

# Installation of Solar System with Calculations

Python for Data Sciences  
(Course Project Final Year)



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# Top Roof View

Department of Mathematics



University of Karachi



## Load Calculations:

*Load: DC Bulbs x Hours of Usage*

$$\Rightarrow 15 \times 5 = 75 \text{ (equivalent) } 80 \text{ watts}$$

## Battery Sizing and Selection:

*Battery = Load x Hours of Usage x Line Losses (AC/DC)*  
*Depth of Discharge x Battery Voltage*

$$= \frac{80 \times 6 \times 1.15}{0.5 \times 12}$$

$$= 92 \text{ Ampere-Hour (Ah)}$$

**100 Ah (Battery Available in Market)  
Model TX-1000 Selected PHOENIX**

## Panel Size and Selection:

*PV watts = Load x Hours of Usage x Panel Losses (30% factor)*  
*Sunny Day of Karachi (4-5 Hours)*

$$= \frac{80 \times 6 \times 1.3}{4.5 \text{ (hours)}}$$

$$= 138.66 \text{ watt}$$

We bought **165 watts panels** for our project

*JASCO High Quality panels with 5 Years Warranty*



# Equipment List with Pictures



# Leveller

## Product Details:

For checking Level

Model Number # GWP-88A

Manufacturer Great Wall

**Length: 30 cm, (11.6 inch)**

**Width: 4.5 cm**

**Price: 250 Rs/-**

**Purpose: Stand leveling**



# LED Bulb

## Product Details:

DC Electric Bulb

Model Number # IB-32

Manufacturer Imran Brothers Qazi Center  
Hall Road Lahore Pakistan

**Wattage: 12 Watt**

**Price: 150 Rs/-**

**Purpose: Outdoor lighting**

**Quantity Purchased: 1**



# Solar Plates

## Product Details:

Jasco Solar Systems Panel

Model Number # **J165M/36/ZP**

Manufacturer Jasco Solar Systems

Type: Monocrystalline

**Wattage: 165 Watt**

**Price: 8900 Rs/- Delivery Cost: 400 Rs/-**

**A Grade Quality Solar Panel**

**Quantity Purchased: 1**



# Before Fitting



## Product Details:

L2 Stand

Material: MS

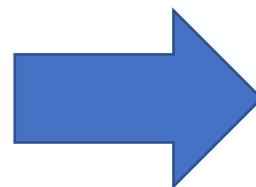
Manufacturer Local Vendor

Price: 2400 Rs/-

Single Panel Solar Panel

Quantity Purchased: 1

# After Fitting



# **Stand for Fitting Solar Power Plant**



# High Quality LED Bulb

## Product Details:

DC Electric Bulb & Holder

Model: IB # 44

Life Time 5000+ hours

Manufacturer Imran Brothers Qazi Center

Dimensions: 3.75" Length , 2.125" width

Hall Road Lahore Pakistan

**Wattage: 12 Watt**

**Price Per Unit: 170 Rs/-**

**Total Price: 1500 (Holder Included)**

**Quantity Purchased: 5 (Bulbs and Holders)**

**Purpose: Outdoor lighting**



# DC Wires Single Core Flexible

## Double Insulation (149 Rupees/meters)

### Product Details:

DC Wires for Solar Connections

Shop Name: Burq Cables

Address: Aram Baagh, Saddar

*Length: 90 meters + 20 meters = 110 meters*

**Diameter: 4mm single core**

**Price: 13050 + 2000 + 1000 (more used)**

**Quantity of Purchased Coil: 1 and some piece**

**Purpose: Solar Load Connections**



# DC Tubular Battery

## (110 Ampere-Hour) AH

### Product Details:

DC Tubular Battery

Brand: Phoenix Battery Model: TX 1000

**Dimensions in (mm):**

L=370,W=175 & H=315

Voltage: 12 volts

**Battery Sizing: 110 AH**

**Price: 16000 Rs/-**

**Quantity Purchased: 1**

**Purpose: Solar Energy Storage  
(Using with 50% of DoD)**



# TDS meter

## Total Dissolved Solids Meter for Water Quality Check

Product Details:

TDS meter Portable

Model: WT01

**Dimensions in (mm):**

**(6.1 X 1.25 X 1 Inches)**

Maximum Scale: 1999

**Battery : 2 X 1.5V Button Cell Batteries**

**Price: 800 Rs/-**

**Quantity Purchased: 1**

**Purpose: Solar Battery Water Testing**



# Charge Controller for Battery and Panels

For maintaining the health quality while charging & discharging

Product Details:

Charge Controller Local  
Model: Chinese Supplier

Current rating: 30 A

Solar Charge Controller 24V 12V

PWM Solar Panel Battery  
Intelligent Regulator Controller with USB Port  
and LCD Display

Price: 2300 Rs/-

Quantity Purchased: 1

Purpose: Charging Battery with Adequate Health



# DC Battery Clips/Lugs with Heat Shrink

For connecting wires with DC battery

Product Details:

Battery Clips DC

**Local Distributor**

**Battery : For all 6-12 Volts DC Batteries**

**Price: 100 Rs/-**

**Quantity Purchased: 1 set**

**Purpose: Solar Battery and DC wire connection**



# MC-4 Connectors Clips and Breaker

For connecting wires with DC Panels

Product Details:

MC-4 Connectors and Breaker Switch

For Panels and DC wire connections

Price: 140 Rs/-

Quantity Purchased: 1 set

Purpose: Solar Battery and DC wire connection



# Button and Switch Box

Product Details:

Single Button and Wooden Box

**For Switching the system On and OFF**

**Price: 120 Rs/-**

**Quantity Purchased: 1 set**

**Purpose: Switching load ON and OFF**



# Plastic Pipes for Wiring and Clips, Nails, Joints

## Product Details:

Plastic Pipes for Wiring

Pipe Holding Clips

Nails and Cut Screws

**For Proper and Safe Wiring Process**

**Price: 1500 Rs/-**

**Quantity Purchased: According to 150 feet length**

**Purpose: Safety from Atmospheric conditions**



# Steel Wires, Wire Tapes, Bolts and Cement, Sand

## Product Details:

Steel wires for Pipe Holding



Ball Tapes for Connections

Cement for Panel Ground Fitting



## For Wiring and Installation Process

Price: 500 Rs/-

Quantity Purchased: According to Requirements

Purpose: Safety and Secure Transmissions



# Battery Water with 5-6 ppm TDS

## Product Details:

AGS Battery Water

Water For Batteries

**Liters: 2**

**Price: 140 Rs/-**

**Quantity Purchased: Two Bottles**

**Purpose: Long life for Batteries**

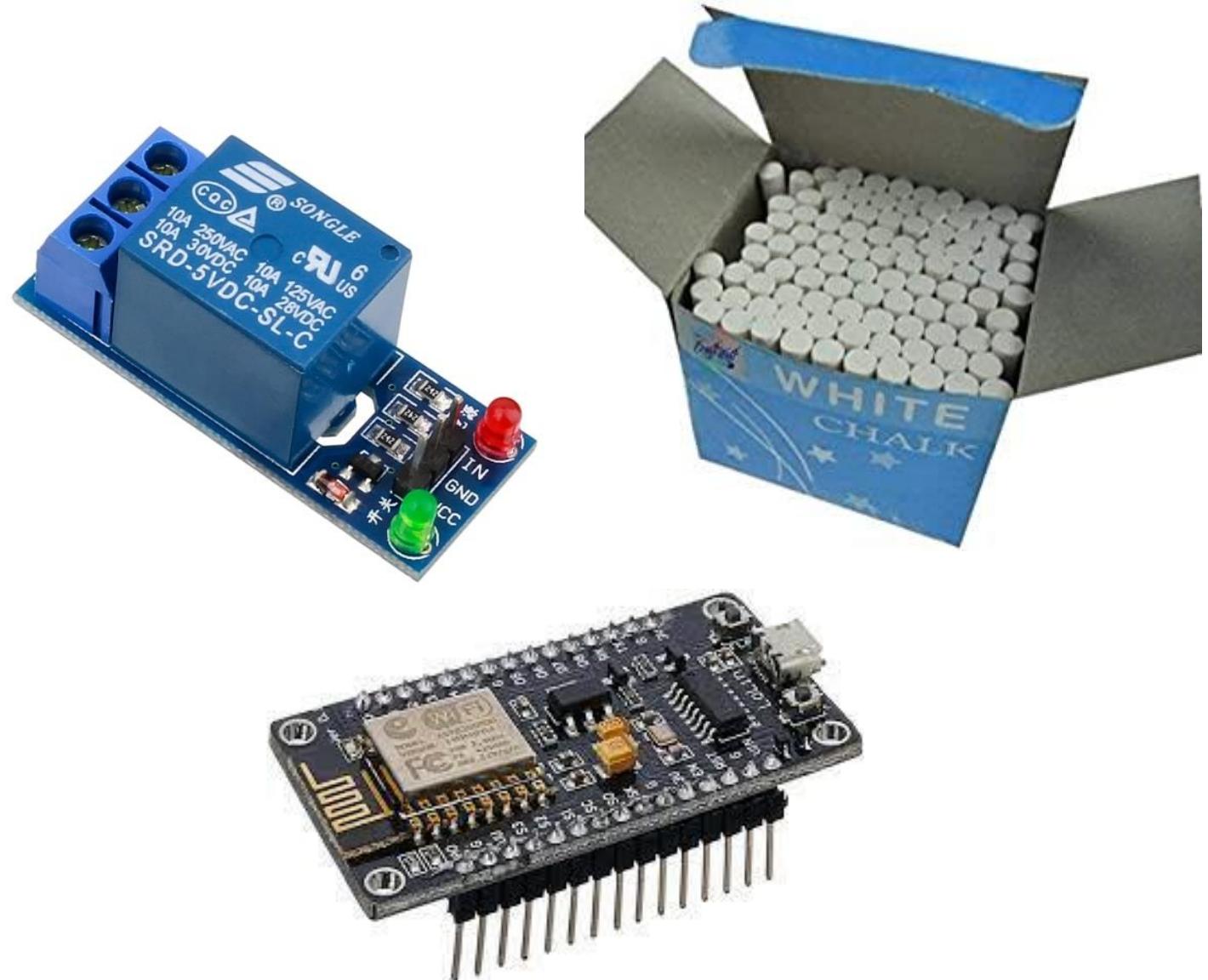


# Chalks, Breaker, Relay and NodeMCU

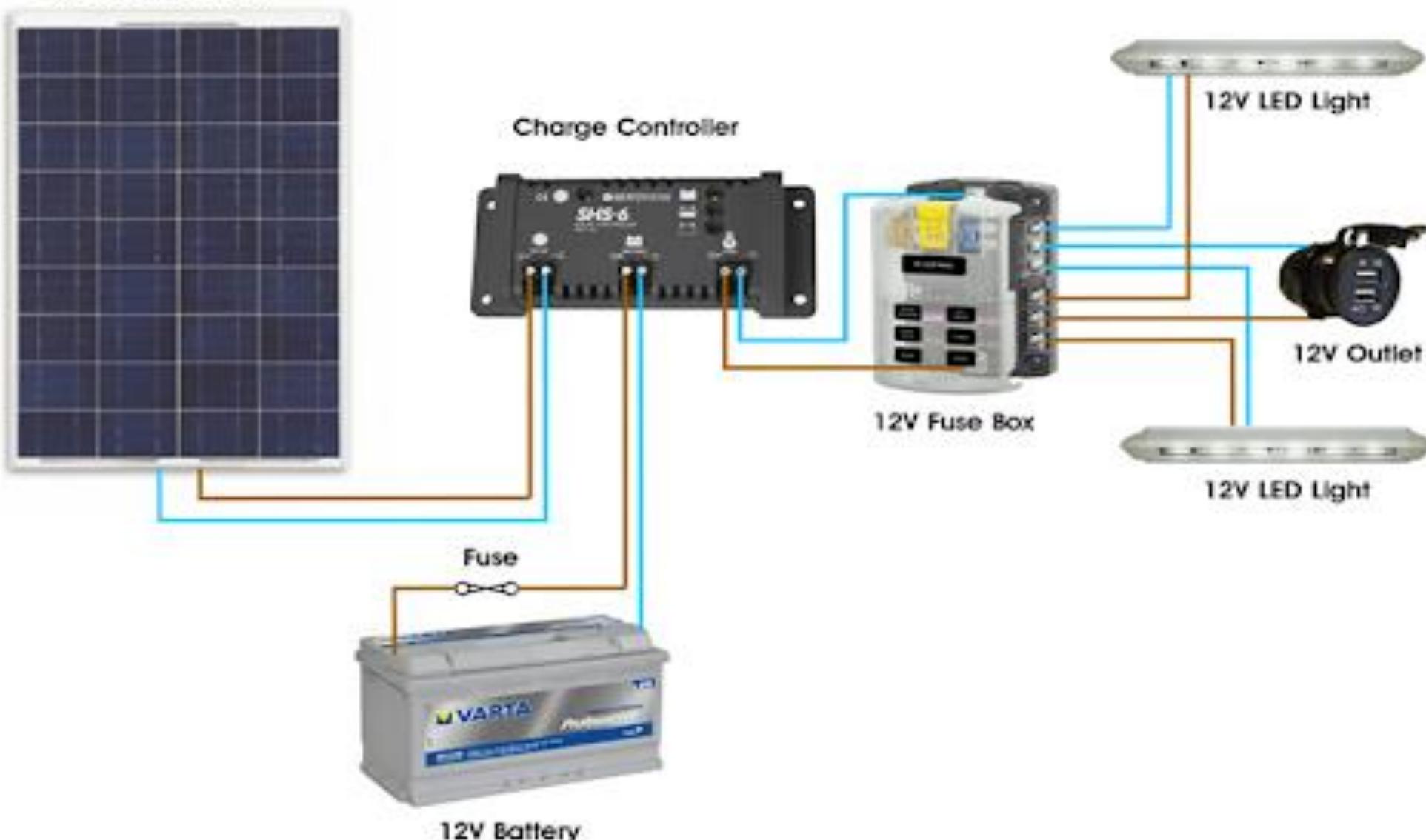
## Product Details:

1 Chalk Box  
Single Channel Relay Module  
Node MCU

**Price:** 600 Rs/-  
**Quantity Purchased:** 1 each  
**Purpose:** Marking and Electrical Safety



# Final Diagram



# Another Diagram Example



## DC wires Shop Araam Baagh Karachi



## Battery Shop Maskan Chowrangi



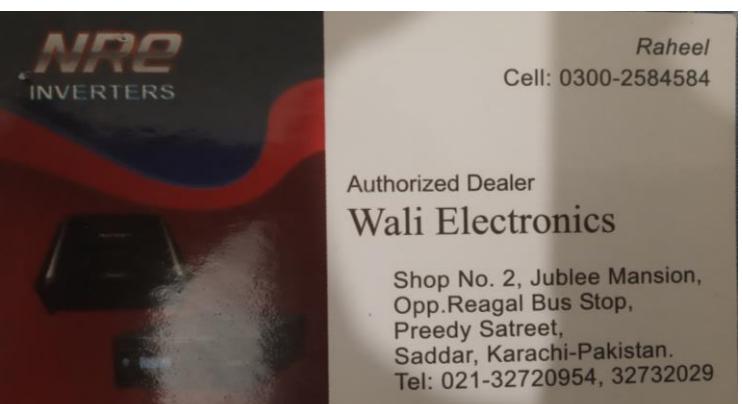
## Battery Sales Shop Safoora Chowk



## Bulbs Gulistan-e-Johar



## Battery and Charge Controller Regal



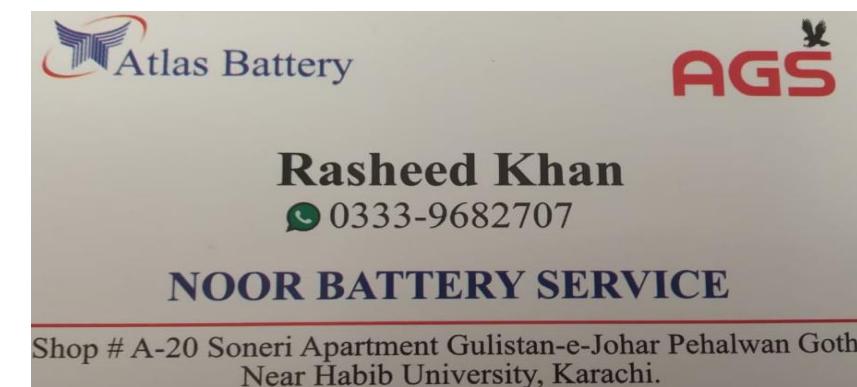
## Solar Panel Shop Gulistan-e-Johar



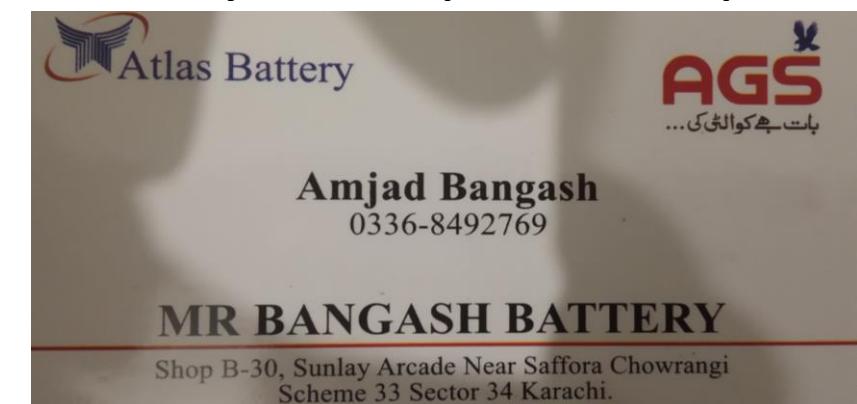
## Battery Bulbs National Highway



## Battery Sales Shop Gulistan-e-Johar

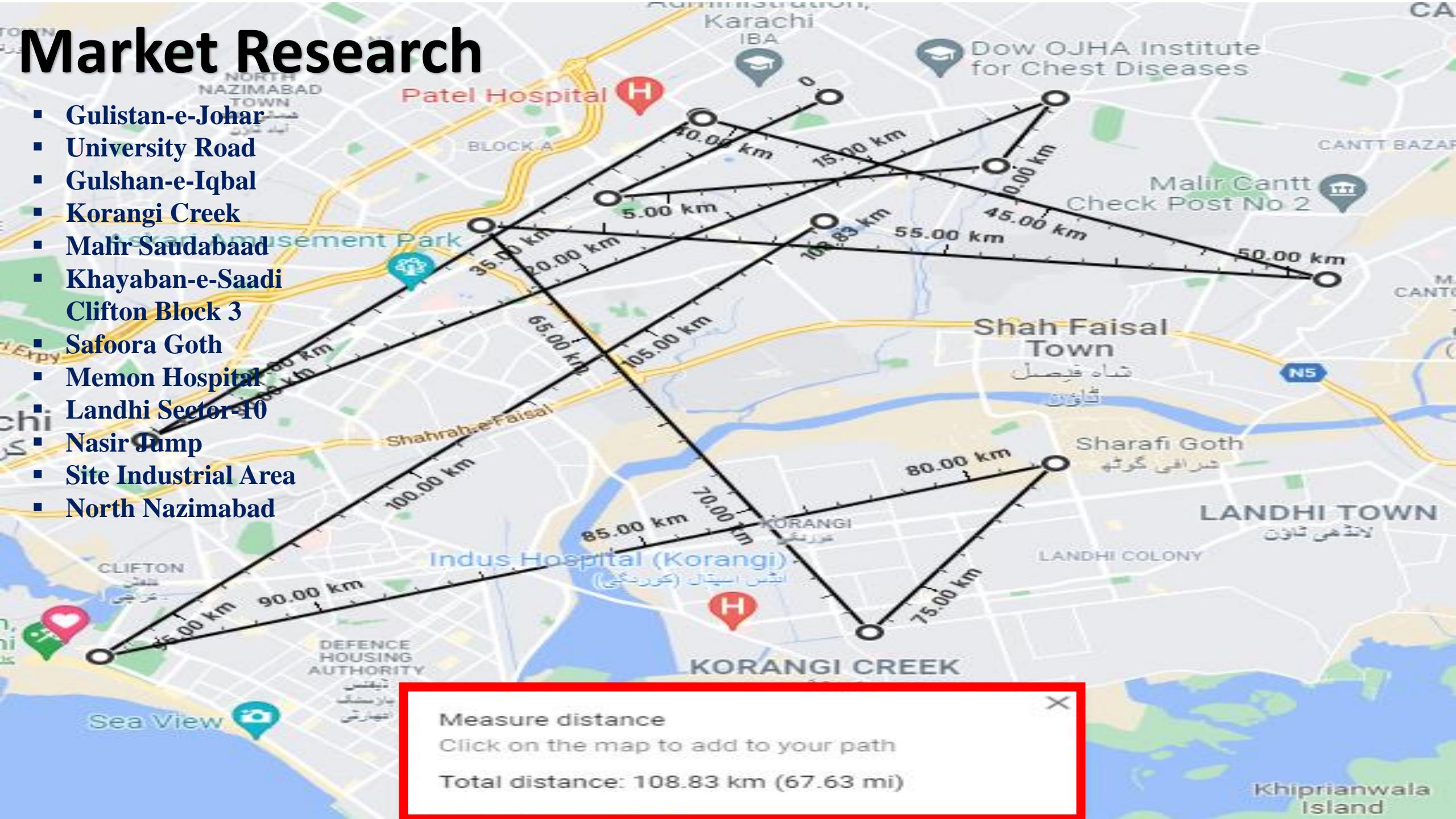


## Battery Sales Shop Memon Hospital



# Market Research

- Gulistan-e-Johar
- University Road
- Gulshan-e-Iqbal
- Korangi Creek
- Malir Saudabaad
- Khayaban-e-Saadi
- Clifton Block 3
- Safoora Goth
- Memon Hospital
- Landhi Sector-10
- Nasir Jum
- Site Industrial Area
- North Nazimabad



# Contact for Expert Engineers in Solar Domain

1. Engr Naseer Ahmed  
BE Electrical, ME Power  
Assistant Manager Reon Energy  
Help: Calculation and Panel Selection



2. Engr Rais Badshah  
BE Electrical  
Assistant Manager Huawei, Solar Expert  
With experience at Sawarya Foundations  
Help: Battery Sizing and Wiring Calculations



3. Engr Faizan Nisar  
BE Electrical  
CEO and Director Flux Energy  
Help: Charge Controller and Load Calculation



4. Engr Hassan Qadeer  
BE Electrical  
IOT Leader at Nazeer Hussain University  
Mass 10KW Project Intern at Sawayra Foundation  
Help: Best Quality Panels and Battery



5. Engr Taha Munir  
BE Electronics Hamdard,  
ME Electrical Power NED  
Electrical Team Leader at Pakistan Navy Projects  
Embedded Systems Expert at Projexels  
Hardware for Readings Calculations

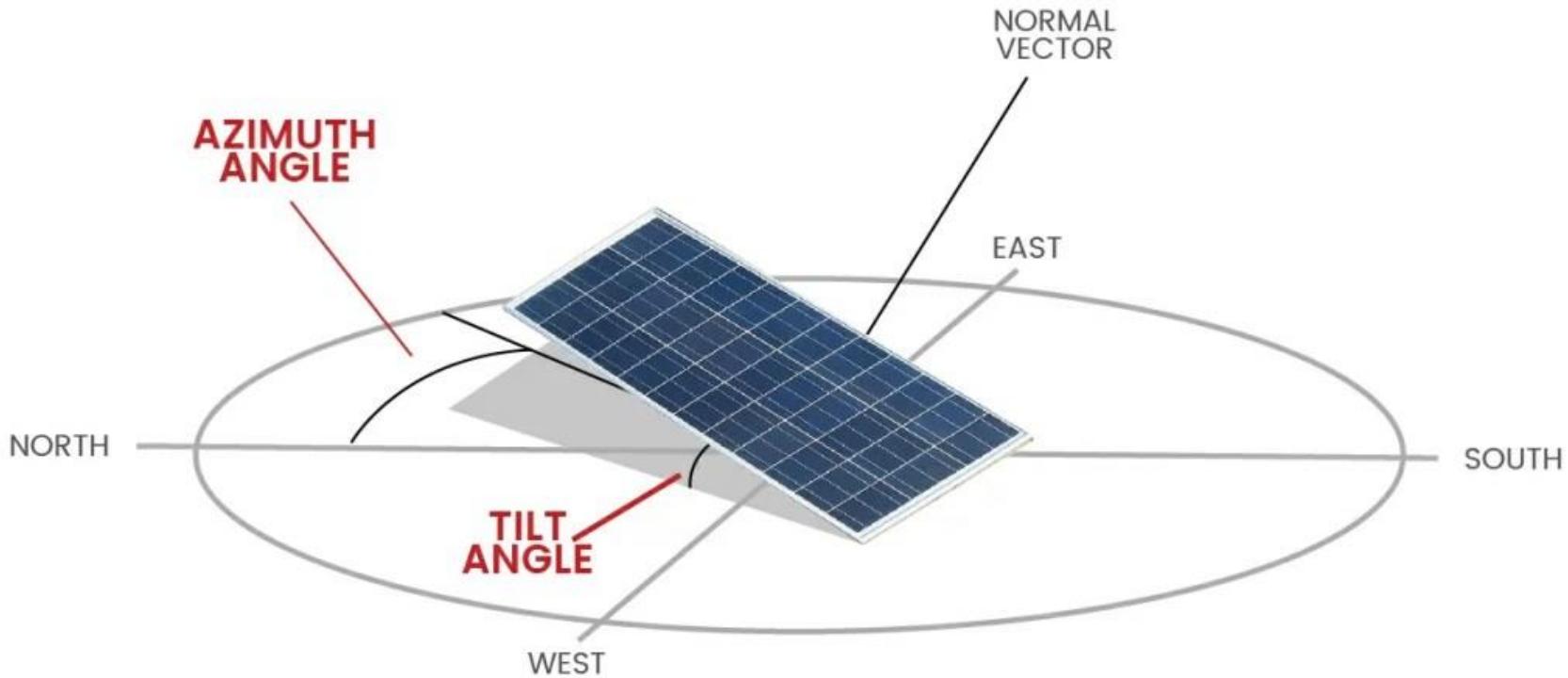


Sun rise in the East and sets in the west  
Direction should be : South Facing



**Maximum Time is between South 12AM to 2PM**

# Why we give angle to Solar Panel ?



**Summer : Subtract -15 in your city Latitude**

**Winter: Add +15 in your city angle Latitude**



latitude of karachi



All

Images

News

Videos

More

Tools

About 4,550,000 results (0.60 seconds)

Karachi / Coordinates

24.8607° N, 67.0011° E

Sun rise in the East and sets in the west  
Direction : South Facing

For maximum output, Just add 5° Degree in the value of your latitude

$$24.8607^{\circ} + 5^{\circ} = 30^{\circ} \text{ (Approx.)}$$

South Facing

# Solar Panel Angle using Mobile App (Inclinometer)



*It is also facing south by usage of compass*

# Power Consumption Calculations

**DC Fan**



54  
Inches

$$P = V \times I$$

12 V 2.08 A

$$P = 12 \times 2.08 = 25 \text{ Watt}$$

**AC Fan**



54  
Inches

$$P = V \times I$$

220 V 0.36 A

$$P = 220 \times 0.36 = 80 \text{ Watt}$$

**Total Cost:**

Level for measuring the Bubble	250
Solar Plates and Delivery Cost	9300
Nuts and Rawal Bolts	300
L2 Stand for Solar Panels	2400
DC cables Single core and Double Insulated	16050
Phoenix Tubular Battery TX-1000 12 volts	16000
Charge Controller Chinese 30 Ampere	2300
TDS meter	800
Bulbs and Holders	1650
Battery DC Clips	100
Best Quality Water for Batteries (AGS company)	140
Button and Electrical Box	130
Cement and Sand , Tapes	500
Battery Lugs	40
MC-4 Connector	140
Bulb Plastic Junction Boxes	200
Plastic PVC Pipes for Wiring	1500
Wiring Clips	200
Chalks, Relay and NodeMCU, Breaker	600
Miscellaneous	+ 400

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**Total Cost:****53,000**