

Roll No. of Candidate : _____

PHYSICS

(INTERMEDIATE PART-II) 421 - (IV) Paper II (Group - I)

Time: 20 Minutes

OBJECTIVE Code: 8477 **GUJ-41-21** Marks: 17

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

1. Electrons are
(A) hadrons (B) leptons (C) quarks (D) baryons
2. The amount of energy equivalent to 1 amu is
(A) 9.315 Mev (B) 93.15 Mev (C) 931.5 Mev (D) 211.5 Mev
3. Normally an electron can reside in metastable state for about
(A) 10^{-8} s (B) 10^{-6} s (C) 10^{-4} s (D) 10^{-3} s
4. The energy required for pair production is
(A) 0.51 Mev (B) 1.02 Mev (C) 2.04 Mev (D) 3.06 Mev
5. Compton wavelength is
(A) $\frac{h}{m_0 c^2}$ (B) $\frac{hc}{m_0}$ (C) $\frac{h}{m_0 c}$ (D) $\frac{hc^2}{m_0}$
6. A photodiode can turn its current ON and OFF in
(A) 10^{-3} s (B) 10^{-6} s (C) 10^{-9} s (D) 10^{-12} s
7. The relation for the gain of an inverting amplifier is
(A) $G = \frac{R_1}{R_2}$ (B) $G = \frac{R_2}{R_1}$ (C) $G = \frac{-R_2}{R_1}$ (D) $G = \frac{-R_1}{R_2}$
8. Substances which break just after the elastic limit is reached are called _____ substances.
(A) brittle (B) non-magnetic (C) magnetic (D) ductile
9. In R-L series circuit, phase angle is given by
(A) $\theta = \tan^{-1}(\omega RL)$ (B) $\theta = \tan^{-1}\left(\frac{R}{\omega L}\right)$
(C) $\theta = \tan^{-1}\left(\frac{\omega L}{R}\right)$ (D) $\theta = \tan^{-1}\left(\frac{1}{\omega RL}\right)$
10. The capacitance required to construct a resonance circuit of frequency 1000 KHz with an inductor of 5 mH is
(A) 5.09 PF (B) 5.09 μ F (C) 5.09 mF (D) 5.09 KF
11. A device which converts mechanical energy into electrical energy is called
(A) D.C. generator (B) D.C. motor (C) A.C. generator (D) transformer
12. The relation for self-inductance of the solenoid is
(A) $L = \mu_0 n A l$ (B) $L = \mu_0 N A l$ (C) $L = \mu_0 n^2 A l$ (D) $L = \mu_0 N^2 A l$
13. The brightness of spot on the screen of CRO is controlled by
(A) filament (B) cathode (C) anode (D) grid
14. The relation $\sum_{i=1}^N (\vec{B} \cdot \Delta \vec{L})_i = \mu_0 I$ is called as
(A) Faraday's law (B) Lenz's law (C) Ampere's law (D) Gauss's law
15. In colour code for carbon resistor, if there is no fourth band, then tolerance is
(A) $\pm 20\%$ (B) $\pm 10\%$ (C) $\pm 5\%$ (D) $\pm 4\%$
16. The formula for electric field as potential gradient is
(A) $E = \frac{-\Delta v}{\Delta r}$ (B) $E = \frac{-\Delta v}{\Delta t}$ (C) $E = \frac{-\Delta U}{\Delta r}$ (D) $E = \frac{-\Delta U}{\Delta t}$
17. The SI unit of electric potential is
(A) $\text{Kg m}^2 \text{s}^{-1} \text{c}$ (B) $\text{Kg m}^2 \text{s}^{-2} \text{c}$ (C) $\text{Kg m}^2 \text{s}^{-2} \text{c}^{-1}$ (D) $\text{Kg m}^{-2} \text{s}^2 \text{c}^{-1}$

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: 2:40 Hours

SUBJECTIVE

Marks: 68

e: Section I is compulsory. Attempt any three (3) questions from Section II.

(SECTION - I) 94J-91-21**2. Write short answers to any EIGHT questions.**

(2 x 8 = 16)

- i. A particle carrying a charge of $2e$ falls through a potential difference of 3.0 V. Calculate the energy acquired by it.
- ii. Define electron volt.
- iii. Define electric flux. Also write down its unit.
- iv. How can you identify that which plate of a capacitor is positively charged?
- v. Why does the picture on a T.V screen become distorted when a magnet is brought near the screen?
- vi. How can you use a magnetic field to separate isotopes of chemical element?
- vii. A plane conducting loop is located in a uniform magnetic field that is directed along the x-axis. For what orientation of the loop, is the flux a maximum? For what orientation is the flux a minimum?
- viii. If a charged particle moves in a straight line through some region of space, can you say that the magnetic field in the region is zero?
- ix. 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?
- x. Does the induced emf always act to decrease the magnetic flux through a circuit?
- xi. Is it possible to change both the area of the loop and the magnetic field passing through the loop and still not have an induced emf in the loop?
- xii. Show that ϵ and $\frac{\Delta\phi}{\Delta t}$ have the same units?

3. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- i. Is the filament resistance lower or higher in a 500 W, 220 V light bulb than in a 100 W, 220 V bulb.
- ii. Describe a circuit which will give a continuously varying potential.
- iii. What are thermistors? Write down their applications.
- iv. How many times per second will an incandescent lamp reach maximum brilliance when connected to a 50 Hz source?
- v. In a R-L circuit, will the current lag or lead the voltage? Illustrate your answer by a vector diagram.
- vi. A 100 μ F capacitor is connected to an alternating voltage of 24 V and frequency 50 Hz. What will be the reactance of the capacitor?
- vii. Define stress and strain. What are their SI units?
- viii. What is meant by hysteresis loss? How is it used in the construction of transformer?
- ix. Define modulus of elasticity. Show that the units of modulus of elasticity and stress are the same.
- x. Why a photo diode is operated in reverse biased state?
- xi. Why is the base current in a transistor very small?
- xii. Define open loop gain and write down its relation.

4. Write short answers to any SIX questions.

(2 x 6 = 12)

- i. Define pair production and write down its equation.
- ii. What happens to total radiation from a black body if the absolute temperature is doubled?
- iii. Which photon red, green or blue carries the most (a) Energy and (b) Momentum ?
- iv. Write down two uses of Laser in Medicine.
- v. What do we mean when we say that the atom is excited?
- vi. What do we mean by the term critical mass?
- vii. Describe a brief account of interaction of various types of radiations with matter.
- viii. Define half-life of a radioactive element, write down its expression.
- ix. What is radioactivity?

(Turn Over)

(SECTION - II) 9UJ-G1-21

5. (a) What is a wheatstone bridge? How is it used to determine an unknown resistance? 5
(b) Compare magnitudes of electrical and gravitational forces exerted on an object (mass = 10.0 g, charge = 20.0 μ C) by an identical object that is placed 10.0 cm from the first. ($G=6.67 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$) 3
6. (a) Discuss the principle, construction and working of an alternating current generator. Also find expression for induced emf and current. 5
(b) Find the radius of an orbit of an electron moving at a rate of $2.0 \times 10^7 \text{ ms}^{-1}$ in a uniform magnetic field $1.20 \times 10^{-3} \text{ T}$. 3
7. (a) Explain R-L-C series resonance circuit. Draw its impedance diagram and also write down its properties. 5
(b) In a certain circuit, the transistor has a collector current of 10 mA and base current of 40 μ A. What is the current gain of the transistor? 3
8. (a) What are radiation detectors? Describe the principle, construction and working of Wilson Cloud Chamber for detecting nuclear radiation. 5
(b) The length of a steel wire is 1.0 m and its cross-sectional area is $0.03 \times 10^{-4} \text{ m}^2$. Calculate the work done in stretching the wire when a force of 100 N is applied within the elastic region. Young's modulus for steel is $3.0 \times 10^{11} \text{ Nm}^{-2}$. 3
9. (a) What is LASER? Describe its principle and operation. 5
(b) An electron is placed in a box about the size of an atom that is about $1.0 \times 10^{-10} \text{ m}$. What is the velocity of the electron? 3

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Roll No. of Candidate : _____

PHYSICS

(INTERMEDIATE PART-II) 421 - (I)

Paper II

(Group - II)

Time: 20 Minutes

OBJECTIVE

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Code: 8472 GUF 42-21

Marks: 17

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

1. Electric flux through a closed surface depends upon
(A) charge (B) medium (C) geometry (D) charge and medium
2. Coulomb per volt is called
(A) farad (B) ampere (C) joule (D) henry
3. The substance having negative temperature co-efficient of resistance
(A) silver (B) gold (C) carbon (D) tungsten
4. One Tesla is equal to
(A) $1 \text{ N}^{-1} \text{ Am}$ (B) 1 NA m (C) $1 \text{ NA}^{-1} \text{ m}^2$ (D) $1 \text{ NA}^{-1} \text{ m}^{-1}$
5. Magnetic flux density at a point due to current carrying coil is determined by
(A) Ampere's law (B) Gauss's law (C) Faraday's law (D) Lenz's law
6. Mutual induction has a practical role in the performance of the
(A) radio choke (B) transformer (C) A.C generator (D) D.C generator
7. The self-induced emf is sometimes called _____ emf.
(A) motional (B) constant (C) back (D) variable
8. Power dissipated in a pure inductor is
(A) large (B) small (C) infinite (D) zero
9. At resonance frequency the impedance of RLC parallel circuit is
(A) zero (B) infinite (C) minimum (D) maximum
10. Above the curie temperature iron is
(A) paramagnetic (B) diamagnetic (C) ferromagnetic (D) remain same
11. A P-n junction cannot be used as
(A) amplifier (B) rectifier (C) detector (D) LED
12. The width of central region of a transistor is
(A) 10^{-4} m (B) 10^{-6} m (C) 10^{-3} m (D) 10^{-9} m
13. When platinum wire is heated it becomes orange at
(A) 500°C (B) 900°C (C) 1100°C (D) 1300°C
14. The value of plank's constant h is
(A) $6.63 \times 10^{-34} \text{ JS}$ (B) $6.63 \times 10^{-34} \text{ JS}^{-1}$ (C) $6.63 \times 10^{-34} \text{ JS}^2$ (D) $6.63 \times 10^{-34} \text{ JS}^{-2}$
15. Helium - Neon Laser discharge tube Contain Neon
(A) 85% (B) 80% (C) 30% (D) 15%
16. A pair of quark and antiquark makes a
(A) meson (B) hadron (C) lepton (D) baryon
17. A device that shows the visible path of ionizing particle is called
(A) G.M. counter (B) solid detector (C) scalar (D) Wilson Cloud Chamber

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Note: Section I is compulsory. Attempt any three (3) questions from Section II.

(SECTION – I)**2. Write short answers to any EIGHT questions.**

(2 x 8 = 16)

- i. Define electron volt and prove that $1\text{ev} = 1.6 \times 10^{-19}\text{J}$.
- ii. Give a comparison between electric force and gravitational force.
- iii. Upon what factors electric flux does depend?
- iv. Do electrons tend to go to region of high potential or of low potential?
- v. State Ampere's law and write down its formula.
- vi. Define magnetic flux and flux density.
- vii. A plane conducting loop is located in a uniform magnetic field that is directed along the x-axis. For what orientation of the loop, is the flux a maximum? For what orientation is the flux a minimum?
- viii. Why does the picture on a TV screen become distorted, when a magnet is brought near the screen?
- ix. 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.
- x. Does the induced emf always act to decrease the magnetic flux through a circuit?
- xi. Define motional emf and write down its formula.
- xii. Upon what factors self-inductance does depend?

3. Write short answers to any EIGHT questions.

(2 x 8 = 16)

- i. Define the temperature co-efficient of resistance. Write down an expression for temperature co-efficient of resistance in terms of resistivity.
- ii. Do bends in a wire affect the electrical resistance? Explain.
- iii. Explain why the terminal potential difference of a battery decreases when the current drawn from it is increased?
- iv. Define impedance and write down its SI units.
- v. What is the main advantage of three phase A.C supply?
- vi. A circuit contains an iron-cored inductor, a switch and a D.C. source, arranged in series. The switch is Closed and after an interval reopened. Explain why a spark jumps across the switch contacts?
- vii. Draw a stress-strain curve for a metallic wire and mention the points representing proportional limit, elastic limit, UTS or nominal strength and fracture stress.
- viii. Define modulus of elasticity. Also discuss its three kinds.
- ix. What is meant by hysteresis loss? How is it used in the construction of a transformer?
- x. What is photovoltaic cell?
- xi. What does it mean when we say that output of an amplifier is 180° out of phase with its input?
- xii. What is the net charge on an n-type or a p-type substance?

4. Write short answers to any SIX questions.

(2 x 6 = 12)

- i. What advantages an electron microscope has over an optical microscope?
- ii. Write down some important results of photoelectric effect.
- iii. If the following particles have the same energy, which has the shortest wavelength? Electron, alpha Particle, neutron, proton.
- iv. What do we mean when we say that atom is excited?
- v. Explain de-Broglie's interpretation of Bohr's orbits.
- vi. Why are heavy nuclei unstable?
- vii. What factors make a fusion reaction difficult to achieve?
- viii. Write down the name of basic forces of nature.
- ix. Differentiate between mass defect and binding energy.

(Turn Over)

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(SECTION - II) **4UJ-42-21**

5. (a) State Gauss's law. Find electric field intensity between two oppositely charged parallel plates. 5
(b) A platinum wire has resistance of 10Ω at 0°C and 20Ω at 273°C . Find the value of temperature co-efficient of resistance of platinum. 3
6. (a) State Faraday's law of electromagnetic induction and also derive the relation for induced emf. 5
(b) A solenoid 15.0 cm long has 300 turns of wire. A current of 5.0 A, flows through it. What is the magnitude of magnetic field inside the solenoid. 3
7. (a) How can we use a transistor as an amplifier? 5
(b) A 10 mH, 20Ω coil is connected across 240 V and $\frac{180}{\pi}$ Hz. source. How much power does it dissipate? 3
8. (a) Differentiate between insulators, conductors and semi-conductors on the basis of energy band theory. 5
(b) Find the mass defect and binding energy of the deuteron nucleus. The experimental mass of deuteron is 3.3435×10^{-27} kg, and that of proton and neutron 1.6726×10^{-27} kg and 1.6749×10^{-27} kg respectively. 3
9. (a) What is photoelectric effect? What is the effect of frequency of light on photoelectric current? 5
Derive the Einstein's photoelectric equation.
(b) Electrons in an x-ray tube are accelerated through a potential difference of 3000 V. If these 3
Electrons were slowed in a target, what will be the minimum wavelength of x-rays produced?