# PHYSICS HSSC–II

## SECTION – A (Marks 17)

**Time allowed: 25 Minutes**

NOTE: Section–A is compulsory and comprises pages 1–2. 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) The Electric intensity near an infinite plate of positive charge will be_____.

A. $q / \varepsilon_0$

B. $\sigma / 2\varepsilon_0$

C. $q / A$

D. None of these

(ii) One Electron Volt is equal to_____

A. $6.25 \times 10^{18} \, Joule$

B. $6.25 \times 10^{18} \, Joule$

C. $1.6 \times 10^{-19} \, Joule$

D. $1.6 \times 10^{19} \, Joule$

(iii) Ceramic materials exhibit super-conductivity at_____.

A. $0^0 C$

B. 273 K

C. 60 K

D. 30 K

(iv) Which electric bulb has the least resistance?

A. 60 watts

B. 100 watts

C. 200 watts

D. 500 watts

(v) The grid in CRO_____.

A. Controls the number of electrons accelerated by anodes

B. Controls the brightness of the spot fall on the screen

C. Both A and B

D. Deflects the beam of electrons

(vi) The frequency of A.C. used in Pakistan is_____.

A. 60 CPS

B. 50 CPS

C. 100 CPS

D. 120 CPS

(vii) Potentiometer can be used as_____.

A. Ohm meter

B. Ammeter

C. Galvanometer

D. Potential Divider

(viii) To convert a Weston-Type galvanometer into voltmeter, the series resistance is given by_____.

A. $R_h = \dfrac{V}{I_g} + R_g$

B. $R_h = \dfrac{V}{I_g} - R_g$

C. $R_h = \dfrac{V}{R_g} - I_g$

D. $R_h = \dfrac{V}{R_g} + I_g$

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(ix)    N-Type germanium is obtained by doping intrinsic germanium with_____.

    A.    Tetravalent impurity atom        B.    Trivalent impurity atom

    C.    Pentavalent impurity atom        D.    Hexavalent impurity atom

(x)    Emission of electron by metals on heating is called_____.

    A.    Secondary Emission        B.    Field effect

    C.    Photoelectric Emission        D.    Thermionic Emission

(xi)    Which of the following is **NOT** basic operation of Boolean variables?

    A.    YES operation        B.    NOT operation

    C.    AND operation        D.    OR operation

(xii)    When X-rays are passed through successive aluminum sheets, their hardness_____.

    A.    Decreases        B.    Increases

    C.    Remains the same        D.    None of these

(xiii)    If the ionization energy of hydrogen atom is 13.6 eV, its ionization potential will be_____.

    A.    · 13.6 V        B.    136.0 V

    C.    3.4 V        D.    None of these

(xiv)    One amu is equal to_____.

    A.    931 MeV        B.    9.31 MeV

    C.    93.1 MeV        D.    0.931 MeV

(xv)    Cobalt 60 emits $\gamma$ - rays of energy_____

    A.    117 MeV        B.    11.7 MeV

    C.    1.17 MeV        D.    1.17 BeV

(xvi)    Which of the following statements is **CORRECT**?

    A.    Moderators slow down the neutrons.

    B.    Moderators bring the neutrons to rest.

    C.    Moderators absorb the neutrons.

    D.    Moderators reflect the neutrons.

(xvii)    The half life of radioactive element is_____.

    A.    $T_{\frac{1}{2}} = \dfrac{0.693}{\lambda}$        B.    $T_{\frac{1}{2}} = 1.43\lambda$

    C.    $T_{\frac{1}{2}} = 0.693\lambda$        D.    None of these

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**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:    Sections B and C comprise pages 1-2. 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    Attempt any FOURTEEN parts. The answer to each part should not exceed 3 to 4 lines.     ( 14 x 3 = 42 )**

(i)      How can you identify that which plate of a capacitor is positively charged?

(ii)     If a point charge q of mass m is released in a non-uniform electric field with field lines pointing in the same direction, will it make a rectilinear motion?

(iii)    Why does the resistance of a conductor rise with temperature?

(iv)     What is Wheatstone Bridge? How can it be used to determine an unknown resistance?

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

(vi)     You are asked to design a solenoid that will give a magnetic field of 0.10 T, yet the current must not exceed 10.0 A. Find the number of turns per unit length that the solenoid should have.

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

(viii)   A metal rod of length 25 cm is moving at a speed of 0.5 $ms^{-1}$ in a direction perpendicular to a 0.25 T magnetic field. Find the emf produced in the rod.

(ix)     A circuit contains an iron-cored inductor, a switch and D.C. source arranged in series. The switch is closed and after an interval reopened. Explain why a spark jumps across the switch contacts.

(x)      At what frequency will an inductor of 1.0 H have a reactance of $500\Omega$?

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

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

(xiii)   In a certain circuit, the transistor has a collector current of 10 mA and a base current of 40 $\mu A$. What is the current gain of the transistor?

(xiv)    A beam of red light and a beam of blue light have exactly the same energy. Which beam contains the greater number of photons?

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

(xvi)    Find the speed of the electron in the first Bohr orbit.

(xvii)   A tungsten target is struck by electrons that have been accelerated from rest through 40 kV potential difference. Find the shortest wavelength of the bremsstrahlung radiation emitted?

(xviii)  The radioactive element $_{88}^{226}Ra$ has a half-life of $1.6 \times 10^3$ years. Since the Earth is about 5 billion years old, how can you explain why we still can find this element in nature?

(xix)    Why are heavy nuclei unstable?

## SECTION – C (Marks 26)

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

**Q. 3** **a.** What is temperature co-efficient of Resistance and Resitivity? Derive the equations. (06)

**b.** The resistance of an iron wire at $0^0 C$ is $1 \times 10^4 \Omega$. What is the resistance at $500^0 C$ if the temperature co-efficient of iron is $5.2 \times 10^{-3} K^{-1}$? (05)

**c.** Define electron Volt and find its relation with joule. (02

**Q. 4** **a.** Describe RLC series circuit. Derive relation for resonance frequency. Also give any four properties of series resonance. (07)

**b.** What is the resonant frequency of a circuit which includes a coil of inductance 2.5 H and capacitance of $40 \mu F$? (03

**c.** Write a short note on three phase AC Supply. (03

**Q. 5** **a.** What do you know about the Biological effect of radiation? Write in detail. (05

**b.** A 75 kg person receives a whole body radiation dose of 24 m-rad, delivered by $\alpha$ particles for which RBE factor is 12. Calculate: (05

(i) The absorbed energy in joules

(ii) The equivalent dose in rem.

**c.** Write a short note on basic forces of nature. (03

Sig. of Candidate._____     Sig. of Invigilator._____

# PHYSICS HSSC–II

## SECTION – A (Marks 17)

**Time allowed: 25 Minutes**

NOTE: Section–A is compulsory and comprises pages 1–2. 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)    The ratio of gravitational force $F_g$ to the electrostatic force $F_e$ between two electrons, the same distance apart is _____.

    A.    9.8                      B.    $24 \times 10^9$

    C.    $24 \times 10^{12}$            D.    $24 \times 10^{-44}$

(ii)    The SI units of relative permittivity $\varepsilon_r$ are _____

    A.    $coul^2 / N - m^2$        B.    $N - m^2 / coul^2$

    C.    $N - m / coul$            D.    No units

(iii)    The magnetic field at the interior points of a toroid of radius r and number of turns N and each turn carrying a current $I$ is_____.

    A.    $B = \dfrac{\mu_0 NI}{2\pi r^2}$        B.    $B = \dfrac{\mu_0 NI}{2\pi r}$

    C.    $B = \dfrac{\mu_0 NI^2}{2\pi r}$        D.    $B = \dfrac{\mu_0 NI}{4\pi r}$

(iv)    Terminal potential difference of a battery of internal resistance r and electromotive force $\varepsilon$ is_____.

    A.    $V_t = \varepsilon + Ir$         B.    $V_t = \varepsilon - Ir$

    C.    $V_t = \dfrac{\varepsilon - r}{r}$         D.    $V_t = \dfrac{\varepsilon - r}{I}$

(v)    Self inductance of a long solenoid is given by_____.

    A.    $\mu_0 n^2 \ell A$           B.    $\dfrac{\mu_0 n^2 A}{\ell}$

    C.    $\mu_0 N\ell^2 A$           D.    None of these

(vi)    The peak value of A.C voltage is $2\sqrt{2}$ volts. Its rms or effective value will be _____.

    A.    $\sqrt{2}$ volts           B.    2 volts

    C.    $\dfrac{1}{\sqrt{2}}$ volts         D.    None of these

(vii)    Which of the following statements is **NOT CORRECT**?

    A.    An ammeter is moving coil galvanometer of low resistance.

    B.    A voltmeter is moving coil galvanometer of high resistance.

    C.    The terminals of an ammeter are made of thick bare metal while that of a voltmeter are light and well insulated.

    D.    A voltmeter is always connected in series with the circuit while an ammeter is always connected in parallel to a circuit.

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(viii)  The accurate potential measuring device should be of_____.

    A.   Very low resistance

    B.   Very high resistance

    C.   Neither very low nor very high resistance

    D.   Infinite resistance

(ix)  Which of the following electromagnetic waves have the highest frequency and shortest wavelength?

    A.   X-rays              B.   Ultraviolet rays

    C.   $\gamma$-rays            D.   Cosmic rays

(x)  Which of the following is **NOT** a Semi-conductor?

    A.   Silicon            B.   Germanium

    C.   Gallium Arsenide     D.   Copper

(xi)  Relativistic velocity is of the order of_____.

    A.   1/15$^{th}$ of the velocity of light     B.   1/20$^{th}$ of the velocity of light

    C.   1/10$^{th}$ or more of the velocity of light     D.   All of these

(xii)  The Compton shift in wavelength is given by_____.

    A.   $\lambda_c = \dfrac{h}{m_o c}(1 - \cos\phi)$     B.   $\lambda_c = \dfrac{h}{m_o c^2}(1 + \cos\phi)$

    C.   $\lambda_c = \dfrac{hc}{m_o}(1 - \cos\phi)$     D.   None of these

(xiii)  Which of the following is the innermost shell?

    A.   M-shell          B.   K-shell

    C.   L-shell          D.   N-shell

(xiv)  Which of the following statements is **INCORRECT**?

    A.   X-rays can damage the living tissues.

    B.   X-rays can cause ionization of atoms through photo ionization.

    C.   X-rays can be diffracted by crystal lattice.

    D.   X-rays cannot cause photoelectric effect.

(xv)  The atom bomb is an example of_____

    A.   Controlled nuclear fission     B.   Controlled nuclear fusion

    C.   Uncontrolled nuclear fission     D.   Uncontrolled nuclear fusion

(xvi)  $\gamma$- rays can cause photoelectric emission when their energy is_____.

    A.   Less than 0.1 MeV     B.   Greater than 0.1 MeV

    C.   Equal to 0.1 MeV     D.   None of these

(xvii)  Half-life of Argon-40 is_____.

    A.   13 million years     B.   13 billion years

    C.   1.3 billion years     D.   13.3 million years

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                      **Total Marks:**     | 17 |

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# PHYSICS HSSC–II

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**NOTE:** Sections B and C comprise page 1-2. 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**   **Attempt any FOURTEEN parts. The answer to each part should not exceed 3 to 4 lines.**    **( 14 x 3 = 42 )**

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

(ii)    Electric lines of force never cross. Why?

(iii)   A potential difference is applied across the ends of a copper wire. What is the effect on the drift velocity of free electron by:

   a.   Increasing the potential difference.

   b.   Decreasing the length and the temperature of the wire.

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

(v)     Why does the picture on a TV screen become distorted when a magnet is brought near the screen?

(vi)    What should be the orientation of a current carrying coil in a magnetic field so that torque acting upon the coil is:

   a.   Maximum

   b.   Minimum

(vii)   Does the induced emf in a circuit depend on the resistance of the circuit? Does the induced current depend on the resistance of the circuit?

(viii)  a.   Can a step-up transformer increase the power level?

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

(ix)    A sinusoidal current has rms(effective) value of 10 A. What is the maximum or peak value?

(x)     A 100 $\mu F$ capacitor is connected to an alternating voltage of 24 V and frequency 50 Hz. Calculate:

   a.   The reactance of the capacitor

   b    The current in the circuit

(xi)    Write a short note on Super-conductors.

(xii)   The anode of a diode is 0.2 V positive with respect to its cathode. Is it forward biased?

(xiii)  Why is the base current in a transistor very small?

(xiv)   What happens to total radiation from a blackbody if the absolute temperature is doubled?

(xv)    Will higher frequency light eject greater number of electrons than low frequency light?

(xvi)   What are the three advantages of lasers over ordinary light?

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

(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.   1mGy dose to the entire body

**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 stored in an Electric field. (3+3)

**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 $50.0\,\Omega$ resistance which gives

full scale deflection with 2.0 m A current, so as to convert it into an ammeter of range 10.0A? (03)

**Q. 4**  **a.** What is Compton Effect? How was this phenomenon explained by A.H. Compton on the basis of

the particle theory of light? (2+4

**b.** X-rays of wavelength 22 pm are scattered from a carbon target. The scattered radiation being

viewed at $85^{0}$ to the incident beam. What is Compton shift? (04

**c.** Describe the Digital system. (03

**Q. 5**  **a.** What is Laser? Describe its principle and operation. (06

**b.** What are Isotopes? Describe Aston Mass Spectrograph. How can it be used for detection of

isotopes?. (05

**c.** The half life of $_{38}^{91}Sr$ is 9.70 hours. Find its decay constant. (02