# SRM INSTITUTE OF SCIENCE AND TECHNOLOGY Ramapuram Campus Department of Physics

* Required

Answer all the questions (50 X 1= 50 marks)

1. The electrical conductivity of intrinsic semiconductor is equal to _____(CLO-2) *

- (A) σ = ne. e . μe + ne. h. μh
- (B) σ = ne. e. μe/2
- (C) σ = n .h. μh/2
- (D) σ = ni. e. (μe + μh)

2. When silicon is mixed with amount of pentavalent impurity elements _____ semiconductor crystal is formed. (CLO-2) *

- (A) Pure
- (B) p-type
- (C) n-type
- (D) Dilute magnetic

3. In a basic OLED structure, the diamine layer is used as a _____.(CLO-2) *

- [x] (A) HTL
- [ ] (B) ETL
- [ ] (C) ITL
- [ ] (D) CCL

4. _____ is the condition for transport of charge carriers in Ohmic contact. (CLO-2) *

- [ ] (A) $\phi m = \phi s$
- [ ] (B) $\phi m > \phi s$
- [x] (C) $\phi m < \phi s$
- [ ] (D) $\phi m = 0$

5. When T = 0K, the Fermi energy (EF) of n-type semiconductor is equal to _____.(CLO-2) *

- [ ] (A) EF/2
- [x] (B) (Ec+Ed)/2
- [ ] (C) Ea/2
- [ ] (D) EV/2

6. LED is a semiconductor p-n junction diode which converts --------- under forward bias. (CLO-2) *

- (A) Light energy into Electrical energy
- (B) Electrical energy into Light energy
- (C) thermal energy into electrical energy
- (D) Electrical energy into thermal energy.

7. The p-region has a greater concentration of _____ as compared to the n-region in a P-N junction. (CLO-2) *

- (A) Holes
- (B)Electrons
- (C) Both holes & electrons
- (D) Phonons

8. A p-type semiconductor material is doped with _____ impurities whereas a n- type semiconductor material is doped with _____ impurities. (CLO-2) *

- (A) acceptor, donor
- (B) acceptor, acceptor
- (C) donor, donor
- (D) donor, acceptor

9. The Fermi level of n-type semiconductor _____ with increase in temperature. *

- (A) Decreases
- (B) Increases
- (C) remains unchanged
- (D) becomes zero

10. An Ohmic contact is a ---------providing current conduction in both direction. (CLO-2) *

- (A) low –resistance junction
- (B) High –resistance junction
- (C) Infinite – resistance junction
- (D) Zero

11. In _____ generation process, an electron and a hole recombine in a band-to- band transition, but the resulting energy is given off to another electron or hole. (CLO-2) *

- (A) Auger
- (B) band to band
- (C) Impurity to band
- (D) Valence

12. The amount of radiance in planer type of LED structures is---. (CLO-2) *

- (A) Low
- (B) High
- (C) Zero
- (D) Negligible

13. The rectifying metal-semiconductor junction is also called as -----. (CLO-2) *

- (A) Ohmic Junction
- (B) Schottky Junction
- (C) Conducting Junction
- (D) PN Junction

14. The expression for drift current density due to electrons is given by----. (CLO-2) *

- (A) J = pμeE
- (B) J = pμeV
- (C) J = nμeE
- (D)J = nμeV

15. Photo diode acts as a------. (CLO-2) *

- (A) Inductor
- (B) Capacitor
- (C) Sensor
- (D) Insulator

16. What is full form of AMOLED? (CLO-2) *

- (A) Active matrix organic light emitting diode
- (B)Array matrix organic light emitting diode
- (C)Active motion organic light emitting diode
- (D) Array motion organic light emitting diode

17. When a free electron recombines with a hole, there results (CLO-2) *

- (A) Generation of energy
- (B) Release of energy
- (C) No change in energy
- (D) Forbidden energy

18. Which of the following materials can be used to produce infrared LED? (CLO-2) *

- (A)Si
- (B)Ge
- (C) GaAs
- (D) CdS

19. A semiconductor has ..... temperature coefficient of resistance. (CLO-2) *

- (A) Positive
- (B) Zero
- (C) Negative
- (D) infinite

20. Which of the following junction conducts on both forward bias and reverse bias(CLO-2). *

- (A)Non-rectifying Junction
- (B)Schottky Junction
- (C)Semiconductor-Insulator Junction
- (D) Metal-Insulator Junction

21. Which process of the Electron-hole pair is responsible for light emission? (CLO-2) *

- (A)Generation
- (B)Ionisation
- (C)Recombination
- (D) Diffusion

22. Which of the below mentioned statements is false regarding a p-n junction diode? *

- (A)Diode are current control devices
- (B)Diodes are rectifying devices
- (C)Diodes are unidirectional devices
- (D)Diodes have three terminals

23. The drift velocity of the electrons in the conductor_____ (CLO-2) *

- (A) Increase with an increase in temperature
- (B) Decrease with Decrease in temperature
- (C) Increase with Decrease In the temperature
- (D) Decrease with the increase in temperature

24. The excess carriers move from the region of higher density to region of lower density tending to produce a uniform distribution is called---.(CLO-2) *

- (A) diffusion current
- (B) drift current
- (C) carrier concentration
- (D) recombination

25. The diffusion current is proportional to----.(CLO-2) *

- (A) square of applied electric field
- (B) applied electric field
- (C) concentration gradient of charge carriers
- (D) mobility of charge carriers

26. The Einstein coefficient for spontaneous and stimulated emission is_____. (CLO-3) *

$\frac{A_{21}}{B_{21}} = \frac{8\pi kc}{\lambda^5}$

(A)

$\frac{A_{21}}{B_{21}} = \frac{8bhc}{\lambda^5}$

(B)

$\frac{A_{21}}{B_{21}} = \frac{8\pi rc}{\lambda^5}$

(C)

$\frac{A_{21}}{B_{21}} = \frac{8\pi hc}{\lambda^5}$

(D)

27. ..... is the process of radiative recombination of electron-hole pairs created by electron bombardment. (CLO-3) *

(A) Luminescence

(B) Cathodoluminescence

(C) Photoluminescence

(D) Electroluminescence

28. ..... takes place when the excited electron interacts with another photon. (CLO-3) *

- (A) Spontaneous emission
- (B) Stimulated emission
- (C) Absorption
- (D) Amplification

29. The open circuit voltage of a solar cell increases with _____.(CLO-3) *

- (A) Increase in bandgap
- (B) Decrease in band gap
- (C) Increase of in holes
- (D) Decrease in holes

30. Efficiency of Amorphous Silicone is about --------.(CLO-3) *

- (A) 14 – 17
- (B) 1-7
- (C) 13 – 15
- (D) 5 - 7

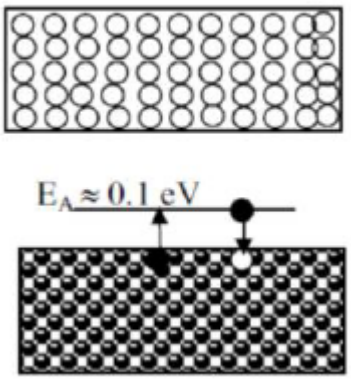
31. H = H0 + H' , H0 represents--------. *

- (A) Perturbed Hamiltonian
- (B) Unperturbed Hamiltonian
- (C) Joint density of state
- Recombination

32. The reverse saturation current in a p-n diode. (CLO-3) *

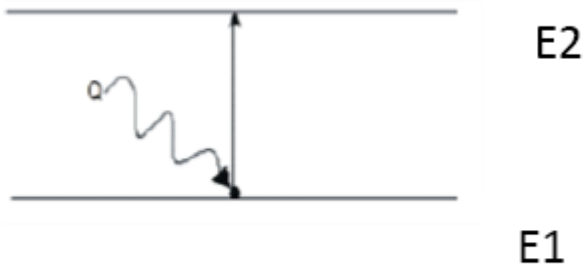
- (A) increases
- (B) decreases
- (C) remains constant with increase of reverse bias .
- (D) Moderate

33. Which one of the following is related to the diagram? *




- (A) Band to band transition
- (B) Impurity to band transition
- (C) Free carrier Transition
- (D) Photonic transition

34. The given diagram represents ..... (CLO-3) *




- (A)Spontaneous emission
- (B) Stimulated emission
- (C) Absorption process
- (D) Temperature inversion

35. The ratio between Eg and charge of electron in photovoltaic cell is called _____. (CLO-3) *

- (A) Current loss
- (B) Voltage loss
- (C) Loss due to metal
- (D) Optical loss

36. The maximum current flows in solar cell when its P-side & N-side terminal are shorted, such a current is called _____. (CLO-3) *

- (A) Drift current
- (B) Diffuse current
- (C) Short-circuit current
- (D) Alternative current

37. Fill factor of PV cell equal to ----------(CLO-3) *

- (A) (I mp ) / (I SC . V OC )
- (B) (I mp .Vmp) / (I SC . VOC )
- (C) ( V mp) / (I SC )
- (D) (I mp .Vmp) / ( VOC )

38. Which one of the following is not a drawback of Classical free electron theory? (CLO-3) *

- (A) It could not explain photoelectric effect and Compton effect.
- (B) It verifies ohms law
- (C) Electrical conductivity of semiconductors and insulators could not explain.
- (D) Ferromagnetism could not explain by this theory.

39. _____ is the process where the excess energy due to recombination is usually imported to phonons and dissipated as heat. (CLO-3) *

- (A) Radiative transition
- (B) Non-radiative transition
- (C) absorption
- (D) Radiation.

40. Determine the Fill Factor FF of the solar cell, if Short-Circuit Current (Isc) = 2.75 A, Open-Circuit Voltage (Voc) = 0.6V, Current at Maximum Power (Im) = 2 A and Voltage at Maximum Power (Vm) = 0.5V. (CLO-3) *

- (A) 0.606
- (B) 0.222
- (C) 0. 089
- (D) 0. 856

41. The resistivity of intrinsic germanium at 300 K is 0.47 Wm. If the electron and hole mobilities are 0.38 m^2/V-s and 0.18 m^2/V-s, then calculate the Intrinsic carrier density (n) at 300 K. (CLO-3) *

- (A) 2.3 X 10_ 19 m3
- (B) 8.3 X 10 _19 m3
- (C) 12.3 X 10_19 m3
- (D) 42.3 X 10_19 m3

42. The surface of solar cell is coated with----------to avoid the loss of incident light energy due to reflection. (CLO-3) *

- [x] (A) Anti-reflection coating
- [ ] (B) Plastic coating
- [ ] (C) Metal coating
- [ ] (D) Silver coating

43. The solar cells are based on the principles of ----------.(CLO-3) *

- [ ] (A) Compton effect
- [x] (B) Photovoltaic effect
- [ ] (C) Stark effect
- [ ] (D) Zeeman effect

44. Stimulated emission is responsible for the operation of ----------.(CLO-3) *

- [x] (A) Laser diodes
- [ ] (B) Rectifiers
- [ ] (C) Multi meters
- [ ] (D) Voltmeters

45. Efficiency of polycrystalline Silicone is about --------. .(CLO-3) *

- [x] (A) 14 – 17
- [ ] (B) 1-7
- [ ] (C) 13 – 15
- [ ] (D) 5 - 7

46. Absorption process is responsible for the operation of ----------.(CLO-3) *

- [ ] (A) Half wave rectifiers
- [x] (B) Photo detectors
- [ ] (C) Vacuum tubes
- [ ] (D) Amplifiers

47. Efficiency of PV cell equal to ----------.(CLO-3) *

- [x] (A) (Voc . Isc . FF) / Prad
- [ ] (B) ( Isc . FF) / Prad
- [ ] (C) (Ioc . FF) / Prad
- [ ] (D) (Ioc . Is(C) / Prad

48. Recombintaion rate of charge carriers is depends upon the----------. (CLO-3) *

- (A) Energy of photon
- (B) Density of photon
- (C) Band gap
- (D) Lifetime of charge carriers

49. The photon of energy value less than the band gap value does not get absorbed in PV cell is called ----------.(CLO-3) *

- (A) Losses due to excess energy photon
- (B) Losses due to low energy photon
- (C) Fill factor losses
- (D) Voltage losses

50. The direct band to band absorption and emission can take place only at wave length for which photon energy is ---------. (CLO-3) *

- (A) $\lambda g = \lambda$
- (B) $\lambda g < \lambda$
- (C) $\lambda g > \lambda$
- (D) $\lambda g = 0$

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