Q. 2.

PHYSICS HSSC–II
SECTION – A (Marks 17)

Time allowed: 25 Minutes

| Version Number | 1 | 7 | 0 | 3 |

NOTE: Section–A is compulsory. All parts of this section are to be answered on the question paper itself. It should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Circle the correct option i.e. A / B / C / D. Each part carries one mark.

(i) As mass number increases, which of the following does not change?
   A. Density   B. Binding energy C. Mass   D. Volume

(ii) The half life of radioactive element is:
   A. $T_{\frac{1}{2}} = 0.693\,\lambda$ B. $T_{\frac{1}{2}} = \frac{\lambda}{0.693}$ C. $T_{\frac{1}{2}} = \frac{0.693}{\lambda}$ D. $T_{\frac{1}{2}} = 1.43\,\lambda$

(iii) The direction of field lines due to a test charge " $+q$ " is:
   A. Circular   B. Curve
   C. Radially outward   D. Radially inward

(iv) The dimensional representation of Planck's constant is the same as:
   A. Momentum   B. Angular momentum
   C. Gravitational constant   D. Torque

(v) A capacitor of capacitance 'C' has a charge 'Q' and stored energy is 'w'. If the charge is increased to '2Q'. The stored energy will be:
   A. $2w$ B. $4w$ C. $\frac{w}{4}$ D. $\frac{w}{2}$

(vi) The amount of heat produced in a resistor when a current is passed through it, can be found by using:
   A. Faraday's law   B. Lenz's law   C. Joule's law   D. Kirchhoff's rule

(vii) The SI units of resistivity is:
   A. Ωm B. Ωm^{-1} C. Ωm^2 D. $\Omega^{-1}m^{-1}$

(viii) The $\frac{e}{m}$ of an electron moving with the speed along a circular path in a magnetic field is given as:
   A. $\frac{e}{m} = \frac{E^2}{B^2R}$ B. $\frac{e}{m} = \frac{ER}{B^2}$ C. $\frac{e}{m} = \frac{B^2R}{E}$ D. $\frac{e}{m} = \frac{E}{B^2R}$

(ix) An instrument which can measure potential without drawing any current is:
   A. Cathode Ray Oscilloscope (CRO)   B. Ammeter
   C. Voltmeter   D. Galvanometer

(x) If L and R represent inductance and resistance respectively, then the dimensions of $\frac{L}{R}$ will be:
   A. $[M^0L^{-1}T^{-2}]$ B. $[M^0L^0T]$ C. $[M^0L^0T^{-1}]$ D. $[M^0L^0T^{-2}]$

(xi) On what principle does a transformer work?
   A. Ohm's Law   B. Mutual Induction
   C. Electrostatic Induction   D. Electromagnetism

(xii) "Eddy Currents" are set up in the direction:
   A. At an angle 45° to the flux   B. Perpendicular to the flux
   C. Parallel to the flux   D. Anti parallel to the flux

(xiii) The r.m.s value of the current when $I_0 = 2A$ is given by:
   A. $4\sqrt{2}A$ B. $\frac{1}{\sqrt{2}}A$ C. $\sqrt{2}A$ D. $2\sqrt{2}A$

(xiv) If the capacitance of LC circuit is made four times then the frequency of the circuit becomes:
   A. Four times   B. Thrice   C. Twice   D. One half

(xv) What are substances called which undergo plastic deformation until they break?
   A. Amorphous solids   B. Polymeric solids
   C. Brittle substances   D. Ductile substances

(xvi) The substances in which magnetic fields produced by orbital and spin electrons of molecule add up to zero are called:
   A. Paramagnetic   B. Super magnetic C. Ferromagnetic   D. Diamagnetic

(xvii) In which type of logic gate, the output is one, when both inputs are zero?
   A. NOT gate   B. NOR gate   C. OR gate   D. AND gate

PHYSICS HSSC–II

Time allowed: 2:35 Hours **Total Marks Sections B and C: 68**

NOTE: Answer any fourteen parts from Section 'B' and any two questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 42)

Q. 2   Answer any FOURTEEN parts. The answer to each part should not exceed 3 to 4 lines.   (14 x 3 = 42)

(i)   Electric lines of force never cross why?

(ii)   The potential is constant throughout a given region of space. Is the electric field zero or non-zero in this region? Explain.

(iii)   Is the filament resistance lower or higher in $500W, 220V$ light bulb than in a $100W, 220V$ bulb?

(iv)   What are the difficulties in testing whether the filament of a lighted bulb obeys Ohm's law?

(v)   What is meant by A.M. and F.M.?

(vi)   Show graphically the phase relationship between the current and the voltage across an inductor.

(vii)   Show that ϵ and $\frac{\Delta\emptyset}{\Delta t}$ have the same units.

(viii) Does the induced emf always act to decrease the magnetic flux through a circuit?

(ix)   What is meant by Hysteresis loss? How is it used in the construction of a transformer?

(x)   In a transformer there is no transfer of charge from the primary to the secondary coil. How is then power transferred?

(xi)   A sinusoidal current has r.m.s (effective) value of $10A$. What is the maximum or peak value?

(xii)   Which proton red, green or blue carries the most energy and momentum?

(xiii) If measurements show a precise position for electron. Can those measurements show precise momentum also? Explain.

(xiv)   Why a photo diode is operated in reverse biased state?

(xv)   How have the results of the special theory of relativity been applied to NAVSTAR navigation system?

(xvi)   How can the spectrum of hydrogen contain so many lines when hydrogen contains one electron?

(xvii) If an electron and a proton have the same de-Broglie wavelength. Which particle has greater speed?

(xviii) What do you mean by the term "Critical mass"?

(xix)   Which radiation dose would deposit more energy to the body?

(a) $10\ mGy$ to the hand   (b) $1\ mGy$ does to the entire body

SECTION – C (Marks 26)

Note: Attempt any TWO questions.   (2 x 13 = 26)

Q. 3   a.   Derive an expression for energy stored in a charged capacitor. Also calculate the energy density stored in any electric field.   **(3+2)**

b.   Explain how moving coil Galvanometer can be converted into: **(2+2)**
(i)   An Ammeter   (ii)   A Voltmeter

c.   What shunt resistance must be connected across a galvanometer of 50Ω resistance which gives full scale deflection with $2mA$ current so as to convert it into an ammeter of range $10A$?   **(4)**

Q. 4   a.   What are Transistors? How can we use transistor as an amplifier?   **(2+5)**

b.   What is a voltage gain of an amplifier?   **(2)**

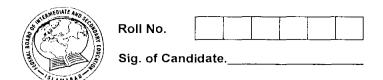**c.**   The current flowing into the base of the transistor is $100\mu A$. Find the collector current I_c, emitter current I_E and the ratio $\frac{I_C}{I_E}$, if the value of the current gain β is 100.   **(4)**

Q. 5   a.   What is Laser? Describe its principle and operation.   **(2+2+2)**

b.   What is Compton Effect? How was this phenomenon explained by A.H. Compton on the basis of the particle theory of light?   **(2+3)**

c.   The half life of $_{38}^{91}Sr$ is 9.70 hours. Find its decay constant.   **(2)**

Roll No. ☐☐☐☐☐☐

Sig. of Candidate._____

Answer Sheet No._____

Sig. of Invigilator._____

PHYSICS HSSC–II
SECTION – A (Marks 17)

Time allowed: 25 Minutes

| Version Number | 1 | 7 | 0 | 7 |

NOTE: Section–A is compulsory. All parts of this section are to be answered on the question paper itself. It should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Circle the correct option i.e. A / B / C / D. Each part carries one mark.

(i) Leptons are the particles that do not experience:
- A. Electric force
- B. Magnetic force
- C. Weak nuclear force
- D. Strong nuclear force

(ii) γ-rays can cause photoelectric emission when their energy is:
- A. Equal to $0.1\ Mev$
- B. Equal to $0.5\ Mev$
- C. Less than $0.1\ Mev$
- D. Greater than $0.1\ Mev$

(iii) The ratio of gravitational force F_g to the electrostatic force F_e between two electrons, the same distance apart is:
- A. 24×10^{12}
- B. 24×10^{-44}
- C. 9.8
- D. 24×10^{9}

(iv) The electric intensity near an infinite plate of positive charge will be:
- A. $\frac{q}{A}$
- B. $2\sigma\epsilon_0$
- C. $\frac{q}{\epsilon_0}$
- D. $\frac{\sigma}{2\epsilon_0}$

(v) The terminal potential difference of a battery of internal resistance r and electromotive force c is:
- A. $V_t = \frac{\epsilon - r}{r}$
- B. $V_t = \frac{\epsilon - r}{I}$
- C. $V_t = \epsilon + Ir$
- D. $V_t = \epsilon - Ir$

(vi) The accurate potential measuring device should be of:
- A. Neither very low nor very high
- B. Infinite resistance
- C. Very low resistance
- D. Very high resistance

(vii) The process of combining low frequency signal with a high frequency radio wave is called:
- A. Resonance
- B. Impedance
- C. Demodulation
- D. Modulation

(viii) According to Faraday's Law, emf induced in a circuit depends on:
- A. Change in magnetic flux
- B. Initial magnetic flux
- C. Maximum magnetic flux
- D. Rate of change of magnetic flux

(ix) In Compton scattering the change in the wavelength is maximum if:
- A. Angle of scattering is 180°
- B. Angle of scattering is zero
- C. Angle of scattering is 90°
- D. Angle of scattering is 60°

(x) The colour of light emitted by LED depends on:
- A. The amount of forward current
- B. The type of semiconductor material used
- C. Its forward bias
- D. Its reverse bias

(xi) The output of a two inputs OR gate is 0 only when its:
- A. Both inputs are 1
- B. Either input is 0
- C. Both inputs are 0
- D. Either input is 1

(xii) If an object moves with a velocity of light, its mass becomes:
- A. Some extent large
- B. Infinity
- C. Zero
- D. Very small

(xiii) The atom bomb is an example of:
- A. Uncontrolled nuclear fission
- B. Uncontrolled nuclear fusion
- C. Controlled nuclear fission
- D. Controlled nuclear fusion

(xiv) The existence of positron was discovered in the:
- A. Electromagnetic radiation
- B. Non-electromagnetic radiation
- C. Thermal radiation
- D. Cosmic radiation

(xv) In which region of electromagnetic spectrum of Hydrogen, the Balmer series lies?
- A. Ultraviolet
- B. X-rays
- C. Infrared
- D. Visible

(xvi) The rest mass of photon is:
- A. 1
- B. 0.5
- C. Infinity
- D. Zero

(xvii) The absorption power of a perfect black body is always:
- A. −1
- B. 100
- C. Zero
- D. 1

For Examiner's use only:

Total Marks: | 17 |

Marks Obtained: | |

PHYSICS HSSC-II

Time allowed: 2:35 Hours   **Total Marks Sections B and C: 68**

NOTE: Answer any fourteen parts from Section 'B' and any two questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 42)

Q. 2   Answer any FOURTEEN parts. The answer to each part should not exceed 3 to 4 lines.   (14 x 3 = 42)

(i)   Suppose you follow an electric field line due to a positive charge. Do the electric field and potential increase or decrease?

(ii)   Compare electric and gravitational forces.

(iii)   Is it possible to orient a current loop in a uniform magnetic field such that loop will not tend to rotate? Explain.

(iv)   If a charge particle moves in a straight line through some region of space, can you say that the magnetic field in the region is zero?

(v)   Name the device that will (a) permit flow of direct current but oppose the flow of A.C. current (b) permit flow of A.C. current but not that of the direct current.

(vi)   What is meant by A.M and F.M.

(vii)   Define elastic limit. Also write SI units.

(viii) What is the effect of forward and reverse biasing of a diode on the width of depletion region?

(ix)   A transformer steps down the voltage of $220V$ to $20V$ with the help of 20 turns on the secondary coil. What is the number of turns on the primary?

(x)   What do you understand by an equipotential surface in an electric field?

(xi)   Verify that an *ohm* × *farad* is equivalent to second.

(xii)   Photon A has twice the energy of photon B. What is the ratio of the momentum of A to momentum of B?

(xiii) What factors make a fusion reaction difficult to achieve?

(xiv)   If an electron and proton have the same de-Broglie wavelength, which particle has greater speed?

(xv)   What happens to a total radiation from a black body if the absolute temperature is doubled?

(xvi)   Is energy conserved when an atom emits a photon of light?

(xvii) Why ordinary silicon diodes do not emit light?

(xviii) What is photon?

(xix)   Show graphically the phase relationship between the current and voltage across an inductor.

SECTION – C (Marks 26)

Note: Attempt any TWO questions.   **(2 x 13 = 26)**

Q. 3   a.   What is a capacitor and its capacitance? Discuss the factors upon which capacitance of a capacitor depends. Obtain the expression for the dielectric constant.   **(1+1+6)**
b.   Describe the change in magnetic field inside a solenoid carrying a steady current I, if: **(2.5+2.5)**
   i)   The length of the solenoid is doubled, but the number of turns remains same
   ii)   The number of terms is doubled but length remains same

Q. 4   a.   What is wheat stone bridge? Explain and prove the principle of wheat stone bridge? How it can be used to find the unknown resistance of a wire?   **(1+3+2)**
b.   A platinum wire has resistance of 10Ω at 0 °C and 20Ω at $273°C$. Find the value of temperature co-efficient of resistance of platinum.   **(4)**
c.   State and explain Kirchhoff's voltage rule.   **(3)**

Q. 5   a.   What is an uncertainty principle? How does uncertainty principle explain that electrons cannot exist inside the nucleus?   **(3+4)**
b.   What is Hysteresis loop? Write down its main features and its uses.   **(1+3+2)**