STUDENTS WORKSHEET – PV KIT

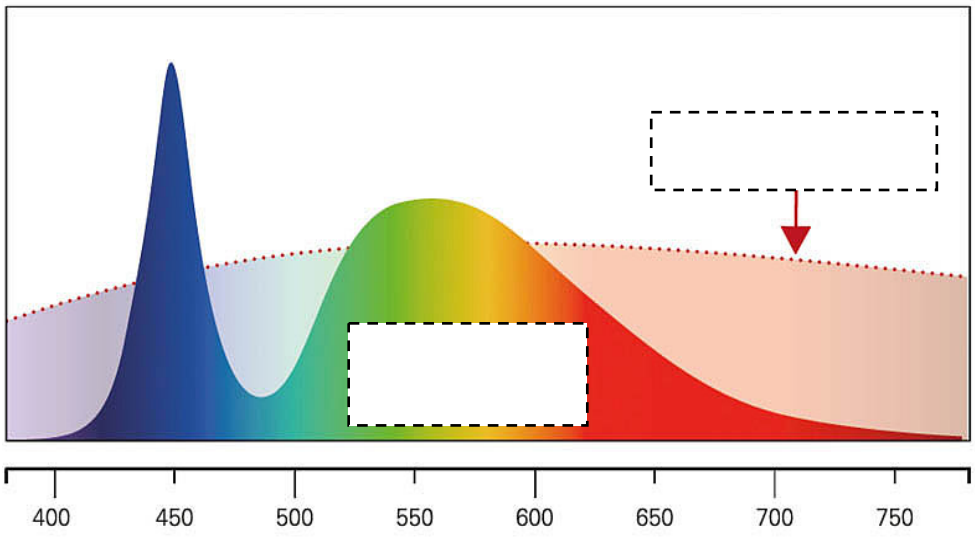
Chapter 1

1.1 Light Colour

Experiment

Light Source	Open-Circuit Voltage (U)	Short-Circuit Current (I)
Yellow Light		
White Light		

Task 2



Task 3

Statement 1:

- **White Light**
- **Yellow Light**

Statement 2:

- **White Light**
- **Yellow Light**

1.2 Angle of Incidence

Experiment

Inclination Angle	U	I
Neutral Position		
1st position		
2nd position		
3rd position		
4th position		

Task 1

Task 2

Task 3

Task 4

1.3 Light Intensity

Experiment

Distance	U	I
5 cm		
10 cm		
15 cm		
20 cm		

Task 1

Task 3

The _____ (greater/lower) the light intensity, i.e. the _____ (greater/lower) the distance of the light source from the PV module, the lower the _____ and the _____. However, the influence on the short-circuit current (I) is significantly _____ (greater/lower) than the influence on the open-circuit voltage (U). The light intensity therefore has a considerable influence on the functioning of the _____.

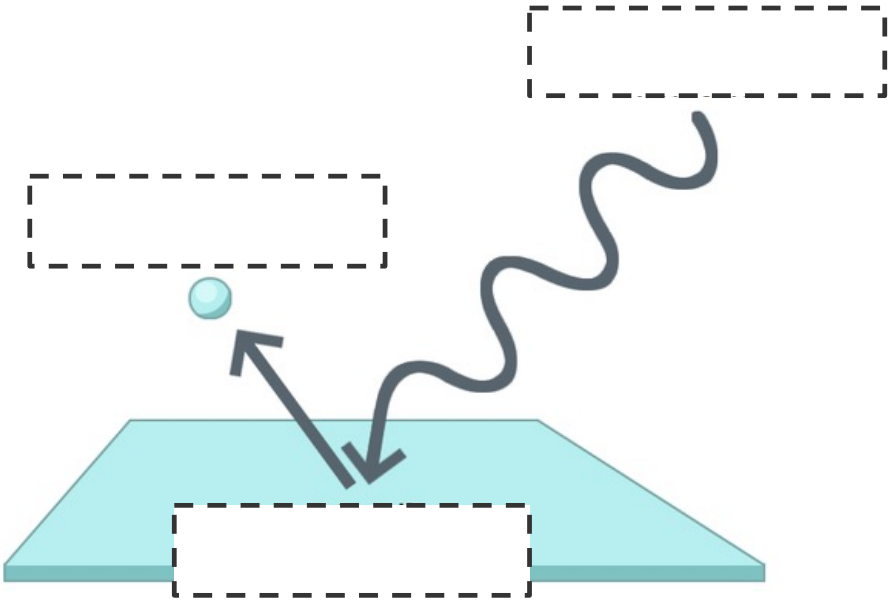
1.4 Impact of Heat

Experiment

Distance	U	I
0 sec (no heat)		
10 sec		
20 sec		
30 sec		

Task 1

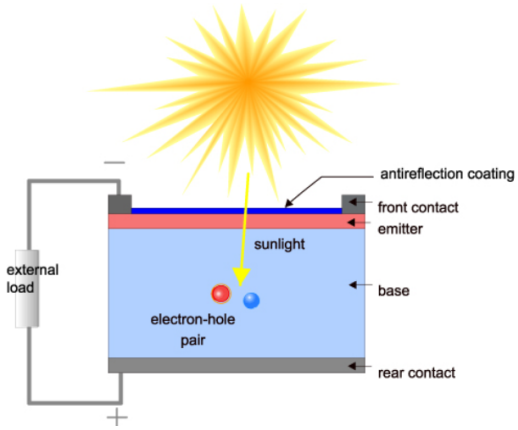
Task 2

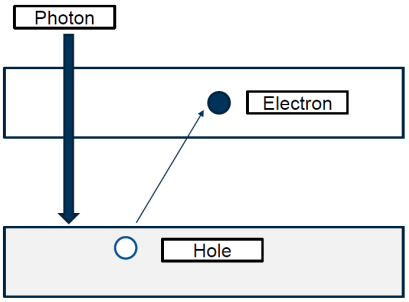


Task 3

Term	Description
Photon	A particle of light carrying energy
Electron	A negatively charged particle
Semiconductor Material	The material, typically silicon, is responsible for converting light into electrical energy
P-Layer	Positive charge carriers
N-Layer	Negative charge carriers
Pn-Junction	Interface between the P and N layers where electrons and holes separate to generate current
Electrode	Conducts the generated electrons away from the PV cell, allowing the generated electricity to be used

Task 4





- Separation of Charge Carriers: At the pn-junction, electrons and holes are
- Release of Electrons: The energy from the photons knocks electrons out of
- Creation of Electron-Hole Pairs: As electrons are released, they leave behind
- Absorption of Photons: The PV cell absorbs sunlight, where photons strike
- Flow of Electrons: The separated electrons flow through the circuit to the

1.5 Impact of Pollution

Experiment

Distance	U	I
Non-polluted		
Polluted		

Task 1

Task 2

1.6 Impact of Shadows

Experiment:

Light	U	I
Normal		
With shadow		

Task 1

Task 2

Chapter 2

2.1 PV Panels in Series

Experiment

Light Source	Open-Circuit Voltage (U)	Short-Circuit Current (I)
One PV panel		
Series of connection		

2.2 PV Panels in Parallel

Experiment

Inclination Angle	U	I
One PV panel		
PV panels in parallel		

Task 1

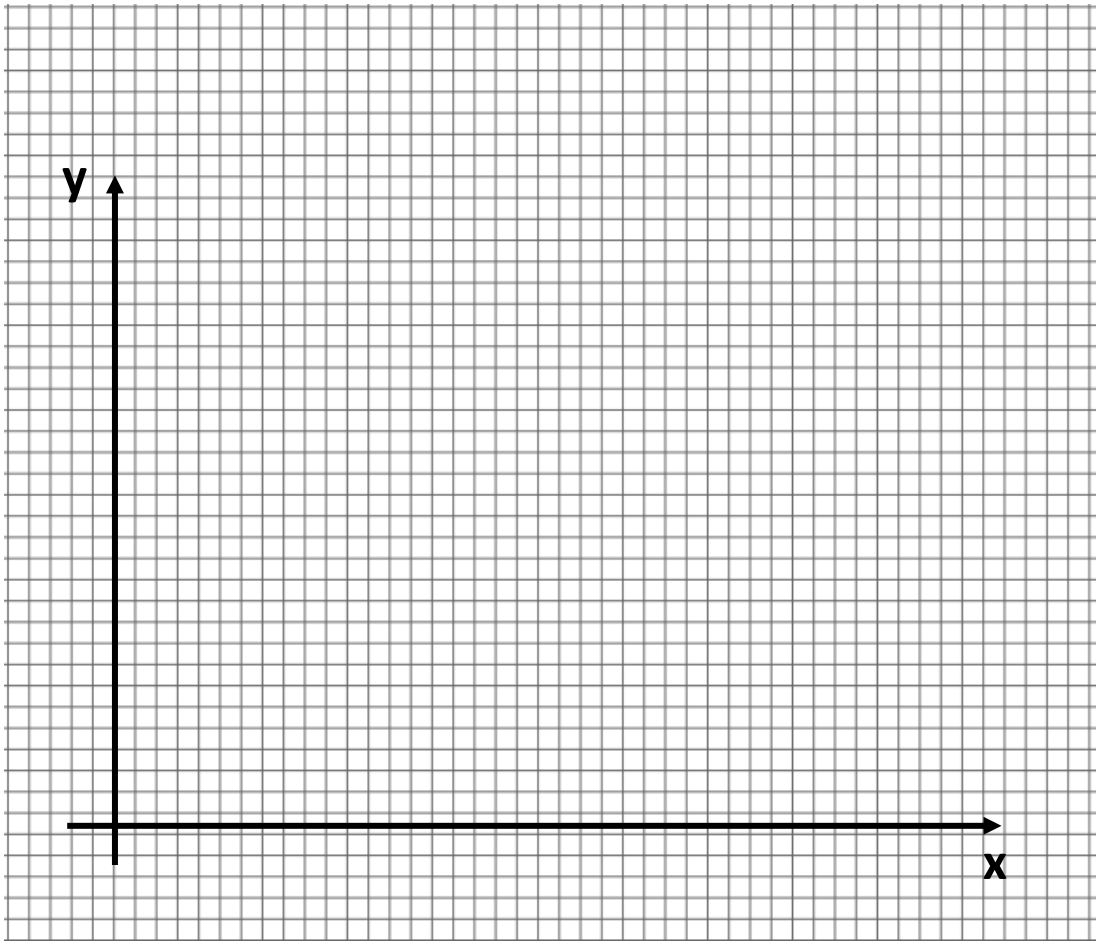
Task 2

2.3 Fixed Load

Experiment

Inclination Angle	U	I
Without Resistor		
With Resistor		

Task 1

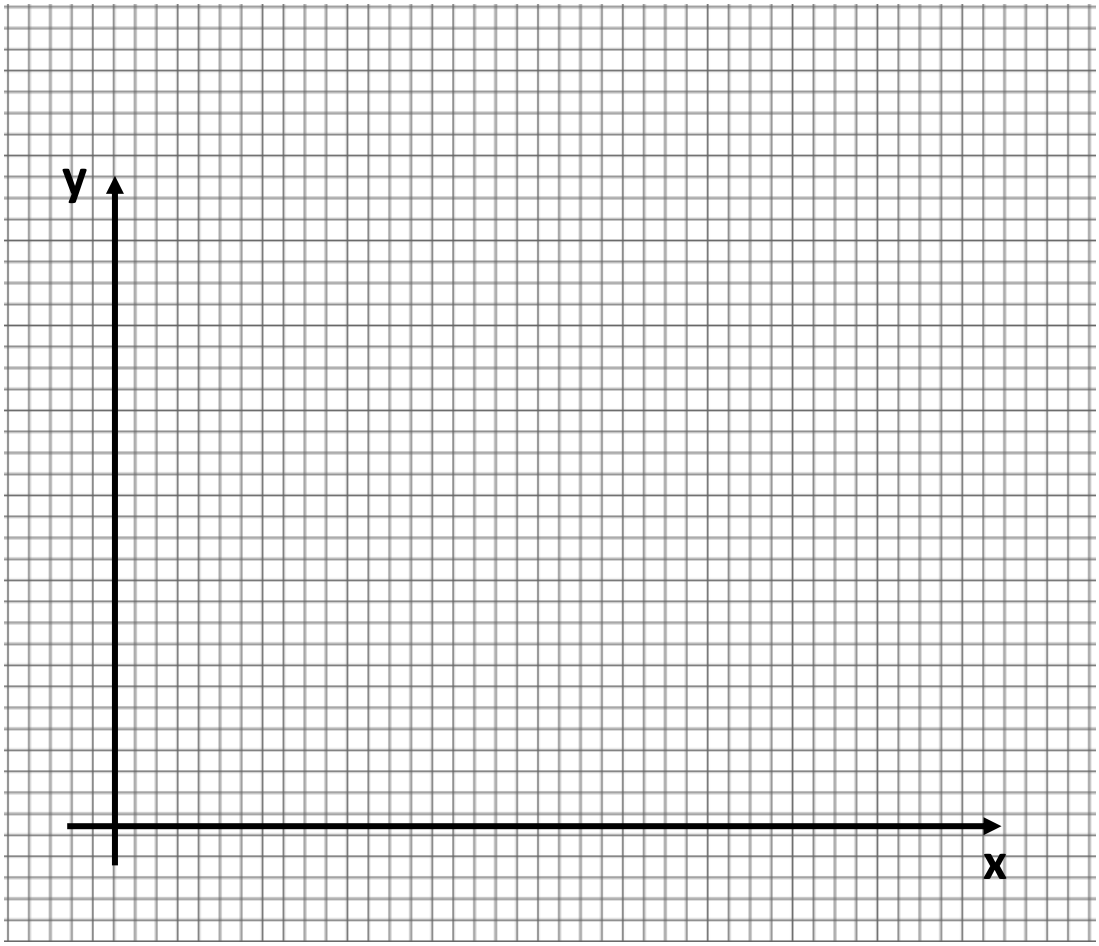


2.4 Changing Load

Experiment

Resistance (Ω)	U	I

Task 1

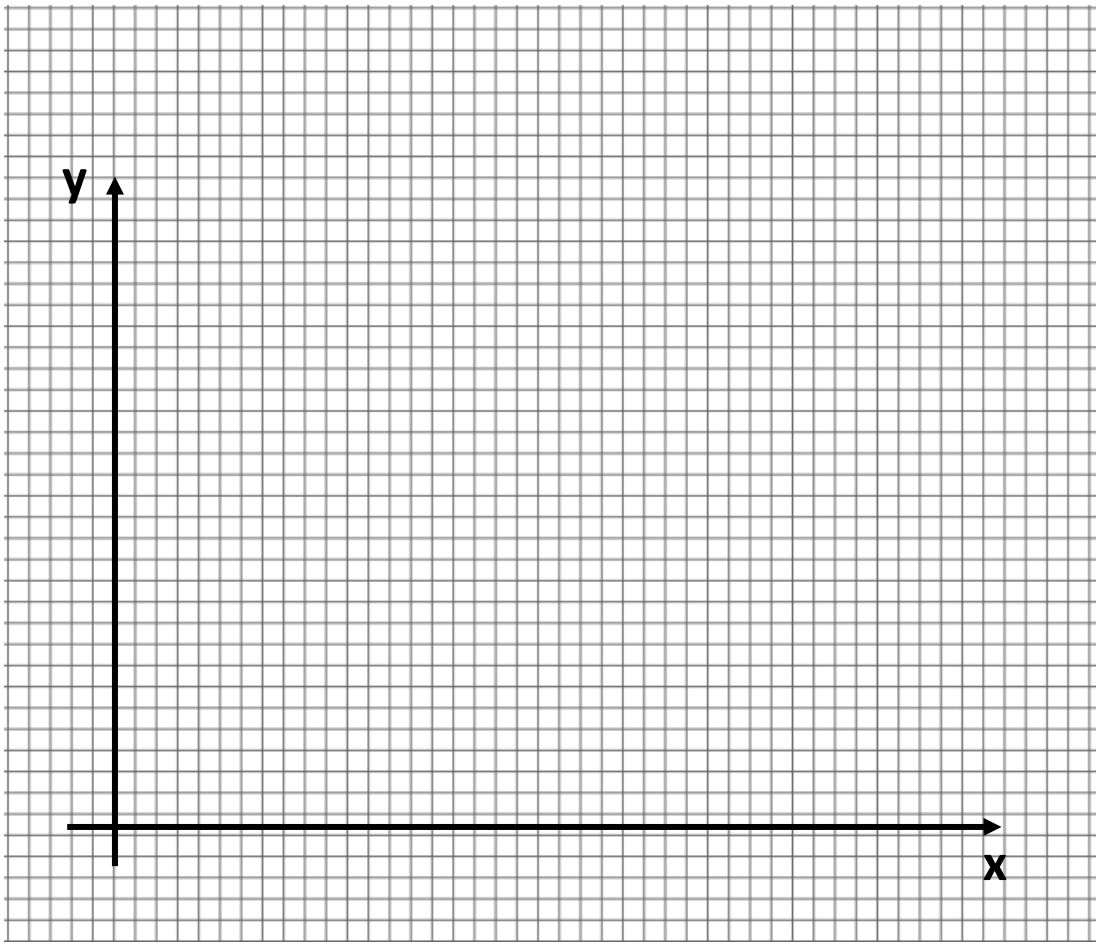


2.5 Local conditions and load changes

Experiment

Resistance (Ω)	U	I
0		

Task 1



Chapter 3

3.1 MPPT Maximum Power Point Tracking

Task 1

3.2 Controlling the MPPT

Task 1

Task 2

Task 3

Task 4

3.3 PWM vs. MPPT

Task 1

Benefits and costs of PWM

Benefits and costs of MPPT

Chapter 4

4.1 Visualizing Energy Consumption Profiles of Household Appliances

Household Appliance 1 (HA1)	Household Appliance 2 (HA2)	Household Appliance 3 (HA3)	Household Appliance 4 (HA4)

4.2 Analyzing Different Usage Modes for the Kettle

Mode A	Mode B	Mode C	Mode D	Mode E	Mode F

2 Cups	3 Cups	4 Cups	5 Cups	6 Cups	7 Cups

4.3 Practical Examples: Kettle

Household 1 (monthly)	Household 2 (monthly)	Household 3 (monthly)

Household 1 (Electric Bill)	Household 2 (Electric Bill)	Household 3 (Electric Bill)

Household 1 (Monthly)	Household 2 (Monthly)	Household 3 (Monthly)

Household 1 (Electric Bill)	Household 2 (Electric Bill)	Household 3 (Electric Bill)

4.4 Practical Examples: Hair Dryer

Mode A	Mode B	Mode C	Mode D	Mode E	Mode F

High Heat High Speed	High Heat Low Speed	Medium Heat High Speed	Medium Heat Low Speed	Low Heat High Speed	Low Heat Low Speed

Household 1 (monthly)	Household 2 (monthly)

Household 1 (monthly)	Household 2 (monthly)

4.5 Evaluating the Photovoltaic (PV) System Options for Residential Use

Household with DSM (Peak Consumption Value)	Household without DSM (Peak Consumption Value)

Calculations:

Household with DSM System Selection	Household without DSM System Selection

Calculations:

Calculations:

Household with DSM System Selection	Household without DSM System Selection