Version No.			

ROLL NUMBER						

Answer Sheet No._____

Sign. of Candidate _____

Sign. of Invigilator _____

PHYSICS HSSC–II (2nd 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 are placed at a certain distance apart in vacuum. If an insulating slab is placed between them, then force will:

A. Increase ◯ B. Decrease ◯
C. Remains constant ◯ D. Be zero ◯

(2) Potential inside a hollow charged spherical conductor:

A. is constant ◯
B. varies directly as distance from centre ◯
C. varies inversely as distance from centre ◯
D. varies directly as square of distance from the centre ◯

(3) The dimension of electric potential is same as that of:

A. work ◯
B. work done per unit charge ◯
C. electric field per unit charge ◯
D. electric force per unit charge ◯

(4) When the hot and cold junctions of a thermocouple are interchanged, the thermo-emf:

A. becomes zero ◯ B. doubles ◯
C. remain the same ◯ D. changes the sign ◯

(5) If the resistivity of a conductor is $2 \times 10^{-6}\ \Omega m$, then its conductivity is:

A. $2 \times 10^{6}\ \Omega^{-1}m^{-1}$ ◯ B. $5 \times 10^{6}\ \Omega^{-1}m^{-1}$ ◯
C. $5 \times 10^{-5}\ \Omega^{-1}m^{-1}$ ◯ D. $5 \times 10^{5}\ \Omega^{-1}m^{-1}$ ◯

(6) The source of emf transfers its maximum power to the external circuit when (r = internal resistance and R= load resistance):

A. $r = 0$ ◯ B. $r = R$ ◯
C. $r < R$ ◯ D. $r > R$ ◯

(7) A galvanometer is made sensitive by:

A. using a small and thick suspension wire ◯
B. decreasing the area of the coil ◯
C. Increasing the magnetic field ◯
D. reducing the number of turns of the coil ◯

(8) A coil of 150 loops is pulled in 0.06s from poles of the magnet, which decreases the magnetic flux linked with the coil from 6 $\times 10^{-4}$ Wb to 2 $\times 10^{-4}$ Wb. The average emf induced in the coil is:

A. 1.5 V ◯ B. 1 V ◯
C. 0.1 V ◯ D. 0.15 V ◯

(9) For long distance electrical power transmission, we use:

A. low current and low voltage ◯
B. high current and high voltage ◯
C. low current and high voltage ◯
D. high current and small voltage ◯

(10) The quantity that remains constant in a transformer is:

A. current ◯ B. voltage ◯
C. resistance ◯ D. power ◯

(11) The minimum number of diodes required for full wave rectification are:

A. 1 ◯ B. 2 ◯
C. 3 ◯ D. 4 ◯

(12) A force of 500 N is applied to one end of a cylindrical steel rod of diameter 50 cm, the tensile stress is:

A. 2.5 x 10^5 Nm^{-2} ◯ B. 1.5 x 10^5 Nm^{-2} ◯
C. 1.0 x 10^5 Nm^{-2} ◯ D. 2.5 x 10^3 Nm^{-2} ◯

(13) The potential difference across the silicon PN junction is:

A. 0.3 V ◯ B. 0.7 V ◯
C. 0.5 V ◯ D. 5.0 V ◯

(14) The radius of 10^{th} orbit in hydrogen atom is

A. 0.053 nm ◯ B. 0.53 nm ◯
C. 5.3 nm ◯ C. 53 nm ◯

(15) A radioactive nuclide $^{228}_{86}Ra$ decays by a series of emissions of 3 alpha particles and 1 beta particle, the nuclide finally formed is:

A. $^{220}_{84}Ra$ ◯ B. $^{222}_{86}Ra$ ◯
C. $^{216}_{83}Ra$ ◯ D. $^{215}_{88}Ra$ ◯

(16) Which phenomenon does **NOT** verify particle nature of light?

A. Photoelectric effect ◯ B. Compton effect ◯
C. Pair Production ◯ D. Diffraction ◯

(17) The half-life of a certain radioactive nucleus is 1.6x10^3 years. Its decay constant is:

A. 1.4x10^{-11} s^{-1} ◯ B. 1.4x10^{-12} s^{-1} ◯
C. 2.0x10^{-11} s^{-1} ◯ D. 2.0x10^{-12} s^{-1} ◯

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. Prove that electric flux $\varphi e = \frac{q}{\varepsilon_o}$ for charge 'q' enclosed in a sphere, where ε_o is the permittivity of free space.

ii. Define resistivity. How does it depend upon temperature?

iii. Describe a circuit which will give continuously varying potential.

iv. What factors cause induced emf?

v. What will happen if the frequency of AC across an inductor is increased?

vi. What do you know about the impedance in RLC series circuit of AC?

vii. Draw and elaborate resistance measuring part of Avometer.

viii. What are eddy currents and how are they minimized in Transformers?

ix. A 220V, 50Hz, AC source is connected to an inductance of 0.2H and a resistance of 20 Ω in series. What is the current in the circuit?

x. Determine the energy associated with the following nuclear reaction:
$^{14}_{7}N + {}^{4}_{2}He \rightarrow {}^{16}_{8}O + {}^{1}_{1}H$
$m(^{14}_{7}N) = 14.003074u$
$m(^{4}_{2}He) = 4.002603u$
$m(^{17}_{8}O) = 16.999131u$
$m(^{1}_{1}H) = 1.007825u$

xi. Young's modulus for particular wood is 1.0×10^{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 100 kg, find the stress on each leg of the chair when he stands on the chair.

xii. Differentiate between conductors, insulators and semiconductor in terms of energy theory.

xiii. Prove that $\beta = \frac{\alpha}{1-\alpha}$ where $\alpha =$ amplification factor and β = current amplification factor of a transistor.

xiv. 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?

xv. Prove that in Pair Production at least 1.02 MeV energy photon is required.

xvi. What are the essential conditions for the biasing of a transistor?

xvii. How can we calculate kinetic energy of photoelectrons?

xviii. Calculate ionization energy and ionization potential for hydrogen atom.

xix. What is the wavelength of the second line of Paschen series?

xx. What is the least energy does the proton has, to make the following reaction possible?

$$^{1}_{1}H + ^{13}_{6}C \longrightarrow ^{14}_{7}N + ^{1}_{0}n$$

The mass of hydrogen ^{1}H is 1.007825 u, carbon ^{13}C is 13.003355 u, nitrogen is 13.005739 u and neutron is 1.008665 u.

SECTION – C (Marks 26)

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

Q.3 a. Define electric potential. Find an expression for electric potential energy and electric potential due to a point charge. **(1+4+1)**

b. What is potentiometer? How can it be used to find emf of a cell? **(1+3)**

c. A 6 μF is charged to a potential difference of 200 V and then connected in parallel with an uncharged 3 μF capacitor. Calculate the potential difference across the parallel plate capacitors. **(3)**

Q.4 a. State Ampere's law and apply it to find magnetic field inside a solenoid. **(2+4)**

b. A loop resistance 0.1 Ω is placed in a magnetic field of 2T. If a conductor of length 0.2m is sliding along a loop with a velocity of 0.2 ms^{-1}. Find (i) the e.m.f produced in the conductor if the motion of a conductor is perpendicular to the field (ii) the current through the loop (iii) the electrical power generated **(3)**

c. In an R-L circuit, will the current lead or lag the applied voltage? Justify through phasor diagram. **(4)**

Q.5 a. What is meant by half-life and decay rate of a radioactive isotope? Find a relation between them. **(2+4)**

b. What is laser? Explain the principle and operation of laser. List two practical uses of lasers. **(1+4+2)**

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PHYSICS HSSC-II (2nd 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 by using the expression E=v/d
(3) Define the unit of potential
(4) Describe thermocouple and its function.
(5) Define resistivity and explain its dependence upon temperature. • Define conductance and conductivity of conductor
(6) Describe the conditions for maximum power transfer.
(7) Predict the turning effect on a current carrying coil in a magnetic field and use this principle to understand the construction and working of a galvanometer.
(8) Apply Faraday's law of electromagnetic induction and Lenz's law to solve problems.
(9) Describe how set-up and step-down transformers can be used to ensure efficient transfer of electricity along cables.
(10) Describe how set-up and step-down transformers can be used to ensure efficient transfer of electricity along cables.
(11) Define rectification and describe the use of diodes for half and full wave rectifications.
(12) Become familiar of ultimate tensile stress, elastic deformation and plastic deformation of a material.
(13) Describe a PN junction and discuss its forward and reverse biasing.
(14) Explain hydrogen atom in terms of energy levels on the basis of Bohr Model. • determine the ionization energy and various excitation energies of an atom using an energy level diagram.
(15) Describe that an element may change into another element when radioactivity occurs.
(16) Explain the particle model of light in terms of photons with particular energy and frequency
(17) Describe the term half life and solve problems using the equation $\lambda=0.693/T_{1/2}$.

SECTION-B

Q.2

i. State and explain Gauss's law.
ii. Define resistivity and explain its dependence upon temperature.
iii. Describe the working of rheostat in the potential divider circuit.
iv. Explain that induced emf's can be generated in two ways. (i) by relative movement (the generator effect). (ii) by changing a magnetic field (the transformer effect).
v. Explain the flow of A.C through resistors, capacitors and inductors.

vi. Explain resonance in an A.C circuit and carry out calculations using the resonant frequency formulae.
vii. Describe the use of avometer / multimeter (analogue and digital).
viii. Explain the need for laminated iron cores in electric motors, generators and transformers.
ix. Explain the flow of A.C through resistors, capacitors and inductors.
x. Determine the release of energy from different nuclear reactions
xi. Define and use the terms Young's modulus, bulk modulus and shear modulus.
xii. Classify insulators, conductors, and semiconductors on the basis of energy bands.
xiii. Describe the operations of transistors.
xiv. Explain the implications of mass increase, time dilation and length contraction for space travel.
xv. Explain the phenomena of pair production and pair annihilation.
xvi. Describe the operations of transistors.
xvii. Describe the phenomenon of photoelectric effect.
xviii. Determine the ionization energy and various excitation energies of an atom using an energy level diagram.
xix. Solve problems and analyze information using $1/\lambda = R_H [1/p^2 – 1/n^2]$.
xx. Describe energy and mass conservation in simple reactions and in radioactive decay.

SECTION-C

Q.3 a. Define electric potential at a point in terms of the work done in bringing unit positive charge from infinity to that point. • define the unit of potential derive an expression for electric potential at a point due to a point charge.
b. Describe the function of potentiometer to measure and compare potentials without drawing any current from the circuit.
c. Solve problems using formula for capacitors in series and in parallel.

Q.4 a Apply Ampere's law to find magnetic flux density around a wire and inside a solenoid.
b. Explain what is meant by motional emf. Given a rod or wire moving through a magnetic field in a simple way, compute the potential difference across its ends.
c. Explain the flow of A.C through resistors, capacitors and inductors.

Q.5 a. Describe the term half life and solve problems using the equation $\lambda=0.693/T_{1/2}$
b. Explain the terms spontaneous emission, stimulated emission, meta stable states, population inversion and laser action.

PHYSICS HSSC-II (2nd Set)

Table of Specification

Assessment Objectives	Unit 11:	Unit 12:	Unit 13:	Unit 14:	Unit 15:	Unit 16:	Unit 17:	Unit 18:	Unit 19:	Unit 20:	Total marks	Percentage
Knowledge based	1(1)1 1(2)1 1(3)1 3(a)1	1(6)1 2(ii)3 3(b)1	4(a)6	2(iv)3 2(viii)3	1(11)1	2(xii)3	1(13)1 2(xiii)3 2(xvi)3		2(xix)3 5(b)1	5(a)2	38	32.7%
Understanding based	2(i)3 2(iii)3 3(a)5	1(4)1 2(v)3 2(vi)3 3(b)3	1(7)1 2(vii)3	1(8)1 1(9)1 1(10)1	4(c)4			1(16)1 2(xiv)3 2(xv)3 2(xvii)3	2(xviii)3 5(b)4	2(x)3 5(a)4	56	48.3%
Application based	3(c)3	1(5)1		4(b)3 2(ix)3		1(12)1 2(xi)3			1(14)1 5(b)2	1(15)1 1(17)1 2(xx)3	22	19%
Total marks	18	16	10	15	5	7	7	10	14	14	116	100%

KEY:

1(1)(01)

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