µ) X 2	-	15 ₹
3. IC7480	-	38 ₹
4. Connection wire	-	10 ₹
5. Breadboard	-	45 ₹
TOTAL AMOUNT	-	623 ₹

MARKET PRICE OF SOLAR MOBILE CHARGER

We can see that the market pricing for solar mobile chargers is pretty high when we compare it to the cost of a self-made solar charger.

ADVANTAGES

- It makes use of the sun as a clean, sustainable source of electricity.
- There are fewer maintenance tasks.

  , Unlike non-rechargeable batteries, these are reasonably priced.
- It is secure and efficient.
- It is useful for users in rural areas
- Low input voltage is used to generate high voltage output.
- Reduces pollution in the environment

DISADVANTAGES

- We are unable to charge at night.

- Charging a gadget with a solar charger is typically slower than charging through a standard outlet.
- Small chargers have a very limited power output capacity.
- The silicon layer utilised by chargers is typically quite thin and prone to damage.

CONCLUSION

In this project, we built a solar mobile charger out of a 6V solar panel, an IC7804, and 100uf capacitors. First, we measured the V-I characteristics of a 6 v solar panel and a 5 v solar panel linked in parallel under various illumination conditions and also we found out the vi characteristics separately. The optimal tilt angle for best efficiency was discovered to be 3 degrees. VI Characteristics are measured and recorded in a tabular column under two conditions: exposure to sunlight and exposure to a mercury lamp. In bright sunlight, faster charging was noticed. It takes 4 minutes 11 seconds to charge a mobile phone by 1% using a 6 v solar panel. From the series of experiments conducted to obtain vi characteristics of various solar panels of different voltages, we find out that the parallel connected 5v and 6v solar panels has the maximum output current. Using that parallel-arranged solar panel, a solar mobile charger is constructed and the charging time is successfully reduced by 2 minutes and 6 seconds. The solar should be kept at a tilt angle for faster charging, and best results, we chose a bright sunny day for this project Through this project, We were able to create our own effective solar mobile charger at a reasonable cost as the market available solar panels are expensive. and also this will help to reduce our electricity costs.

REFERENCE

Handbook of solar energy- *G.N Tiwari, Arvind Tiwari, Shyam*

Solar photovoltaics(third edition)- *Chetan Singh Solanki*

www.slideshare.in

www.alternativeenergy.com