

Unit 14 - Week 12: Applications of Solar Energy

Course outline
How does an NPTEL online course work?
Week 0 : Prerequisite
Week 1: Introduction to Solar Energy
Week 2: Solar Radiation Geometry
Week 3: Solar Radiation Estimation
Week 4: Fundamentals of Photovoltaic Conversion
Week 5: Standalone Photovoltaic System
Week 6: Grid connected PV system
Week 7: Fundamentals of Flat Plate Collectors
Week 8: Flat Plate Collectors
Week 9: Solar Air Heaters
Week 10: Solar Concentrating Collectors
Week 11: Thermal Energy Storage
Week 12: Applications of Solar Energy
<input type="radio"/> Lec 32: Emerging technologies <input type="radio"/> Lec 33: Solar energy applications in cooking, desalination, refrigeration and electricity generation <input type="radio"/> Lec 34: Tutorial : COP of VARS and performance analysis of PVT collector
<input type="radio"/> Quiz : Assignment 12 <input type="radio"/> Feedback Form <input type="radio"/> Lecture Slides <input type="radio"/> Assignment solutions
Text Transcripts
Live Session

Assignment 12

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-12-09, 23:59 IST.

1) Fabrication technique used for Perovskite Solar Cell is 1 point

- a. Spin coating
 b. Spray coating
 c. Vapor deposition
 d. All of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. All of the above

2) Advantages of Quantum Dot Solar Cells are 1 point

- a. integrated in various types of solar cells to increase the power efficiency
 b. alternative to molecular dyes in DSSC
 c. cost of fabrication is significantly lower
 d. all of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. all of the above

3) The overall solar-to-hydrogen (STH) conversion efficiency for Photo electrochemical (PEC) water splitting having an operational current density of 9mA/cm^2 and irradiance arriving at the PEC device is 1000W/m^2 is 1 point

- a. 7 %
 b. 11 %
 c. 18 %
 d. 25 %

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. 11 %

4) Calculate the time taken for 5kg water at 30°C to boil in a solar cooker with the following specifications: 1 point

Average transmissivity-absorptivity product = 0.8,
Solar collector efficiency factor = 0.82,
Overall heat transfer coefficient = $6.65\text{W/m}^2\text{ }^\circ\text{C}$,
Cooking area = 0.4m^2 ,
Specific heat of water = $4.180\text{kJ/kg}^\circ\text{C}$,
Ambient temperature = 27°C .
Consider water boils at 100°C and solar insolation available at the location is 950W/m^2 .

- a. 101 min
 b. 115 min
 c. 139 min
 d. 158 min

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. 158 min

5) Which of the following best describes the working of a solar cooker? 1 point

- a. Concentrating sunlight → trapping heat → cooking
 b. Concentrating sunlight → converting light to heat energy → trapping heat →cooking
 c. Concentrating sunlight → cooking → trapping heat
 d. Trapping heat → converting heat to light energy → radiating light → cooking

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. Concentrating sunlight → converting light to heat energy → trapping heat →cooking

6) Sun tempering, shading, heat storage, natural cooling, natural lighting are important considerations for 1 point

- a. solar active architecture
 b. solar passive architecture
 c. solar pond
 d. none of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. solar passive architecture

Common data for Q7 and Q8

For a solar distillation unit, the following data are available-

- Evaporative heat transfer coefficient from water surface to the glass cover = $25\text{W/m}^2\text{ }^\circ\text{C}$
- Temperature of the inner glass = 55°C
- Water temperature = 60°C
- Saturation temperature of water = 100°C
- Latent heat of vaporization = 2260kJ/kg
- Effective area of solar still basin = 1m^2
- Solar insolation = 950W/m^2
- Specific heat of water = $4.180\text{kJ/kg}^\circ\text{C}$

7) Hourly distillate yield (kg/hr) per square meter from the solar distillation unit is 1 point

- a. 0.2
 b. 0.6
 c. 0.8
 d. 1.3

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. 0.2

8) Thermal Efficiency (in %) of the solar distillation unit is 1 point

- a. 7.48
 b. 14.12
 c. 28.25
 d. 42.15

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. 14.12

Common data for Q9 – Q10

In an aqua-ammonia absorption refrigeration system, heat is supplied to the generator from an array of solar collector at 110°C . The temperature to be maintained in the refrigerator is -12°C and the ambient temperature is 25°C . Consider the COP_{actual} is 42% of the COP_{max} .

9) The COP_{max} of the refrigerator is 1 point

- a. 0.156
 b. 1.566
 c. 2.56
 d. 15.6

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. 1.566

10) If the refrigeration load is 25 tones, then the heat supplied (in kW) by the solar collector is 1 point

- a. 78
 b. 121
 c. 148
 d. 186

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 148

Common data for Q11 - Q12

A solar PV/T collector having collector area of 0.68m^2 is installed in a household produces 71.2W power. The solar irradiance falling on the collector is recorded to be 970W/m^2 at 12.30 pm. The fluid is entering into the collector at a mass flow rate of 0.016kg/s with an inlet temperature of 34.1°C and delivers water at a temperature of 40.2°C . Consider the ambient temperature and the surface temperature of the Sun to be 34.5°C and 6000K respectively.

11) The energy efficiency (%) of the PV/T collector is 1 point

- a. 73.50
 b. 62.38
 c. 80.50
 d. 52.2

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. 73.50

12) The exergy efficiency (%) of the PV/T collector is 1 point

- a. 25.23
 b. 18.06
 c. 12.55
 d. 10.1

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 12.55