Version No.			

ROLL NUMBER						

Answer Sheet No._____

Sign. of Candidate _____

Sign. of Invigilator _____

PHYSICS HSSC–II (3rd Set)

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.**

Q.1 Fill the relevant bubble for each part. Each part carries one mark.

(1) Two charges q_1 and q_2 are placed in vacuum at a distance d and force between them is F. If a medium of relative permittivity 4 is introduced between them then new force will be:

A. $\frac{F}{4}$ ◯ B. $\frac{F}{2}$ ◯

C. 2F ◯ D. 4F ◯

(2) Three capacitors of 4μF each are connected in such a way that net capacitance of their combination is 6μF. It is possible if:

A. All the three in series ◯

B. All the three in parallel ◯

C. Two in series and one in parallel ◯

D. Two in parallel and one in series ◯

(3) Slope of I-V graph of a resistor is numerically equal to:

A. Conductivity ◯ B. Conductance ◯

C. Resistance ◯ D. Resistivity ◯

(4) Which one of the following is correct for an open circuit?

A. $V_t = 0$ ◯ B. $V_t < E$ ◯

C. $V_t = E$ ◯ D. $V_t = E - Ir$ ◯

(5) Magnetic flux will be maximum when:

A. Magnetic field is perpendicular to the plane area ◯

B. Magnetic field lies parallel to the plane area ◯

C. Area is held at an angle of 45° ◯

D. Magnetic flux density is perpendicular to area vector of the surface ◯

(6) A proton is moving along the axis of a solenoid carrying a current. The magnetic force on proton will be:

A. Radially inward ◯ B. Radially outward ◯

C. Zero ◯ D. Parallel to axis of solenoid ◯

(7) A steady current is passing through a coil, magnitude of self- induced emf in it, will be:

A. zero ◯ B. maximum ◯

C. $\varepsilon = L\frac{\Delta I}{\Delta t}$ ◯ D. $\varepsilon = -L\frac{\Delta I}{\Delta t}$ ◯

(8) At high frequency in a capacitive circuit, the current will be:

A. Large ◯ B. Small ◯

C. Zero ◯ D. Infinite ◯

(9) The peak value of A.C source is 20 A, its rms value will be:

A. 14.1 A ◯ B. 10 A ◯

C. 20 A ◯ D. 28.2 A ◯

(10) The materials in which disordered structure of liquid is frozen are:

A. Amorphous ◯ B. Crystalline ◯

C. Polycrystalline ◯ D. Quartz ◯

(11) The temperature below which the resistivity of a superconductor falls to zero is called:

A. Absolute temperature ◯ B. Kelvin temperature ◯

C. Limiting temperature ◯ D. Critical temperature ◯

(12) In a half wave rectifier, the diode conducts:

A. Only positive half of input cycle ◯

B. Only negative half of input cycle ◯

C. Both halves of input cycle ◯

D. Any one half of input cycle ◯

(13) The maximum kinetic energy of emitted photoelectrons, from different metal surfaces, depends upon:

A. Intensity of incident light only ◯

B. Frequency of the incident light only ◯

C. Nature of metal surface ◯

D. Both frequency of incident light and nature of metal surface ◯

(14) The rest mass of photon is:

A. Infinite ◯ B. Zero ◯

C. 1.6×10^{-27} kg ◯ D. 3×10^{8} kg ◯

(15) The type of spectra produced by atoms is:

A. Continuous spectra ◯ B. Band spectra ◯

C. Line spectra ◯ D. Braking radiation spectra ◯

(16) The shortest wavelength radiation series in Lyman Series have wavelength equal to:

A. $\frac{3}{4}R_H$ ◯ B. R_H ◯

C. $\frac{1}{R_H}$ ◯ D. $\frac{2}{R_H}$ ◯

(17) The half-life of a radioactive element which has only $\frac{1}{32}$ of its original mass left after elapsed of 60 days is:

A. 30 days ◯ B. 20 days ◯

C. 15 days ◯ D. 12 days ◯

Federal Board HSSC-II Examination
Physics Model Question Paper
(Curriculum 2006)

Time allowed: 2.35 hours | Total Marks: 68

Note: Answer any fourteen parts from Section 'B' and attempt any two questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

SECTION – B (Marks 42)

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

i. "Electric field is a field of force." Justify this statement

ii. Define electron volt (eV). Derive its relation with SI unit of energy?

iii. Compare the effects of temperature increase on resistivity of thermistor and copper wire.

iv. Write full forms of E.C.G. and E.E.G. For what purpose these instruments are used?

v. What is magnitude of magnetic flux density at distance of 5 cm from a straight conductor carrying current of 5A?

vi. Galvanometer can be converted into ammeter and voltmeter by connecting resistance with it. What are basic differences in their construction from galvanometer?

vii. Why are induction heaters more efficient than conventional gas heaters?

viii. A 2cm diameter ring is moved out of uniform magnetic field of 10T in 0.1s. What is magnitude of induce emf in the ring if normal to ring is parallel to magnetic field at all the time?

ix. Name basic forces of nature. Briefly compare electromagnetic force and gravitational force.

x. Define resonance frequency for RLC series circuit. Why is its power dissipation maximum at resonance?

xi. How does stator help rotor to rotate in AC motor?

xii. Define elasticity and plasticity of a material. Draw a stress strain curve for ductile material to represent elastic and plastic regions.

xiii. What do you understand by characteristic X-rays?

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

xv. For a common base configuration of npn transistor, collector current is greater than base current. Why?

xvi. Briefly describe three uses of laser in medical field.

xvii. A beam of orange light and a beam of green light have same energies. Which of these light beams contains greater number of photons?

xviii. How is retentivity and coercive force values in hysteresis loop help to select material for making permanent magnet?

xix. The opposition to current in a choke coil for direct current is 5 ohm. When alternating current is sent through it; will its opposition to current increase, decrease or remains the same? Give reason to your answer

xx. From intensity distribution diagram for black body radiation, state:
a. Wein's displacement law b. Stefan Boltzmann law

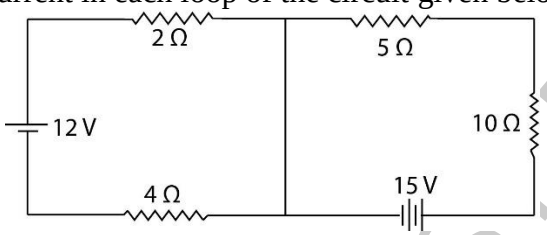
SECTION – C (Marks 26)

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

Q.3 a. Capacitor is an energy storage device. Derive mathematical expression for energy stored in capacitor in terms of electric field? (5)

b. Describe, how can we determine the e/m ratio (charge to mass ratio) of an electron. Show that charge to mass ratio of an electron is $\frac{e}{m} = \frac{v}{Br}$. (4)

c. Find the current in each loop of the circuit given below: (4)



Q.4 a. What is transformer? Describe its working. Show that ratio of voltages secondary and primary coils is equal to their turns ratio. (5)

b. State Heisenberg uncertainty principle. Discuss it in detail (4)

c. A 220V, 50Hz A.C. supply is applied to series combination of a 2.5Ω, 6mH inductor and a 6.5°F capacitor. Calculate (i) reactance of inductor (ii) reactance of capacitor (iii) impedance of circuit (iv) current in the circuit (4)

Q.5 a. What is mass spectrograph? Show that radius of circular path of isotopes depends upon its mass. (5)

b. Explain the basic principle of working of CT Scanner. (4)

c. Find the Binding energy of α particle. (Mass of proton = 1.007276 u; Mass of neutron = 1.008665 u; Mass of α particle = 4.002603 u) (4)

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PHYSICS HSSC-II (3rd Set)
Student Learning Outcomes Alignment Chart
(Curriculum 2006)

SECTION-A

Q.1

(1) State Coulomb's law and explain that force between two-point charges is reduced in a medium other than free space using Coulomb's law.
(2) Solve problems using formula for capacitors in series and in parallel.
(3) State Ohm's law. Define resistivity and explain its dependence upon temperature. Define conductance and conductivity of conductor.
(4) Explain the internal resistance of sources and its consequences for external circuits.
(5) Describe the concept of magnetic flux (Φ_B) as scalar product of magnetic field (B) and area (A) using the relation $\Phi_B = \mathbf{B}.\mathbf{A}$
(6) Explain that a force may act on a charged particle in a uniform magnetic field.
(7) Define mutual inductance (M) and self-inductance (L), and their unit henry.
(8) Explain the flow of A.C through resistors, capacitors and inductors.
(9) Describe the terms time period, frequency, instantaneous peak value and root mean square value of an alternating current and voltage.
(10) Distinguish between the structure of crystalline, glassy, amorphous and polymeric solids.
(11) Become familiar with the behaviour of superconductors and their potential uses.
(12) Define rectification and describe the use of diodes for half and full wave rectifications.
(13) Identify data sources, gather, process and present information to summarize the use of the photoelectric effect in solar cells & photocells
(14) Elaborate the particle nature of electromagnetic radiation.
(15) Describe and explain the origin of different types of optical spectra.
(16) Solve problems and analyze information using. $\frac{1}{\lambda} = R_H\left[\frac{1}{P^2} - \frac{1}{n^2}\right]$.
(17) Describe the term half-life and solve problems using the equation $\lambda = 0.693/T_{1/2}$

SECTION-B

Q.2

i. Describe the concept of an electric field as an example of a field of force.
ii. Define and become familiar with the use of electron volt.
iii. Define resistivity and explain its dependence upon temperature. State the characteristics of a thermistor and its use to measure low temperatures.
iv. Describe the use of electrocardiograph (E.C.G.), electroencephalograph (E.E.G) instruments to study heart and brain disorders.
v. Apply Ampere's law to find magnetic flux density around a wire and inside a solenoid.
vi. Explain how a given galvanometer can be converted into a voltmeter or ammeter of a specified range.
vii. Analyze and present information to explain how induction heating is used in furnaces to provide oxygen free heating environment.
viii. Apply Faraday's law of electromagnetic induction and Lenz's law to solve problems.
ix. Describe the basic forces of nature.
x. Explain resonance in an A.C circuit and carry out calculations using the resonant frequency formulae. Explain the flow of A.C through resistors, capacitors and inductors

xi. Describe the main features of an A.C electric motor and the role of each feature.
xii. Become familiar of ultimate tensile stress, elastic deformation and plastic deformation of a material.
xiii. Understand that inner shell transitions in heavy elements result into emission of characteristic X-rays.
xiv. Distinguish between P & N type substances.
xv. Describe the operations of transistors.
xvi. Illustrate the use of laser in medicine, industry and holography.
xvii. Solve problems and analyze information using: E = hf and c = f λ.
xviii. Describe hysteresis loss.
xix. Explain the flow of A.C through resistors, capacitors and inductors. • apply the knowledge to calculate the reactance of capacitors and inductors.
xx. Describe how energy is distributed over the wavelength range for several values of source temperature

SECTION-C

Q.3 a. Prove that energy stored in a capacitor is $W = \frac{1}{2}QV$ and hence $W = \frac{1}{2}CV^2$
b. Describe a method to measure the e/m of an electron by applying magnetic field and electric field on a beam of electrons.
c. Apply Kirchhoff's second law as conservation of energy to solve problem.

Q.4 a. Describe the construction of a transformer and explain how it works. • identify the relationship between the ratio of the number of turns in the primary and secondary coils and the ratio of primary to secondary voltages.
b. Describe uncertainty principle.
c. Construct phasor diagrams and carry out calculations on circuits including resistive and reactive components in series. Solve the problems using the formulae of A.C Power

Q.5 a. Explain the use of mass spectrograph to demonstrate the existence of isotopes and to measure their relative abundance.
b. Describe the working of CT scanner.
c. Define the terms unified mass scale, mass defect and calculate binding energy using Einstein 's equation

PHYSICS HSSC-II (3rd Set)

Table of specification

Assessment Objectives	Unit 11:	Unit 12:	Unit 13:	Unit 14:	Unit 15:	Unit 16:	Unit 17:	Unit 18:	Unit 19:	Unit20:	Total marks	% age
Knowledge based	2(i)(03)	1(3)(01) 1(4)(01)	1(5)(01)	1(7)(01)	1(9)(01) 2(x)(03)	1(10)(01) 1(11)(01) 2(xii)(03)	1(12)(01) 2(xiv)(03)	4(b)(04) 2(xx)(03) 1(14)(01)	1(15)(01)	2(ix)(03) 1(17)(01)	33	28.4%
Understanding based	1(1)(01) 2(ii)(03) 3(a)(05)	2(iii)(03) 3(c)(04)	1(6)(01) 2(v)(03) 2(vi)(03) 3(b)(04)	2(viii)(03) 4(a)(05)	1(8)(01)	2(xviii)(03)	2(xv)(03)	2(xvii)(03) 1(13)(01)	1(16)(01) 2(xiii)(03)	5(a)(05)	55	47.4%
Application based	1(2)(01)	2(iv)(03)		2(vii)(03) 2(xi)(03)	4(c)(04) 2(xix)(03)				5(b)(04) 2(xvi)(03)	5(c)(04)	28	24.1%
Total marks	13	12	12	15	12	08	07	12	12	13	116	100%

KEY:

1-1(1)

Question No-Part No. (Allocated Marks)

Note: (i) The policy of FBISE for knowledge based questions, understanding based questions and application based questions is approximately as follows:

a) 30% knowledge based.
b) 50% understanding based.
c) 20% application based.

(ii) The total marks specified for each unit/content in the table of specification is only related to this model question paper.

(iii) The level of difficulty of the paper is approximately as follows:

a) 40% easy
b) 40% moderate
c) 20% difficult