

PHYSICS HSSC-II

SECTION – A (Marks 17)

Time allowed: 25 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed.

Do not use lead pencil.

حصہ اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر ناظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لید پنسل کا استعمال ممنوع ہے۔

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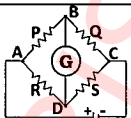
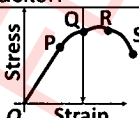
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Answer Sheet No. _____

Invigilator Sign. _____

Fill the relevant bubble against each question according to curriculum: Candidate Sign. _____

Question	A	B	C	D	A	B	C	D
1. Which of the following CANNOT be accelerated using electric field?	Proton	Ion	Electron	Neutron	☐	☐	☐	☐
2. According to Quantum theory, increasing the brightness of a beam of light without changing the color will increase:	The speed of photons	The frequency of photons	The number of photons	The energy of each photon	☐	☐	☐	☐
3. Primary function of transformer is to change:	The direction of alternating current	The level of alternating voltage	Alternating current into direct current	Mechanical energy into heat energy	☐	☐	☐	☐
4. A forward biased PN Junction offers:	Very high resistance	Very low resistance	Infinite resistance	Zero resistance	☐	☐	☐	☐
5. Which is NOT the characteristic of LASER?	Intense	Multi-directional	Monochromatic	Coherent	☐	☐	☐	☐
6. The resulting nucleus in given reaction is: ${}^1_0n + {}^{137}_{56}\text{Ba} \longrightarrow \text{_____} + \gamma$	${}^{136}_{56}\text{Ba}$	${}^{138}_{57}\text{La}$	${}^{138}_{56}\text{Ba}$	${}^{138}_{55}\text{Cs}$	☐	☐	☐	☐
7. Compton effect proves the:	Particle nature of radiations	Wave nature of particle	Wave nature of radiations	Dual nature of particle	☐	☐	☐	☐
8. Which is an <i>application</i> of Mutual Induction?	AC generator	Transformer	Radio choke	DC generator	☐	☐	☐	☐
9. The temperature at which a ferromagnetic material becomes paramagnetic is called:	Neutral Point	Absolute Point	Inflection Point	Curie Point	☐	☐	☐	☐
10. SI unit of capacitive reactance is:	Ohm	Mho	Farad	Henry	☐	☐	☐	☐
11. In which of the following conditions, the galvanometer shows zero deflection? 	$V_B = V_D$	$V_B < V_D$	$V_B > V_D$	$V_B = 2V_D$	☐	☐	☐	☐
12. Due to electric polarization of dielectric, the charge storing capacity of capacitor:	Remains the same	Becomes zero	Decreases	Increases	☐	☐	☐	☐
13. In the given stress-strain curve which point is known as yield point? 	R	S	P	Q	☐	☐	☐	☐
14. Which of the following series lies in the ultraviolet region?	Bracket series	Pfund series	Lyman series	Balmer series	☐	☐	☐	☐
15. Which one belongs to Hadrons?	Photon	Pion	Electron	Neutrino	☐	☐	☐	☐
16. Coulomb force between two electric charges is 120N. If the distance between the charges is doubled, the coulomb force will be:	15 N	30 N	60 N	40 N	☐	☐	☐	☐
17. A particle having the mass of an electron and charge of proton is called:	Antiproton	Electron	Photon	Positron	☐	☐	☐	☐

—2HA-I 25004 (B)—

$\Delta K.E = q\Delta V$
 $\frac{1}{\lambda} = R_H \left[\frac{1}{p^2} - \frac{1}{n^2} \right]$
 $R_H = 1.0974 \times 10^7 \text{ m}^{-1}$
 $\varepsilon = \frac{\Delta \phi}{\Delta t}$
 $X_c = \frac{1}{2\pi fC}$
 $F = \frac{Kq_1q_2}{r^2}$



PHYSICS HSSC-II

Time allowed: 2:35 Hours

Total Marks Sections B and C: 68

SECTION – B (Marks 42)

Q. 2 Answer the following parts briefly.

(14x3=42)

(i)	By coulomb's law prove that the force between two-point charges is reduced in a medium other than free space.	03	OR	Briefly illustrate the variation of binding energy per nucleon with the mass number. Also draw the graph.	1+2
(ii)	Write three postulates of Bohr's atomic model.	03	OR	Differentiate 'statically induced emf' and 'dynamically induced emf'. Illustrate your answer with example.	03
(iii)	Write three sources of emf by clearly specifying the energy conversion in each.	1x3	OR	If an electron and a proton have the same de-Broglie wavelength, which particle has greater speed? Justify.	1+2
(iv)	When is Compton shift maximum? Prove it.	03	OR	A metal sphere of radius 15cm has a positive charge of +3.0μC at its centre. Find the electric field strength at a distance of 27cm from the centre of sphere.	03
(v)	How can a galvanometer be converted into ammeter? Draw diagram as well.	2+1	OR	A 300kg load produces an extension 0.2cm in a steel wire having length 2.0m and cross-sectional area 15cm² . Determine: a). Stress b). Strain c). Young's Modulus for Steel (Y)	03
(vi)	What are the causes of power losses in Transformer? Write any three.	03	OR	A pure inductor is connected across a 10V, 200Hz AC Supply and the current flowing through it is measured as 0.4A . Determine the value of its inductance.	03
(vii)	What is meant by magnetic flux? State its unit.	2+1	OR	In which combination of capacitors the energy stored is maximum, parallel or series? Justify.	1+2
(viii)	Calculate the longest and the shortest wavelengths for Paschen series.	03	OR	Calculate the current through a single loop circuit if ε=120V , R=1000Ω and internal resistance r=0.01Ω .	03
(ix)	Briefly describe the working of rheostat as a potential divider circuit with diagram.	1.5+1.5	OR	Briefly describe the operation of NPN transistor.	03
(x)	Why the emitter base junction is forward biased and collector base junction is reverse biased?	03	OR	Distinguish between emf and potential difference. (Any three points)	03
(xi)	Briefly explain the role of moderators and control rods in nuclear reactor.	1.5+1.5	OR	What is Coercivity? Why coercive force of Tungsten steel is greater than iron?	1+2
(xii)	Briefly explain the magnetic force acting on a stationary charged particle placed in a uniform magnetic field.	03	OR	What are superconductors? Write down their four applications.	1+2
(xiii)	In RL series circuit, will the current Lag or Lead the voltage? Illustrate your answer by drawing waveforms and phasor diagrams.	1+2	OR	What is Geiger-Muller counter? Briefly describe its working.	1+2
(xiv)	Deduce the expression for maximum output power delivered to a load resistance.	03	OR	Write any three factors affecting the magnitude of the induced emf.	03

SECTION – C (Marks 26)

Note: Attempt the following questions.

Q.3	Explain the concept of Black body radiation with the help of examples. Describe how energy is distributed over the wavelength range for different values of source temperature. Also draw its curves.	2+4+1	OR	What is AC generator? How is an AC generator used to produce an alternating current? Explain with the help of graph between instantaneous emf and time.	2+3+2
Q.4	Construct phasor diagrams and impedance diagrams of an R-L-C series circuit. Determine formula for impedance, phase angle and power factor.	2+5	OR	What is mass spectrograph? Explain its working. Also show that radius of circular path of an isotope depends upon its mass.	1+3+3
Q.5	Demonstrate charging and discharging of a capacitor through a resistance. Elaborate your answer with the help of Q-t graphs.	3+3	OR	What are X-rays? How inner shell transitions in heavy elements result into emission of characteristic X-rays? Explain and draw diagrams.	1+3+2
Q.6	State Ampere's law. Apply it to obtain a quantitative expression for the magnetic field inside a solenoid.	2+4	OR	What is rectification? Describe the use of diodes for half and full wave rectification with circuit diagrams.	2+2+2

— 2HA-I 25005(B) —

$$E = K \frac{q}{r^2}$$

$$V_t = \varepsilon - Ir$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$I = \frac{V}{X_L}$$

$$W = \frac{1}{2} CV^2$$

$$h = 6.626 \times 10^{-34} Js$$

$$X_L = 2\pi fL$$

$$K.E_{\max} = \frac{hc}{\lambda} - \phi$$

$$X_C = \frac{1}{2\pi fC}$$

$$Y = \frac{F/A}{\Delta L/L}$$

$$\Delta\lambda = \frac{\lambda}{m_0c} (1 - \cos\theta)$$

$$\lambda = \frac{h}{mv}$$

$$R_H = 1.0974 \times 10^7 m^{-1}$$

$$\frac{1}{\lambda} = R_H \left[\frac{1}{p^2} - \frac{1}{n^2} \right]$$

$$F = I(\vec{L} \times \vec{B})$$

$$Stress = \frac{F}{A}$$

$$c = 3 \times 10^8 ms^{-1}$$

$$K = 9 \times 10^9 Nm^2C^{-2}$$

$$Strain = \frac{\Delta L}{L}$$



PHYSICS HSSC-II

SECTION – A (Marks 17)

Time allowed: 25 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent.

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Do not use lead pencil.

حصہ اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر ناظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

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Answer Sheet No. _____

Invigilator Sign. _____

Fill the relevant bubble against each question according to curriculum: Candidate Sign. _____

Question	A	B	C	D	A	B	C	D
1. Which one belongs to Lepton's group?	Electron	Proton	Neutron	Pion	☐	☐	☐	☐
2. The unit of electric field intensity $\vec{E}$ is:	Vm	NC^{-2}	Vm^{-1}	NmA^{-1}	☐	☐	☐	☐
3. Capacitance of a capacitor can be increased by:	Using battery of high potential	Increasing distance between the plates	Decreasing area of plates	Inserting dielectric between the plates	☐	☐	☐	☐
4. Use Kirchhoff's first law to deduce the value of Current I in figure:	4A	1A	2A	3A	☐	☐	☐	☐
5. The correct relationship between ε and V_t for a closed circuit is:	$\varepsilon = V_t - Ir$	$\varepsilon = V_t$	$\varepsilon > V_t$	$\varepsilon < V_t$	☐	☐	☐	☐
6. Ohm-meter is the SI unit of:	Resistivity	Resistance	Conductivity	Conductance	☐	☐	☐	☐
7. Lenz's law is in accordance with the law of conservation of:	Mass	Charge	Momentum	Energy	☐	☐	☐	☐
8. Primary function of transformer is to change:	The level of alternating voltage	Alternating current into direct current	Mechanical energy into heat energy	The direction of alternating current	☐	☐	☐	☐
9. Magnetic flux will be minimum if the angle between magnetic field strength and area vector is:	90°	0°	45°	60°	☐	☐	☐	☐
10. At high frequency in an inductive circuit, the current will be:	Infinite	Large	Small	Zero	☐	☐	☐	☐
11. Identify the diamagnetic material:	Copper	Aluminium	Cobalt	Iron	☐	☐	☐	☐
12. In photoelectric effect, which factor increases by increasing the intensity of incident photon?	Stopping potential	Work function	K.E of electrons	Number of photons	☐	☐	☐	☐
13. The conversion of an alternating current into direct current is called:	Rectification	Amplification	Resolution	Magnification	☐	☐	☐	☐
14. An electron in a hydrogen atom is in its ground state. The minimum energy required to ionize it is:	1.5 ev	13.6 ev	3.4 ev	0.1 ev	☐	☐	☐	☐
15. Initial quantity of a uranium sample is 400g. After 3 rd half life how much uranium will be left?	25 g	50 g	100 g	200 g	☐	☐	☐	☐
16. Positron and electron annihilate into:	One γ -ray photon	α - rays	Two γ - ray photons	X-rays	☐	☐	☐	☐
17. Peak value of an AC voltage is 300 V, its rms value is:	212V	300V	220V	320V	☐	☐	☐	☐

—2HA-I 25004 (D)—

$\sum I = 0$ $\Delta K.E = q\Delta V$ For $t = nT_1$, $N = \left(\frac{1}{2}\right)^n \times N_0$ $\varepsilon = \frac{\Delta\phi}{\Delta t}$ $\phi = \vec{B} \cdot \vec{A}$ $E = \frac{F}{q} = \frac{\Delta V}{\Delta r}$

$V_m = \sqrt{2}V_{rms}$ $X_L = 2\pi fL$ $E_n = \frac{E_0}{n^2}$, $E_0 = 13.6ev$



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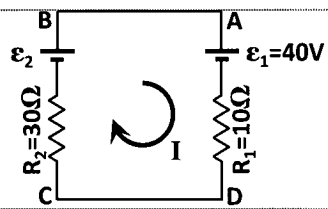
Time allowed: 2:35 Hours

Total Marks Sections B and C: 68

SECTION – B (Marks 42)

Q. 2 Answer the following parts briefly.

(14x3=42)

(i)	Distinguish between soft and hard magnetic materials by drawing hysteresis curves.	03	OR	Three arms of a Wheatstone bridge are 75Ω each. What is the resistance of fourth arm?	03	
(ii)	Under what two conditions the terminal potential difference and electromotive force give the same values?	03	OR	Which capacitor stores more amount of charge, a $100\mu F$ capacitor charged to $200V$ or a $200\mu F$ capacitor charged to $100V$?	03	
(iii)	Write impedance equation for RLC Series circuit. What can be stated about impedance and current in a circuit at resonance condition?	03	OR	What is meant by the term ' back emf ' in any electric motor operation?	03	
(iv)	Will higher frequency light eject a higher number of electrons than low frequency light? Justify.	1+2	OR	Briefly describe a circuit which will give continuously varying potential.	03	
(v)	An electron and a proton are projected with same velocity normal to the magnetic field, which one will undergo greater deflection? And why?	1+2	OR	Write any three results of special theory of relativity.	03	
(vi)	Calculate longest and shortest wavelengths for Paschen series.	1.5+1.5	OR	What happens to the atomic number and mass number of a nucleus that emits γ -ray photons?	03	
(vii)	What is self-inductance? Write its SI unit. Enlist two factors affecting the inductance of a coil.	03	OR	According to Stephen-Boltzmann law what will be the effect on the intensity of radiation emitted by black body when its absolute temperature is doubled?	03	
(viii)	How does thermo emf vary with temperature for copper-iron thermocouple? Also draw the graph.	2+1	OR	In an RC-Circuit, will the current lag or lead the voltage? Illustrate by drawing waveform and phasor diagram.	03	
(ix)	The value in Amperes of an alternating current is given by an equation $I=2\sin(50\pi t)$. What is the peak value of current? What is the frequency(f) of AC supply?	03	OR	Differentiate between conductors and semi-conductors on the basis of energy band theory.	03	
(x)	If a person swallows an α -particle and a β -particle, which would be more dangerous? Justify.	03	OR	Differentiate between N-type semi-conductors and P-type semi-conductors.	03	
(xi)	Calculate the voltage ϵ_2 in the circuit by using Kirchhoff's Voltage Law (KVL) when $I=0.2A$.		03	OR	Why in a transistor: a. The base is thin and lightly doped? b. The collector is large in size?	1.5+1.5
(xii)	A metal sphere of radius 20cm has a positive charge of $+2.0\mu C$ at its centre. Find the electric field strength at a distance of 25cm from the centre of sphere?	03	OR	If a transformer is connected to a steady (DC) supply, no emf is induced across the secondary coil. Why?	03	
(xiii)	What is population inversion? Why can LASER action NOT occur without population inversion between atomic levels?	1.5+1.5	OR	Briefly explain following terms: a. Super-conductors b. Critical temperature	2+1	
(xiv)	Briefly explain the magnetic force acting on a stationary charged particle placed in a uniform magnetic field.	03	OR	Show that the electric field at a point is given by the negative of potential gradient at that point.	1+2	

SECTION – C (Marks 26)

Note: Attempt the following questions.

Q.3	State Gauss's law. Draw and find Electric field due to a conducting plate of infinite size having positive charge.	2+5	OR	What is mass spectrograph? Show that the radius of circular path of isotopes depends on its mass by using labelled diagram.	2+5
Q.4	Differentiate spontaneous emission and stimulated emission. Describe the working of He-Ne Laser with diagram.	3+3+1	OR	Draw symbol diagrams of NPN and PNP transistors. Describe the operation of NPN transistor. Also draw its schematic diagram.	2+4+1
Q.5	What is meant by motional emf? Compute emf across the ends of a conductor of length L that moves at a steady speed of ' v ' at right angle to a uniform magnetic field.	1+5	OR	A coil having a resistance of 7Ω and an inductance of $31.8mH$ is connected to $220V$, $50Hz$ AC supply. Calculate: a) The circuit current b) Phase angle c) Power factor	06
Q.6	What is meant by photoelectric effect? How did Einstein explain photoelectric effect on the basis of Plank's quantum theory?	2+4	OR	How is charge to mass ratio of electron determined using magnetic field?	06

— 2HA-I 25005(D) —

$$E = K \frac{q}{r^2}$$

$$\sum \mathcal{E} = \sum IR$$

$$Z = \sqrt{R^2 + X_L^2}$$

$$h = 6.626 \times 10^{-34} Js$$

$$X_C = \frac{1}{2\pi fC}$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$X_L = 2\pi fL$$

$$K.E_{\max} = \frac{hc}{\lambda} - \phi$$

$$c = 3 \times 10^8 ms^{-1}$$

$$I = \frac{V}{Z}$$

$$\frac{1}{\lambda} = R_H \left[\frac{1}{p^2} - \frac{1}{n^2} \right]$$

$$Q = CV$$

$$R_H = 1.0974 \times 10^7 m^{-1}$$

$$E = \alpha T^4$$

$$X = \frac{RQ}{P}$$

$$I = I_m \sin(\omega t)$$

$$\omega = 2\pi f$$

$$K = 9 \times 10^9 Nm^2C^{-2}$$

$$\tan \phi = \frac{X_L}{R}$$

$$V_i = \mathcal{E} - Ir$$