

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. Write **PAPER CODE**, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly. Otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

- 1) A parallel plate capacitor with oil between the plate ( $\epsilon_r = 2$ ) has a capacitance  $C$ . If the oil is removed then capacitance of capacitor becomes.
- (A)  $C$  (B)  $\frac{C}{2}$  (C)  $\frac{C}{\sqrt{2}}$  (D)  $\sqrt{2}C$
- 2) An ECG records the \_\_\_\_\_ between points on human skin generated by electrical process in the heart.
- (A) Heart beat (B) Pulse rate (C) Voltage (D) Pressure
- 3) If the length of the conductor is doubled and its cross sectional area is halved, its conductance will
- (A) Increases four times (B) Becomes one-fourth (C) Becomes one-half (D) Remains unchanged
- 4) For a current carrying solenoid the term 'n' has unit as
- (A) No unit (B) m (C)  $m^{-1}$  (D)  $m^{-2}$
- 5) Two long parallel wires carrying current in the same direction.
- (A) Attract (B) Repel (C) Turn (D) No effect
- 6) The current in a coil changes from 0 to 2 A in 0.05 s. If the induced emf is 80 V, the self inductance of the coil is
- (A) 1 H (B) 0.5 H (C) 1.5 H (D) 2 H
- 7) Maximum motional emf in a conductor is given by  $VBL$ . At which angle the conductor moves in magnetic field such that emf in it becomes half then its maximum value is
- (A)  $0^\circ$  (B)  $30^\circ$  (C)  $45^\circ$  (D)  $60^\circ$
- 8) At high frequency the current through a capacitor of A.C. Circuit will be
- (A) Large (B) Small (C) Infinite (D) Zero
- 9) With increase in frequency of an A.C. supply, the impedance of RLC series circuit.
- (A) Decreases (B) Increases (C) Remains constant (D) 1st decrease, become minimum and then increase
- 10) Curie temperature for iron is about
- (A) 750 K (B) 570 K (C) 1023 K (D) 670 K
- 11) If  $R_1 = \text{infinity}$  and  $R_2 = 0$ , then gain of non-inverting amplifier is
- (A) 0 (B) 1 (C) 2 (D) Infinity
- 12) The term transistor Stands for
- (A) Transfer of resistance (B) Transfer of voltage (C) Transfer of current (D) All of these
- 13) In the equation  $\Delta\lambda = \frac{h}{m_0c} (1 - \cos\theta)$  which factor is called Compton wavelength
- (A)  $\frac{h}{m_0c}$  (B)  $\frac{1}{m_0c}$  (C)  $(1 - \cos\theta)$  (D)  $\frac{h}{m_0c} (1 - \cos\theta)$
- 14) In photoelectric effect if the intensity of light is made twice than initial value. The maximum K.E of photoelectron becomes
- (A) Same (B) Double (C) Half (D) Four times
- 15) The energy of the 4<sup>th</sup> orbit in hydrogen atom is
- (A) -13.6 eV (B) - 0.85 eV (C) -3.40 eV (D) -1.51 eV
- 16) In which nuclear detector, visible path of ionizing particle is shown
- (A) Wilson cloud chamber (B) GM Counter (C) Solid State detector (D) All of these
- 17) The binding energy per nucleon is
- (A) Greatest for heavy nuclei (B) Least for heavy nuclei (C) Greatest for light nuclei (D) Greatest for medium weight nuclei

1221 Warning:- Please, do not write anything on this question paper except your Roll No.

Physics (Subjective) (Group I) (Session 2017-19 to 2019-21) (Inter Part - II) Paper (II)

Time Allowed: 2.40 hours

Section ----- I

Maximum Marks: 68

Answer briefly any Eight parts from the followings:- **540-I-2) 8 × 2 = 16**

- (i) Is E necessarily zero inside a charged rubber balloon if balloon is spherical? Assume that charge is distributed uniformly over the surface?
- (ii) How can you identify that which plate of a capacitor is positively charged?
- (iii) State Gauss's law and write mathematical expression. (iv) Write four properties of electric field lines.
- (v) How can a current loop be used to determine the presence of a magnetic field in a given region of space?
- (vi) Why does the picture on a TV screen become distorted when a magnet is brought near the screen?
- (vii) State Ampere's circuital law and write its mathematical expression.
- (viii) What is CRO? Write only its main parts. (ix) Show that  $\epsilon$  and  $\frac{\Delta\Phi}{\Delta t}$  have the same unit.

(x) Does the induced emf always act to decrease the magnetic flux through a circuit?

(xi) Define mutual inductance and write its unit.

(xii) Write the factors upon which self inductance depends?

3. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) What is thermistor? (ii) Under what conditions, The emf of a cell and terminal potential are same.

(iii) Explain why the terminal potential of a battery decreases when the current drawn from it is increased.

(iv) In R - L circuit, will the current lag or lead? Illustrate your answer by a vector diagram.

(v) Define instantaneous and peak value of current. (vi) Write down two properties of RLC parallel circuit.

(vii) What is meant by Hysteresis loss? How is it used in the construction of a transformer.

(viii) Discuss the mechanism of electrical conduction by holes and electrons in semiconductor element.

(ix) What is difference between Elasticity and plasticity. (x) Why is the base current is very small?

(xi) The anode of a diode is 0.2 V positive with respect to its cathode. Is it forward biased.

(xii) Define current gain of a transistor. Give its unit.

4. Answer briefly any Six parts from the followings:- **6 × 2 = 12**

(i) Which photon, red, green, or blue carries the most. (a) energy and (b) momentum

(ii) Will bright light ejects more electrons from a metal surface than dimmer light of the same colour?

(iii) Define Stefan's Boltzmann Law. Also give the value of Stefan's constant.

(iv) Can X-ray be reflected, refracted, diffracted and polarized just like any other wave? Explain.

(v) Explain why laser action cannot occur without population inversion between atomic levels?

(vi) What do we mean by the term critical mass?

(vii) A particle which produces more ionization is less penetrating. Why?

(viii) If someone accidentally swallows an  $\alpha$ -source and a  $\beta$ -source. Which would be the more

dangerous to him? Explain why? (ix) Define the terms mass defect and binding energy.

Note: Attempt any three questions. Section ----- II **(8 × 3 = 24)**

5. (a) Explain in detail, electrical power and power dissipation in resistor.

(b) The time constant of a series RC circuit is  $t=RC$ . Verify that an ohm times farad is equivalent to second.

6. (a) Derive an expression for torque on current carrying coil in uniform magnetic field.

(b) A coil of 10 turns and  $35 \text{ cm}^2$  area is in a perpendicular magnetic field of 0.5 T. The coil is pulled out of the field in 1.0 s. Find the induced emf in the coil as it is pulled out of the field.

7. (a) What is operational amplifier? How op. Amplifier is used as Non Inverting Amplifier?

(b) A 10 mH,  $20 \Omega$  coil is connected across 240 V and  $180/\pi$  Hz source. How much power does it dissipate.

8. (a) What are intrinsic and extrinsic semi conductors? Describe the formation of N-type and P-type semi conductors.

(b) If  ${}_{92}^{233}\text{U}$  decays twice by  $\alpha$  - emission, what is the resulting isotope?

9. (a) State Postulates of Bohr's model of Hydrogen atom and show that hydrogen atom has quantized radii.

(b) An electron is accelerated through a potential difference of 50 V calculate its de-Broglie wave length.

Physics (Objective)

(Group II)

PAPER CODE 4478

S40-I-21

Paper (II)

Maximum Marks:- 17

Time Allowed:- 20 minutes

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Q. 1

- 1) In the Bohr's model of hydrogen atom, the lowest orbit corresponds to  
(A) Infinite energy (B) Zero energy (C) Minimum energy (D) Maximum energy
- 2) Which of the following conservation law hold in nuclear transmutation.  
(A) Mass (B) Energy (C) Momentum (D) All of these
- 3) The building blocks of protons and neutrons are  
(A) Ions (B) Electrons (C) Positrons (D) Quarks
- 4) The energy density in a capacitor is directly proportional to  
(A)  $\epsilon_0 \epsilon_r$  (B)  $E^2$  (C)  $C^2$  (D)  $V^2$
- 5) The negative sign in the expression of potential gradient  $\vec{E} = -\frac{\Delta \vec{V}}{\Delta r}$  shows that, direction of  $\vec{E}$  is along.  
(A) Increasing potential (B) Decreasing potential (C) Increasing strength (D) Negative potential
- 6) Colour code of 10  $\Omega$  resistance with 5% tolerance is  
(A) Black, black, Brown, Silver (B) Brown, black, black, Gold (C) Black, brown, black, Gold (D) Brown, brown, black, Gold
- 7) The brightness of spot on C.R.O screen is controlled by  
(A) Anodes (B) Cathodes (C) Grid (D) Plates
- 8) 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
- 9) The direction of induced current is always so as to oppose the change which causes the current is  
(A) Faraday's Law (B) Lenz's Law (C) Ohm's Law (D) Kirchhoff's 1st rule
- 10) When current flowing through an inductor is doubled, then energy stored in it becomes.  
(A) Half (B) Four times (C) One fourth (D) Double
- 11) In RLC series circuit, the current at resonance frequency is  
(A) Minimum (B) Maximum (C) Zero (D) Infinite
- 12) When 10 V are applied to an A.C circuit, the current flowing in it is 100 mA, its impedance is  
(A) 50  $\Omega$  (B) 75  $\Omega$  (C) 100  $\Omega$  (D) 90  $\Omega$
- 13) If stress is increased beyond the elastic limit of a material, it becomes permanently changed, this behaviour of material is called.  
(A) Elasticity (B) Plasticity (C) Yield strength (D) Ultimate tensile strength
- 14) The potential barrier of silicon at room temperature is  
(A) 0.3 V (B) 0.7 V (C) 3.0 V (D) 7.0 V
- 15) The voltage gain of an amplifier having  $r_{ie} = 1\Omega$ ,  $\beta = 100$ ,  $R_c = 20\Omega$  is  
(A) 2000 (B) 1000 (C) 500 (D) 5
- 16) When a photon collide with an electron, which of following of photon increases.  
(A) Frequency (B) Energy (C) Wave Length (D) Mass
- 17) Which of the following explain particle nature of light?  
(A) Interference (B) Diffraction (C) Photoelectric effect (D) Polarization

1277 - 1221 ALP -- 15000 (4)

Allowed: 2.40 hours

Section ----- I

Maximum Marks: 68

Answer briefly any Eight parts from the followings:- **S40-I-21**  $8 \times 2 = 16$

- How can you identify that which plate of a capacitor is positively charged?
- (i) Do electrons tend to go to region of High potential or of low potential?
  - (iii) How much energy will store in a capacitor of capacitance  $1.0 \mu F$  having electrical potential of 10.0 V between the parallel plates capacitor. (iv) Define electron volt. Is it a unit of electrical potential or energy.
  - (v) Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain.
  - (vi) How can you use a magnetic field to separate isotopes of chemical element?
  - (vii) A current carrying rectangular coil is rotating in a magnetic field. What factors does the torque of coil depend?
  - (viii) How can phase difference between two voltages be obtained by Cathode Ray Oscilloscope?
  - (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) Show that  $\varepsilon$  (emf) and  $\frac{\Delta\phi}{\Delta t}$  have the same units.
  - (xi) What will be the energy density of current carrying solenoid if magnetic field is doubled?
  - (xii) Does the self inductance depend on the rate of change of current?

3. Answer briefly any Eight parts from the followings:-

$8 \times 2 = 16$

- (i) State Kirchoff's Rules. (ii) A sinusoidal current has rms value of 10 A. What is the maximum or peak value?
  - (iii) A potential difference is applied across the ends of a copper wire. What is the effect on the drift velocity of free electrons by decreasing the length and the temperature of the wire?
  - (iv) What is Wheatstone bridge? How can it be used to determine an unknown resistance?
  - (v) 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?
  - (vi) Why the choke is used in A.C. circuits? (vii) Define Retativity and coercive current.
  - (viii) Write the name of four applications of superconductors.
  - (ix) Explain briefly the semiconductors in terms of energy band theory. (x) Write name of applications of photodiode.
  - (xi) What is the biasing requirement of the junctions of a transistor for its normal operation? Explain how these requirements are met in a common emitter amplifier.
  - (xii) How does the motion of an electron in a n-type substance differ from the motion of holes in a p-type substance?
4. Answer briefly any Six parts from the followings:-
- (i) Can pair production takes place in vacuum? Explain. (ii) Is it possible to create a single electron from energy? Explain.
  - (iii) We do not notice the de Broglie wavelength for a pitched cricket ball. Explain why?
  - (iv) What do we mean when we say that the atom is excited? (v) Write down any four uses of Laser.
  - (vi) What do you understand by "background radiation"? State two sources of this radiation.
  - (vii) What information is revealed by the length and shape of the tracks of an incident particle in Wilson cloud chamber?
  - (viii) Describe the principle of operation of a solid state detector of ionizing radiation in terms of generation and detection of charge carriers.
  - (ix) Discuss the advantages and disadvantages of nuclear power compared to the use of fossil fuel generated power.

Note: Attempt any three questions.

Section ----- II

$(8 \times 3 = 24)$

- 5. (a) What is Wheatstone bridge? Derive a relation for its balancing condition.  
(b) Two opposite point charges each of magnitude  $q$  are separated by a distance  $2d$ . What is the electric potential at a point  $P$  mid-way between them.
- 6. (a) Derive the expression for torque on a current carrying coil in a uniform magnetic field.  
(b) A metal rod of length 25 cm is moving at a speed of  $0.5 \text{ ms}^{-1}$  in a direction perpendicular to  $0.25 \text{ T}$  magnetic field. Find the emf produced in the rod?
- 7. (a) How an operational amplifier behaves as non-inverting amplifier? Derive a relation for voltage gain of the non-inverting amplifier.  
(b) An alternating source of emf 12 V and frequency 50 Hz is applied to a capacitor of capacitance  $3 \mu F$  in series with a resistor of resistance  $1 \text{ k} \Omega$ . Calculate the phase angle.
- 8. (a) What are the Radiation Detectors? What do you know about "Wilson's cloud chamber"? Explain its principle, construction and working.  
(b) What stress would cause a wire to increase in length by 0.01 % if the Young's modulus of the wire is  $12 \times 10^{10} \text{ Pa}$ . What force would produce this Stress if the diameter of the wire is 0.56 mm.
- 9. (a) What is De-Broglie hypothesis of wave nature of particles? How Davisson and Germer experiment confirmed it?  
(b) Find the speed of electron in the first Bohr orbit.