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

Answer Sheet No. _____

ہر سوال کے سامنے دیے گئے، کریکولم کے مطابق درست دائرہ کو پُر کریں۔ **Invigilator Sign.** _____

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

	Question	A	B	C	D	A	B	C	D
1.	There are two charges $1\ \mu C$ and $6\ \mu C$, the ratio of forces acting on them will be:	1:25	1:6	1:1	6:1	○	○	○	○
2.	The electric potential at a point of distance $1\ m$ from $2\ C$ charge is:	$1.8\times10^{6}V$	$1.8\times10^{8}V$	$1.8\times10^{10}V$	$1.8\times10^{5}V$	○	○	○	○
3.	Three resistors each of $2\ Ohm$ are connected to form a triangle. The resistance on any corner is:	$\frac{3}{4}Ohm$	$\frac{4}{3}Ohm$	$4\times3Ohm$	$3\times2\ Ohm$	○	○	○	○
4.	A 50 volt battery is connected across a 10 ohm resistor. The current is $4.5A$. The internal resistance of the battery is:	1.1Ω	1.6Ω	2.1Ω	2.6Ω	○	○	○	○
5.	The S.I. unit of magnetic flux is:	Tesla	Weber	Joule	Newton	○	○	○	○
6.	A solenoid of length $500m$ is wounded into 100 turns. A current of $10\ A$ flows in it, the magnetic field intensity is:	$2\mu_o$	$200\mu_o$	$2000\mu_o$	$20\mu_o$	○	○	○	○
7.	Lenz's law is consistent with law of conservation of:	Mass	Energy	Charge	Momentum	○	○	○	○
8.	A pair of coils has a mutual inductance of 2H. If the current in the primary changes from 10A to zero in 0.1sec, the induced emf in the secondary will be:	$100V$	$200V$	$300V$	$400V$	○	○	○	○
9.	If μ_o is the permeability of free space and ε_o is the permittivity of free space then the speed of light can be found by formula:	$c=\frac{1}{\sqrt{\varepsilon_o\mu_o}}$	$c=\sqrt{\varepsilon_o\mu_o}$	$c=\frac{1}{\varepsilon_o\mu_o}$	$c=\varepsilon_o\mu_o$	○	○	○	○

	Question	A	B	C	D	A	B	C	D
10.	A mercury volume of $1600 \times 10^{-6} m^3$ is subjected to a pressure of $1.4 \times 10^6 Pa$. If the bulk modulus of mercury is $2.8 \times 10^{10} Pa$, then the decrease in its volume is:	$8 \times 10^{-8} m^3$	$8 \times 10^{8} m^3$	$1.4 \times 10^{6} m^3$	$2.8 \times 10^{-6} m^3$	○	○	○	○
11.	For proper working of a transistor in normal circuits:	Emitter base junction is reverse biased, collector base junction is forward biased	Emitter base junction is forward biased and collector base junction is forward biased	C-B junction is reverse biased, E-B junction is forward biased	C-B junction is reverse biased and E-B junction is reverse biased	○	○	○	○
12.	In a PN junction, the barrier potential offers opposition to only:	Majority carriers in both regions	Minority carriers in both regions	Electrons in N – region	Holes in P – region	○	○	○	○
13.	A passenger passes a clock with a speed $\frac{c}{2}$. The time period observed by him is:	$t = t_\circ$	$t = \frac{\sqrt{3}}{2} t_\circ$	$t = \frac{2}{\sqrt{3}} t_\circ$	$t = \frac{2}{\sqrt{5}} t_\circ$	○	○	○	○
14.	Ground state energy of the 4th orbit in a Hydrogen atom is:	$13.60\ eV$	$3.40\ eV$	$0.85\ eV$	$-1.51 eV$	○	○	○	○
15.	In Balmer series the shortest wavelength radiations have wavelength equal to:	$\left(\frac{R_H}{4}\right) m$	$\left(\frac{4}{R_H}\right) m$	$\left(\frac{R_H}{9}\right) m$	$(9R_H) m$	○	○	○	○
16.	Average distance covered by α – particle in air before its ionizing power ceases is called its:	Trajectory	Range	Firing level	Limit	○	○	○	○
17.	If a radioactive isotope of silver has a half life of about 7.5 days. After 15 days the remaining isotope of its original is:	25%	50%	7.5%	15%	○	○	○	○

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- $F = k\frac{q_1 q_2}{r^2}$
- $V = k\frac{q}{r}$
- $E = V_t + Ir$
- $B = \mu_0 \frac{N}{l} I$
- $\varepsilon_s = M\frac{\Delta Ip}{\Delta t}$
- $B = \frac{\Delta P}{\left(\frac{\Delta V}{V}\right)}$
- $t = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}}$
- $E_n = \frac{-E_0}{n^2}$
- $\frac{1}{\lambda} = R_H\left(\frac{1}{2^2} - \frac{1}{n^2}\right)$
- $T_{\frac{1}{2}} = \frac{\text{Total days}}{\text{No of half lives}}$
- $R_{eq} = R_1 + R_2 + R_3$
- $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$
- $E_0 = 13.6\ eV$

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'. Write your answers neatly and legibly.

SECTION – B (Marks 42)

Q. 2 Attempt any FOURTEEN parts. All parts carry equal marks. **(14 x 3 = 42)**

(i) Prove that electric intensity is equal to negative of potential gradient.

(ii) Find the value of velocity of electron in third Bohr orbit of hydrogen atom.

(iii) Explain why does the terminal potential difference of a battery decrease, when current drawn from it is increased?

(iv) A heating coil has resistance of $20\,\Omega$. It is designed to operate on $220\,V$. What electrical energy in joules is supplied to the heater in $10\,s$?

(v) A rectangular coil of 100 turns and area $500\times10^{-4}m^2$ carrying $2\,A$ current is placed in a uniform magnetic field of $10T$. Find the maximum torque applied on the coil

(vi) Describe the structure of $He-Ne$ gas laser. Draw energy level diagram.

(vii) What is a fission chain reaction? Write its nuclear equation.

(viii) A simple AC generator consists of $N=10$ turns coil of area $A=1200cm^2$ which rotates at a constant frequency $f=60Hz$ in a uniform magnetic field $B=0.40T$. Find the peak e.m.f generated by it.

(ix) What will be the net power loss through a pure capacitor or inductor?

(x) Briefly describe the phase of A.C. How phase lags and leads in A.C Circuits?

(xi) High temperature super conductors are required in MRI machines, why?

(xii) Show schematically, the difference between N-type semiconductor and P- type semiconductors. Also mention majority and minority charge carriers in them.

(xiii) Why is common emitter configuration widely used in amplifier circuits? Explain briefly.

(xiv) In Photoelectric effect, why do all emitted electrons not possess the K.E of maximum value?

(xv) When Compton's shift becomes maximum?

(xvi) Suppose one of a pair of 20 years old twins takes off in a spaceship travelling at a very high speed to a distant star and back again, while the other twin remains on Earth. Will there be any difference in their ages? Why?

(xvii) What is population inversion?

(xviii) If an alpha particle and a beta particle are swallowed which would be more dangerous?

(xix) Differentiate between hadrons and leptons.

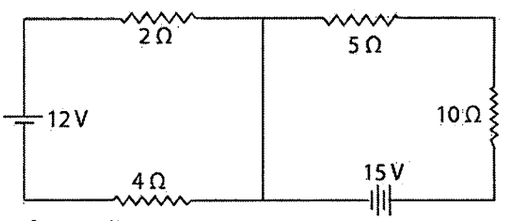
(xx) A certain radioactive element of mass $20g$ has a half life of 8 days. What fraction of original element will remain after 40 days?

SECTION – C (Marks 26)

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

Q. 3 a. Capacitor is an energy storage device. Derive mathematical expression for energy stored in capacitor in terms of electric field.

b. Find the current in each loop of the given circuit:



Q. 4 a. State and prove Ampere's Law? Use Ampere's law to derive an expression for the magnetic field of a solenoid.

b. A $220V$, $50Hz$ A.C. supply is applied to series combination of a 2.5Ω, $6mH$ inductor and a $6.5\,\mu F$ capacitor. Calculate

(i) reactance of inductor **(ii)** reactance of capacitor

(iii) impedance of circuit **(iv)** current in the circuit

Q. 5 a. What is transformer? Describe its working. Show that ratio of voltages of secondary and primary coils is equal to their turns ratio.

b. Young's modulus for particular wood is $1.0\times10^{10}Nm^{-2}$. A wooden chair has four legs each of length $42\,cm$ and cross-sectional area of $20\,cm^2$. A man has a mass of $100kg$, find the stress on each leg of the chair when he stands on the chair.

Important formulae

- $v_n=\dfrac{2\pi ke^2}{nh}$
- $E=V_t+Ir$
- $E=P\times t=\dfrac{V^2}{R}\times t$
- $\tau=NIAB\sin\theta$
- $v=\dfrac{mg}{qB}$
- $\omega=2\pi f$
- $\varepsilon_{max}=NBA\omega$
- $\Delta\lambda=\dfrac{h}{m_0c}(1-\cos\theta)$
- $T_{\frac{1}{2}}=\dfrac{\text{Total days}}{\text{No. of half lives}}$
- $N=N_0\left(\dfrac{1}{2}\right)^n$
- $\sigma=\dfrac{F}{A}$
- $\dfrac{V_S}{V_P}=\dfrac{N_S}{N_P}$
- $X_C=\dfrac{1}{2\pi fC}$
- $X_L=2\pi fL$
- $Z=\sqrt{R^2+(X_C-X_L)^2}$