Time allowed: 25 Minutes

| Version Number | 4 | 0 | 8 | 1 |

Note: Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which 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 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

1) When a particle carrying a charge of 2e falls through a potential difference of 3 V, then the energy acquired by the particle is:
   A. $1.51 \times 10^{-19} J$ B. $3.03 \times 10^{-19} J$ C. $9.6 \times 10^{-19} J$ D. $1.67 \times 10^{-27} J$

2) The ratio of electric field intensity due to an infinite sheet of charge and two oppositely charged parallel plates is:
   A. 1:1   B. 1:2   C. 2:1   D. 2:3

3) Three resistors of 10Ω, 20Ω and 30Ω are connected in series to a potential difference source of 60 V. The current across 30Ω resistor is:
   A. $\frac{1}{2}A$ B. $1 A$ C. $2 A$ D. $4 A$

4) Which of the following instruments can measure and compare potential difference accurately?
   A. Ammeter   B. Voltmeter   C. Potentiometer   D. Ohmmeter

5) The Lorentz force in combined electric and magnetic field is:
   A. $(q + V\vec{B})$ B. $(q\vec{E} + qV^2)$ C. $q[\vec{E} + (\vec{V} \times \vec{B})]$ D. $\frac{q\vec{E}}{q(\vec{V} \times \vec{B})}$

6) Which one of these equation is valid for a transformer?
   A. $\frac{V_s}{V_p} = \frac{I_s}{I_p}$ B. $\frac{V_s}{V_p} = \frac{N_p}{N_s}$ C. $\frac{V_s}{V_p} = \frac{I_p^2}{I_s^2}$ D. $\frac{V_s}{V_p} = \frac{N_s}{N_p}$

7) A conductor of length 100 cm is dragged at right angle into a uniform magnetic field, $B = 0.5T$ with a speed of $500 \, cm/s$. The motional emf induced is:
   A. 0.25 V   B. 2.5 V   C. 5 V   D. 250 V

8) One henry is equal to:
   A. $\frac{VS}{A}$ B. $\frac{VA}{S}$ C. $\frac{AS}{V}$ D. $\frac{Nm}{A}$

9) AC generator works on the principle of:
   A. Ampere's law   B. Gauss's law
   C. Self-Induction   D. Electromagnetic Induction

10) In R-L series circuit, $R = 3\Omega$ and $X_L = 4\Omega$. The impedance of the circuit is:
    A. 2.65Ω B. 5Ω C. 7Ω D. 25Ω

11) A maximum force of 100 N causes an extension of 0.5 cm in a wire. The strain energy stored is:
    A. 0.125 J   B. 0.25 J   C. 0.5 J   D. 5 J

12) The current flowing into the base of a transistor is $100\mu A$ and current gain β is 100; then the collector current I_c will be:
    A. 0.1 mA   B. 1 mA   C. 10 mA   D. 100 mA

13) In pair production process the creation of two particles electron and positron having _____ occurs.
    A. Same mass and same charge   B. Same mass and opposite charge
    C. Different mass and same charge   D. Different mass and opposite charge

14) The de-Broglie wavelength of tennis ball of 6.63 g moving with $100 \, cm/s$ is:
    A. $10^{-36} m$ B. $10^{-34} m$ C. $10^{-31} m$ D. $10^{-27} m$

15) The shortest wavelength radiation in Lyman series have wavelength equal to:
    A. $\frac{3}{4}R_H$ B. R_H C. $\frac{1}{R_H}$ D. $\frac{2}{R_H}$

16) The force responsible for keeping the atmosphere and seas fixed to the planet is:
    A. Gravitational force   B. Weak nuclear force
    C. Electromagnetic force   D. Strong nuclear force

17) Which junction acts as a forward bias in normal operation of a transistor?
    A. Base-emitter   B. Collector-base
    C. Collector-emitter   D. Base-base

PHYSICS HSSC–II

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

NOTE: Answer any Seven parts each from Section 'B' and 'C' and any two questions from Section 'D' 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 21)

(Chapter 12 – 16)

Q. 2   Answer any SEVEN parts. All questions carry equal marks.   **(7 x 3 = 21)**

(i)   Briefly explain if the electrons tend to go in the region of high potential or low potential.

(ii)   Determine the electric field at the position $\vec{r} = (4\hat{i} + 3\hat{j})m$ caused by a point charge $q = 5 \times 10^{-6}c$ placed at the origin.

(iii)   When the emf source of strength 10 V, gives balanced point at 25 cm. What will be the balance point for another emf source of strength 20 V in case of potentiometer?

(iv)   Explain why the terminal potential difference of a battery decreases when the current drawn from it is increased?

(v)   Suppose that a charge q is moving in a uniform magnetic field with a velocity v. Why is there no work done by the magnetic force that acts on the charge q ?

(vi)   Determine the value of magnetic field B, due to a current carrying solenoid, by applying Ampere's Circuital law i.e. $B = \mu_o nI$

(vii)   Is it possible to change both the area of the loop and the magnetic field passing through the loop and still not have an induced emf in the loop?

(viii)   A square coil of side 16cm has 200 turns and rotates in a uniform magnetic field of magnitude 0.05 T. If the peak emf is 12 V, what is the angular velocity of the coil?

(ix)   In an R-L circuit, will the current lag or lead the voltage? Illustrate your answer by a vector diagram.

(x)   Explain the conditions under which electromagnetic waves are produced from a source.

SECTION – C (Marks 21)

(Chapter 17 – 21)

Q. 3   Answer any SEVEN parts. All questions carry equal marks.   **(7 x 3 = 21)**

(i)   How are many crystals systems based on the geometrical arrangement of their atoms? List any four systems.

(ii)   What is meant by para, dia and ferromagnetic substances?

(iii)   Find the gain of the OP-AMP for inverting and non-inverting; if $R_1 = 10\ k\Omega$ and $R_2 = 100\ k\Omega$.

(iv)   What is a photo diode? How does it operate?

(v)   If the speed of light were infinite, what would the equations of special theory of relativity be reduced to?

(vi)   Which photon, red, green or blue carries the most?   a.   Energy   b.   Momentum

(vii)   What is CAT-Scanner? How does it work?

(viii)   Why is Laser action possible only in stimulated emission? Explain briefly.

(ix)   Briefly explain how α and β –particles may ionize an atom without directly hitting the electrons?

(x)   What is a radioactive tracer? Describe one application each in medicine and agriculture?

SECTION – D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks.   **(2 x 13 = 26)**

Q. 4   a.   State and explain Coulomb's law with the help of diagrams.   **(1+4+1)**
       b.   How is a galvanometer converted into an ammeter and voltmeter?   **(2+2)**
       c.   A charge of 90 C passes through a wire in 1 hour and 15 minutes. What is the current in the wire? **(03)**

Q. 5   a.   Calculate the impedance of R-C and R-L series circuits by drawing their circuit diagrams.   **(3+3)**
       b.   What is Mutual Induction? Explain how induced emf is produced in the secondary coil.   **(1+3)**
       c.   What is meant by strain energy? How can it be determined from the force-extension graph?   **(1+2)**

Q. 6   a.   What is Compton's effect? How was the phenomena explained by A.H Compton on the basis of particle theory of light. Explain with diagram.   **(1+4+1)**
       b.   How is transistor used as a switch? Explain with diagrams.   **(1+3)**
       c.   How Bohr's 2nd postulate was interpreted by de-Broglie? Explain with diagram.   **(1+2)**