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**312316-Electronic Materials & Components
(Sem II)**

**As per MSBTE's K Scheme
DE / EJ / ET / EX / IE / MU**

Unit 5

Solar System Components

Q1. The term photo voltaic comes from _____

- a) Spanish
- b) Greek
- c) German
- d) English

Answer: b) Greek

Explanation: The term photo voltaic comes from Greek word phos means light. The volt is the unit of emf which was named after inventor of the battery.



Q2. The volt is the units of emf that was named after its inventor _____

- a) Alessandro volta
- b) Alxendervolta
- c) Alexavolta
- d) Alexandrovolta

Answer: a) Alessandro volta

Explanation: The volt is the units of that was named after its inventor Alessandro volta. He is an Italian physicist. The term photo voltaic comes from Greek.

Q3. The term photo voltaic is in use since _____

- a) 1840
- b) 1844
- c) 1849
- d) 1850

Answer: c) 1849

Explanation: The term photo voltaic is in use since 1849. Photo voltaic is a field related to practical application of photo voltaic cells





Q4. When the source of light is not sun light then the photo voltaic cell is used as

- a) Photo diode
- b) Photo voltaic cell
- c) Photo detector
- d) Photo transmitter

Answer:c) Photo detector

Explanation: When the source of light is not the sun light then the photo voltaic cell is used as the photo detector. The example of the photo detector is the infra-red detectors.

Q5.The region where the electrons and holes diffused across the junction is called

- a) Depletion Junction
- b) Depletion region
- c) Depletion space
- d) Depletion boundary

Answer: b)Depletion region





Explanation: The region where the electrons and holes diffused across the junction is called depletion region. It is also called as space charge region.

Q6. The current produce by the solar cell can be given by _____

- a) $I_L - I_D + I_{Sh}$
- b) $I_L + I_D - I_{Sh}$
- c) $I_L + I_D + I_{Sh}$
- d) $I_L - I_D - I_{Sh}$

Answer: d) $I_L - I_D - I_{Sh}$

Explanation: The current produced by the solar cell can be given by $I = I_L - I_D - I_{Sh}$.
Where I_L = photo generated current in amperes, I_D = diode current in amperes, I_{Sh} = shunt current in amperes.

Q7. The amount of photo generated current increases slightly with an increase in _____

- a) Temperature
- b) Photons
- c) Diode current
- d) Shunt current





Answer: a)Temperature

Explanation: The amount of the photo generated current is slightly increased due to an increase in the temperature. If the photo generated current increases then the output current increases.

Q8.Solar cells are made from bulk materials that are cut into wafer of _____ thickness.

- a) 120-180 μ m
- b) 120-220 μ m
- c) 180-220 μ m
- d) 180-240 μ m

Answer: d) 180-240 μ m

Explanation: Solar cells are made from the bulk materials that are cut into wafers of thickness 180-240 μ m. Many currently available cells are cut into wafers.

Q9._____ is one of the most important materials is also known as solar grade silicon.

- a) Crushed silicon
- b) Crystalline silicon
- c) Powdered silicon
- d) Silicon



Answer: b) Crystalline silicon

Explanation: The crystalline silicon is one of the most important materials that are also called as solar grade silicon. The mono crystalline, poly crystalline silicon and ribbon silicon are the other types of silicon that are used.

Q10. _____ photo voltaic devices in the form of thin films.

- a) Cadmium Telluroide
- b) Cadmium oxide
- c) Cadmium sulphide
- d) Cadmium sulphate

Answer: a) Cadmium Telluroide

Explanation: Cadmium telluroide is the photo voltaic devices in the form of thin films. Those are used to absorb and convert the sun light into electricity.

Q11.. _____ is a direct band gap material.

- a) Copper Indium Gallium Selenide
- b) Copper Selenide
- c) Copper Gallium Telluride
- d) Copper Indium Gallium Diselenide

Answer: a) Copper Indium Gallium Selenide

Explanation: Copper Indium Gallium Selenide is a direct band gap material. It has the highest efficiency among the film materials. The efficiency is about 20%.

Q12. Dye-sensitized solar cells are made from _____ organic dye.

- a) Ruthiummelallo**
- b) Aniline**
- c) Safranine**
- d) Induline**

Answer: a

Explanation: Dye-sensitized solar cells are made from Ruthiummelallo organic dye in the form of mono layer of light absorbing material and mesoporous layer of nano particles.

Q13. Quantum dot solar cells are based on _____

- a) Gratzel cell**
- b) Solar cell**
- c) Voltaic cell**
- d) Galvanic cell**

Answer: a) Gratzel cell

Explanation: Quantum dot solar cells are based on the Gratzel cell or dye sensitized



solar cell. In dye-sensitized solar cell the nano particulate is titanium dioxide that amplifies the surface area greatly.

Q14. The quantum dot used are _____

- a) Cds
- b) CdTe
- c) PbO
- d) GaAs

Answer: a) Cds

Explanation: The quantum dot used is generally is Cds. The other quantum dots that are used is cadmium selenide, PbS etc.

Q15. Organic polymer solar cells are made from Polyphenylene.

- a) True
- b) False

Answer: a) True

Explanation: Organic polymer solar cells are made from organic semi conductors. Some of them are Polyphenylene, Vinylene, Carbon fullerenes.

Q16. Calculate Fill factor using the data: $P_{max}=15\text{ W}$, $V_{oc}=18\text{ V}$, $I_{sc}=4\text{ A}$. a) .65



b) .59

c) .20

d) .98.

Answer: c) .20

Explanation: Fill factor is the ratio of the maximum obtainable power to the product of the open-circuit voltage and short circuit current.

$$F.F = P_{max} \div (V_{oc} \times I_{sc}) = 15/72 = .20.$$

Q17. A solar cell is a _____

- a) P-type semiconductor
- b) N-type semiconductor
- c) Intrinsic semiconductor
- d) P-N Junction

Answer: d) P-N Junction

Explanation: A p-n junction which generated EMF when solar radiation is incident on it is called a solar cell. The material used for fabrication of solar cell should have a band gap of around 1.5 eV.

Q18. Which of the following materials cannot be used as solar cells materials?

- a) Si
- b) Ga-As
- c) CdS
- d) PbS

Answer: d) PbS



Explanation: If we use PbS as the solar cell material, then most of the solar radiation will be absorbed on the top-layer of the solar cell and will not reach in the depletion zone.

Q19. The principle of a solar cell is same as the photodiode.

- a) True
- b) False

Answer: a) True

Explanation: The solar cell works on the same principle as the photodiode, except that no external bias is applied and the junction area is kept much larger.

Q20. What is the difference between Photodiode and Solar cell?

- a) No External Bias in Photodiode
- b) No External Bias in Solar cell
- c) Larger surface area in photodiode
- d) No difference

Answer: b) No External Bias in Solar cell

Explanation: The Solar Cell does not need an external bias. It simply works on the incident solar radiation, which causes the creation of electron hole pairs.

Q21. During the collection of e-h pairs, holes are collected by _____

- a) Front contact
- b) Back contact

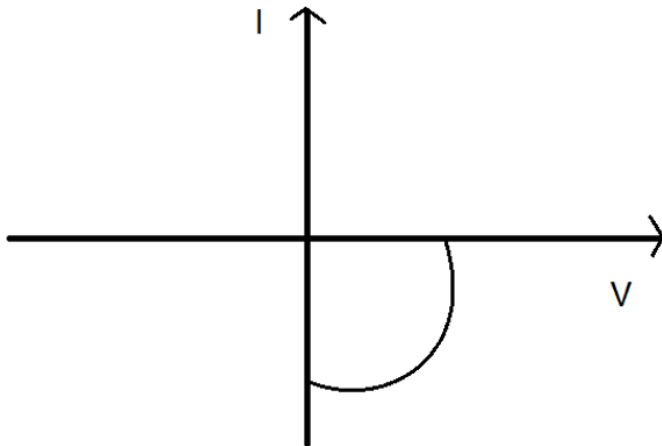


- c) Si-wafer
- d) Finger electrodes

Answer: b) Back contact

Explanation: As the electron-hole pairs move, the electrons are collected by the front contact and the holes reaching p-side are collected by the back contact.

Q22. What is the point where the graph touches the X-axis indicate?



- a) Voltage Breakdown
- b) RMS Voltage
- c) Open Circuit Voltage
- d) Short Circuit Voltage

Answer: c) Open Circuit Voltage

Explanation: In the given figure, the point where the graph touches the X-axis shows the open circuit voltage while the point where it touches the Y-axis shows the short circuit current.

Q23. The I-V characteristics of a solar cell are drawn in the fourth quadrant.

- a) True
- b) False

Answer: a) True

Explanation: The I-V characteristics of a solar cell is drawn in the fourth quadrant of the coordinate axis because a solar cell does not draw current but supplies the same to the load.

Q24. What should be the band gap of the semiconductors to be used as solar cell materials?

- a) 0.5 eV
- b) 1 eV
- c) 1.5 eV
- d) 1.9 eV

Answer: c) 1.5 eV

Explanation: Semiconductors with band gap close to 1.5 eV are ideal materials for solar cell fabrication. They are made with semiconductors like Si, Ga As, CdTe, etc.

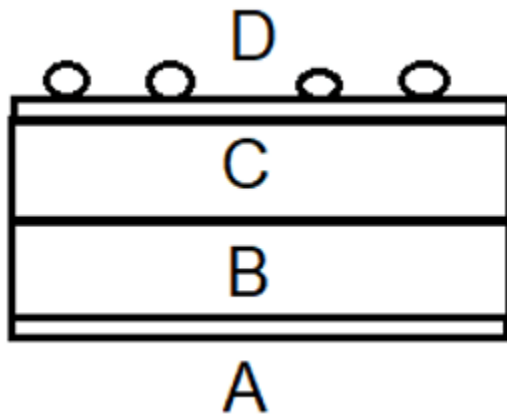
Q25. Which of the following should not be the characteristic of the solar cell material?

- a) High Absorption
- b) High Conductivity
- c) High Energy Band
- d) High Availability

Answer: c) High Energy Band

Explanation: The Energy Band of the semiconductor should not be too high. It should be around 1.5 eV so that the incident solar radiation can cause the generation of e-h pairs.

26. Which of the following region is coated with a metal?



- a) A
- b) B
- c) C
- d) D

Answer: a

Explanation: In the given figure, A is the back contact which is coated with a metal, B is the p-Si wafer, C is the n-Si wafer and D is the front contact which has metallized finger electrodes.

Q27. Which among the following is the cleanest form of energy _____

Nuclear power

Natural gas

Fossil fuels

Solar energy

Answer: d) Solar energy

Explanation: Solar energy is considered one of the cleanest forms of energy since it does not contribute to the pollution of the environment.

Q28. . Choose the correct answer: Solar energy is a _____

- a) Renewable energy
- b) Non-renewable energy

Answer: a) Renewable energy

Explanation: Solar energy does not get exhausted, hence it is known as the renewable energy.

Q29.State true or false: Solar energy is one of the main sources in photosynthesis.

- a) TRUE
- b) FALSE

Answer: a) TRUE

Explanation: Water, Co₂, and sunlight are some of the main requirements of photosynthesis reactions.

Q30. The production of solar energy is less in ____ days

- a) Summer
- b) Winter

Answer: b) Winter



Explanation: In summer, as the sun's radiation is high, maximum solar energy is harnessed. In winter, when the sun's radiation is less, solar energy harnesses will be low.

Q31. Trapping the sun's energy without using any mechanical devices is known as

- a) Concentrating solar power
- b) Solar thermal energy
- c) Active solar energy
- d) Passive solar energy

Answer: d) Passive solar energy

Explanation: In Passive solar energy no mechanical devices are used to trap the radiation of the Sun.

Q32. Can solar energy be used for cooking purposes?

- a) YES
- b) NO

Answer: a) YES

Explanation: Solar energy is used to heat, cook and pasteurize food. Solar cookers are used for cooking food.

Q33. Which is the non-mechanical device that converts sunlight directly into electricity?

- a) Thermometer
- b) Voltmeter





- c) Photovoltaic cell
- d) Barometer

Answer: c) Photovoltaic cell

Explanation: Photovoltaic cells convert the sun's radiation into electric current.

Q34. Choose YES or No: Solar energy can be stored in batteries.

- a) YES
- b) NO

Answer: a) YES

Explanation: Electrochemical batteries are the best example to show how solar energy can be stored in batteries.

Q35. What is the term for the process of converting sunlight into thermal energy for space heating and electricity generation?

- a) Photovoltaics
- b) Solar Concentrating
- c) Solar Heating
- d) Solar Cooling

Answer: c) Solar Heating

Q36. In a solar water heater, what is the primary function of the collector?

- a) Convert sunlight into electricity
- b) Store heat energy
- c) Absorb and transfer heat to water
- d) Generate steam





Answer: c) Absorb and transfer heat to water

Q37. A solar cell converts light energy into _____

- a) Electrical energy
- b) Thermal energy
- c) Sound energy
- d) Heat energy

Answer:a) Electrical energy

Explanation: A solar cell converts light energy into electrical energy. The light energy excites the electron of the solar cell which further flows in the circuit and constitutes the electric current.

Q38. There are three types of the solar cells.

- a) True
- b) False

Answer: a) True

Explanation: There are three types of solar cells. Single crystal, polycrystal, and amorphous silicon cells are the major types of solar cells.

Q39. Series and parallel combination of the solar cell is known as _____

- a) Solar array
- b) Solar light



c) Solar sight

d) Solar eye

Answer: a) Solar array

Explanation: Series and parallel combination of the solar cell is known as Solar array. Shunt diodes are used to avoid the circulating current.

Q40. A typical output of a solar cell is

a) 0.1 V

b) 0.26 V

c) 1.1 V

d) 2 V

Answer: b) 0.26 V

Q41. The efficiency of a solar cell may be in the range

a) 2 to 5%

b) 10 to 15%

c) 30 to 40%

d) 70 to 80%

Answer: b) 10 to 15%

Q42. A module in a solar panel refers to

a) Series arrangement of solar cells.



-
- b) Parallel arrangement of solar cells.
c) Series and parallel arrangement of solar cells.
d) None of the above

Answer: c) Series and parallel arrangement of solar cells.

Q43. . The current density of a photo voltaic cell ranges from

- a) 10 - 20 mA/cm²
b) 40 - 50 mA/cm²
c) 20 - 40 mA/cm²
d) 60 - 100 mA/cm²

Answer: b) 40 - 50 mA/cm²

Q44. What is the rate of solar energy reaching the earth surface?

- a) 1016W
b) 865W
c) 2854W
d) 1912W

Answer: a) 1016W

Explanation: The solar energy reaching the surface of the earth is about 1016W whereas the worldwide power demand is 1013W. That means solar energy gives us 1000 times more energy than our requirement.

Q45. What is total amount of solar energy received by earth and atmosphere?



- a) 3.8×10^{24} J/year
- b) 9.2×10^{24} J/year
- c) 5.4×10^{24} J/year
- d) 2.1×10^{24} J/year

Answer: a) 3.8×10^{24} J/year

Explanation: Even if we use 5% of this energy, it is more than 50 times our requirement. The total solar radiation absorbed by the earth and its atmosphere is 3.8×10^{24} Joules/year. Except that it is distributed over the area of earth.

Q46. The process of converting light (photons) to electricity (voltage) is called:

- a) PV effect.
- b) solar cell.
- c) radiation.
- d) All the Above

Answer: a) PV effect.

Q47. The most expensive type of the solar cells is:

- a) Amorphous.
- b) Polycrystalline.
- c) Monocrystalline.
- d) All the Above

Answer: c) Monocrystalline.

Q48. Which type of solar cells has highest efficiency:

- a) Amorphous.
- b) Polycrystalline.
- c) Monocrystalline.
- d) All the Above

Answer: c) Monocrystalline.

Q49. Which type of solar cells is more efficient in low lights:

- a) Amorphous.
- b) Polycrystalline.
- c) Monocrystalline.
- d) All the Above

Answer: a) Amorphous.

Q50. Energy production from PV systems depends on:

- a) location.
- b) weather.
- c) both a and b
- d) None of the Above

Answer: c) both a and b

Q51. A module in a solar panel refers to

- a) Series arrangement of solar cells.



- b) Parallel arrangement of solar cells.
- c) Series and parallel arrangement of solar cells.
- d) None of the above.

Answer: c) Series and parallel arrangement of solar cells

Q52. The efficiency of the solar cell is about

- a) 25 %
- b) 15 %
- c) 40 %
- d) 60 %

Answer: b) 15 %

Q53. For satellites the source of energy is

- a) Solar cell
- b) Fuel cells
- c) Edison cells
- d) Cryogenic storage

Answer: a) Solar cell

Q54. The output of the solar cell is of the order

- a) 0.5 W
- b) 1.0 W
- c) 5.0 W
- d) 10.25 W

Answer: b) 1.0 W



Q55. In a fuel cell cathode is of

- a) Oxygen
- b) Ammonia
- c) Hydrogen
- d) Carbon monoxide

Answer: c) Hydrogen

Q56. What is the maximum possible output of a solar array?

- a) 300 W/m²
- b) 100 W/m²
- c) 250 W/m²
- d) 500 W/m²

Answer: c) 250 W/m²

Q57. The current density of a photo voltaic cell ranges from

- a) 10 - 20 mA/cm²
- b) 40 - 50 mA/cm²
- c) 20 - 40 mA/cm²
- d) 60 - 100 mA/cm²

Answer: b) 40 - 50 mA/cm²

Q58. A pyrometer is used for the measurements of

- a) Diffuse radiations only.
- b) Direct radiations only.
- c) Both direct and diffused radiations.
- d) None of the above.

Answer: c) Both direct and diffused radiations.

Q59. Reflector mirrors used for exploiting the solar energy are called

- a) Mantle.
- b) Heliostats.
- c) Diffusers.
- d) Ponds.

Answer: b) Heliostats.

Q60. The function of a solar collector is of converting solar energy into

- a) Radiations
- b) Electrical energy directions.
- c) Thermal energy.
- d) All of these.

Answer: c) Thermal energy.

Q61. What are pyr heliometers?

- a) Instruments measures beam radiations
- b) Diffuse radiations.
- c) Direct radiations only.
- d) None of the above.

Answer: a) Instruments measures beam radiations

Q62. Temperature attained by cylindrical parabolic collector is of the order of

- a) 50 - 100 °C
- b) 100 - 150 °C
- c) 150 - 200 °C
- d) 200 - 300 °C

Answer: d) 200 - 300 °C

Q63. In a solar collector, why is the transparent cover provide for?

- a) Protect the collector from dust.
- b) Reduce the heat losses from collector beneath to atmosphere.
- c) Transmit solar radiation only
- d) All of the above.

Answer: d) All of the above.

Q64. The formula of solar constant is _____

- a) $S = (R/r) \cdot \sigma T^2$
- b) $S = (R/r)^2 \cdot \sigma T^4$
- c) $S = (R/r^2) \cdot \Sigma T^2$
- d) None of the above

Answer: b) $S = (R/r)^2 \cdot \sigma T^4$

Q65. What are the drawbacks of the solar cooker?

- a) Doesn't work at night
- b) Solar cooker takes more time to cook the food
- c) Both a and b
- d) None of the above

Answer: a) Doesn't work at night

Q66. What are the layers which improve the receiver efficiency of solar thermal energy?

- a) Absorber layer coated tube
- b) Anti-reflective layer coated tube
- c) Both a and b
- d) None of the above

Answer: C) Both a and b

Q67. The coating materials which are used in solar absorber should possess the _____ properties

- a) High absorptivity, low emissivity
- b) Strong adhesion, high durability
- c) High thermal conductivity, corrosion, and wear resistance
- d) All of the above

Answer: d) All of the above

Q68. The solar radiation range in infrared is about _____

- a) 52-55%
- b) 33-35%
- c) 40-43%
- d) None of the above

Answer: a) 52-55%

Q69. The efficiency of the poly crystalline silicon solar cell is about _____

- a) 14-17%
- b) 12-17%
- c) 13-15%
- d) None of the above

Answer: c) 13-15%

Q70. The deficiency of polycrystalline silicon solar cell is _____

- a) Less than monocrystalline silicon solar cell
- b) Higher than monocrystalline silicon solar cell
- c) Equal to monocrystalline Si solar cell
- d) None of the above

Answer: a) Less than monocrystalline silicon solar cell



Q71. Who observed the materials which turn light into energy?

- a) August Mouchout
- b) Edmund Becquerel
- c) Miyasaka
- d) None of the above

Answer: b)Edmund Becquerel

Q72. The solar water heater payback period is up to _____

- a) 2-4 years
- b) 2-6 years
- c) 1-2 years
- d) 6-7 years

Answer: b)2-6 years

Q73. Who has seen the direct conversion of solar radiation into mechanical power?

- a) August Mouchout
- b) Edmund Becquerel
- c) Miyasaka
- d) None of the above

Answer: a) August Mouchout



Q74. Who developed perovskite materials into the solar cells?

- a) August Mouchout
- b) Edmund Becquerel
- c) Miyasaka
- d) None of the above

Answer: c) Miyasaka

Q75. The solar constant value is _____

- a) 1327 W/m²
- b) 1366 W/m²
- c) 1357 W/m²
- d) 1377 W/m

Answer: b) 1366 W/m²

Thank You

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