



12 Physics

Name : _____

Roll #: _____

T3 ch18,19 25/04/2020

Time: 2h40m; Marks: 85

Wasim Tahir physics center

Q1) Choose the most appropriate option. Cutting / overwriting is not allowed:

17 Marks

- i) Unit of Planck's constant is _____
 A) Volt B) Js C) $J.s^{-1}$ D) e.V
- ii) All motions are:
 A) Absolute B) Uniform C) Relative D) Variable
- iii) A positron is a particle having _____
 A) Mass equal to electron B) Charge equal to electron C) Equal mass but opposite charge to electron D) Mass equal to proton
- iv) Maximum kinetic energy of photoelectrons depends upon _____ of incident light.
 A) Frequency B) Intensity C) Brightness D) Power
- v) In n-type materials the minority carriers are _____
 A) free electrons B) holes C) protons D) Mesons
- vi) A PN-junction cannot be used as:
 A) Rectifier B) Amplifier C) Detector D) LED
- vii) The rest mass energy of an electron positron pair is _____
 A) 0.51MeV B) 1.02MeV C) 1.2MeV D) 1.00MeV
- viii) The output voltage of a rectifier is _____
 A) Smooth B) Pulsating C) Perfectly direct D) Alternating
- ix) When a p-n junction is reverse biased, the depletion region is _____
 A) Widened B) Narrowed C) Normal D) No change
- x) In 1905, the special theory of relativity was proposed by _____
 A) Maxwell B) de-Broglie C) Bohr D) Einstein
- xi) In photoelectric effect, which factor increases by increasing the intensity of incident photons?
 A) kinetic energy of electrons B) stopping potential C) Work function D) Number of emitted electrons
- xii) Which one pair belongs to acceptor impurity?
 A) Arsenic, phosphorus B) Boron, gallium C) Antimony, indium D) Arsenic, antimony
- xiii) The ratio of potential barriers of Ge to Si at room temperature is
 A) 7:3 B) 2:5 C) 1:3 D) 3:7
- xiv) In Compton scattering, the Compton shift $\Delta\gamma$ will be equal to Compton wavelength, if the scattering angle is _____ degrees.
 A) 0 B) 45 C) 60 D) 90
- xv) Light emitting diodes (LED) are made from _____ semi-conductors
 A) Silicon B) Germanium C) Carbon D) Gallium arsenide
- xvi) If both the inputs are low, the output is high for _____
 A) OR gate B) AND gate C) XOR gate D) NOR gate
- xvii) Which light photon has the least momentum?
 A) Red B) Blue C) Yellow D) Green

Q2) Write short answer of the following:

44 Marks

- i) How the motion of an electron in an n-type substance differs from the motion of holes in a p-type substance?
- ii) Why ordinary silicon diodes do not emit light?

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- iii) What is the biasing requirement of the junctions of a transistor for its normal operation? Explain how these requirements are met in a common emitter amplifier (with diagram)?
- iv) The anode of a diode is 0.2V positive with respect to its cathode. Is it forward biased?
- v) Write down characteristics of operational amplifier.
- vi) What is the principle of virtual ground? Apply it to find the gain of an inverting amplifier.
- vii) What is the effect of forward and reverse biasing of a diode on the width of the depletion region?
- viii) What is photodiode? Write its two applications.
- ix) When does light behave as a wave? When does it behave as a particle?
- x) If the speed of light were infinite, what would the equations of special theory of relativity reduce to?
- xi) State uncertainty principle. Give its two mathematics forms.
- xii) If speed of light were infinite, what would the equations of special theory of relativity reduce to?
- xiii) If measurements show a precise position for an electron, can those measurements show precise momentum also? Explain.
- xiv) Since mass is a form of energy, can we conclude that a compressed spring has more mass than the same spring when it is not compressed?
- xv) Will higher frequency light eject greater number of electrons than low frequency light? Give reason to your answer.
- xvi) Can pair production take place in vacuum? Explain
- xvii) Why do not we observe a Compton effect with visible light?
- xviii) Distinguish between general theory of relativity and special theory of relativity.
- xix) How the time dilation affects the aging process of human body?
- xx) What is the energy of quanta in eV having wavelength $\lambda = 400nm$? ($h = 6.63 \times 10^{-34} Js$)

Give explanatory answer of the following:

24 Marks

- 3A) Calculate the gain of an amplifier in which the collector resistance RC is $5k\Omega$. The input resistance between the base and emitter of a typical transistor is $2.5k\Omega$ and value of its $\beta = 100$.
- 3B) Draw the circuit diagram of non-inverting amplifier and label it. Evaluate a relation for its gain.
- 4A) Explain Heisenberg Uncertainty Principle.
- 4B) A particle of mass $5.0mg$ moves with speed of $8.0mS^{-1}$. Calculate its de-Broglie wavelength ($h=6.63 \times 10^{-34} J.S.$)
- 5A) Define photoelectric effect. Explain photoelectric effect on the basis of quantum theory. Also derive Einstein equation.
- 5B) What is black body radiation? Explain the effect of temperature on radiation emitted by hot body. Also discuss energy distribution curve of black body among different wavelength.

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