Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	The rest mass energy of electron positron pair is :			
	(A) 0.51 MeV	(B) 0.71 MeV	(C) 1.02 MeV	(D) 2 MeV
2	The SI unit of impedance is :			
	(A) Ohm	(B) Farad	(C) Volt	(D) Ampere
3	To convert galvanometer into voltmeter, high resistance is connected to the galvanometer in :			
	(A) Parallel	(B) Series	(C) Anti parallel	(D) Perpendicular
4	In transistor, concentration of impurity is highest in :			
	(A) Collector	(B) Emitter	(C) Base and collector	(D) Base
5	At high frequency, RLC series circuit behaves like :			
	(A) R-C circuit	(B) R-L circuit	(C) RLC series circuit	(D) L-C circuit
6	If electric and gravitational forces on an electron balance each other, then electric field intensity will be :			
	(A) mgq	(B) $\dfrac{q}{mg}$	(C) $\dfrac{mg}{q}$	(D) $\dfrac{q}{4\pi\varepsilon_o r^2}$
7	The temperature of steam coming out of turbine in nuclear reactor is :			
	(A) 200 °C	(B) 300 °C	(C) 600 °C	(D) 1300 °C
8	The dimensions of motional emf are same as that of :			
	(A) Magnetic induction	(B) Magnetic flux		
	(C) Potential difference	(D) Magnetic force		
9	The value of Stefen's constant 'σ' is given by :			
	(A) $5.67 \times 10^{-8}\, Wm^{-2}K^{-2}$	(B) $5.67 \times 10^{-8}\, Wm^{-2}K^{-4}$		
	(C) $5.67 \times 10^{-8}\, Wm^{2}K^{2}$	(D) $5.67 \times 10^{-8}\, W^{2}m^{2}K^{-2}$		
10	A charge of 4C is placed in the field of intensity $8 NC^{-1}$. The force on the charge is :			
	(A) 2 N	(B) 4 N	(C) 16 N	(D) 32 N
11	The example of crystalline solid is :			
	(A) Zirconia	(B) Natural rubber	(C) Polystrene	(D) Nylon
12	Heat sensitive resistors are called :			
	(A) Resistor	(B) Thermistor	(C) Inductor	(D) Capacitor
13	The atoms can reside in metastable state for about :			
	(A) $10^{-2}s$	(B) $10^{-3}s$	(C) $10^{-4}s$	(D) $10^{-8}s$
14	X = A + B is the mathematical notation for :			
	(A) OR gate	(B) NOR gate	(C) NOT gate	(D) NAND gate
15	Binding energy per nucleon for isotope iron-58 has a value of :			
	(A) 6.6 MeV	(B) 7.7 MeV	(C) 8.8 MeV	(D) 9.9 MeV
16	For step up transformer :			
	(A) $N_s < N_p$	(B) $N_s > N_p$	(C) $N_s = N_p$	(D) $N_s \geq N_p$
17	Brightness of screen of CRO is controlled by :			
	(A) Grid	(B) Anode	(C) Cathode	(D) Filament

SECTION – I

LHR–1–24

2. Write short answers to any EIGHT (8) questions :   **16**

(i) Write down dimensions of : (a) Pressure. (b) Density.

(ii) Does a dimensional analysis give any information on constant of proportionality that may appear in an algebraic expression?

(iii) Name two major types of errors.

(iv) Write down factors of prefixes atto and tera.

(v) Can magnitude of a vector have a negative value?

(vi) If $\vec{A} - \vec{B} = \vec{O}$, what can you say about the components of the two vectors?

(vii) Can you add zero to a null vector?

(viii) Motion with constant velocity is a special case of motion with constant acceleration. Is this statement true? Discuss.

(ix) An object is thrown vertically upward. Discuss sign of acceleration due to gravity relative to velocity, while the object is in air.

(x) How impulse is equal to change in momentum?

(xi) An object has 1J of potential energy. Explain what does it mean?

(xii) Prove that $P = \vec{F}.\vec{v}$ where P , $\vec{F}$ and $\vec{v}$ are power, force and velocity.

3. Write short answers to any EIGHT (8) questions :   **16**

(i) A wheel covers 200 m distance between two points. If its radius is 0.2 m, find the number of revolution completed by the wheel.

(ii) Describe what should be the minimum velocity for a satellite, to orbit close to the earth around it.

(iii) State the direction of the following vectors in simple situations, angular momentum and angular velocity.

(iv) When mud flies off the tyre of a moving bicycle, in what direction does it fly? Explain.

(v) A person is standing near a fast moving train. Is there any danger that he will fall towards it?

(vi) Explain the working of a carburetor of a motorcar using Bernoulli's principle.

(vii) Time period of a simple pendulum is 2.0 s and amplitude 20 cm, find its maximum speed.

(viii) What are the conditions of constructive and destructive interference of two sound waves from coherent sources?

(ix) Can we realize an ideal simple pendulum?

(x) What is the total distance travelled by an object moving with SHM in a time equal, to its period, if its amplitude is A?

(xi) Explain the terms : (i) crest. (ii) antinode.

(xii) Why does sound travel faster in solids than in gases?

(Turn Over)

4. **Write short answers to any SIX (6) questions :**   **12**

    (i) Which principle is helpful to determine the shape and location of new wavefront? Explain briefly.

    (ii) Explain whether the Young's experiment is an experiment for studying interference or diffraction effects of light.

    (iii) What are different methods to get polarized light?

    (iv) What is multimode step index fibre? Explain in short.

    (v) Draw the ray diagram of compound microscope.

    (vi) Describe in short the construction and working of collimator.

    (vii) What will be efficiency of an engine if it performs 100 J of work and rejects 400 J of heat energy to the cold reservoir?

    (viii) Why the efficiency of real heat engine is always less than one?

    (ix) Give an example of a process in which no heat is transferred to or from the system but temperature of system changes.

SECTION – II

Note :   **Attempt any THREE questions.**

5. (a) Find resultant of $\overline{A}$ and $\overline{B}$ using addition of vectors by rectangular components.   5

    (b) A football is thrown upward at an angle of $30°$ with respect to horizontal. To throw a 40 m pass what must be the initial speed of the ball?   3

6. (a) How would you describe the analytical approach of formula of absolute P.E., also derive the formula with diagrammatic explanation.   5

    (b) The frequency of the note emitted by a stretched string is 300 Hz. What will be the frequency of this note when the tension is increased by one third without changing the length of the wire?   3

7. (a) Define angular momentum and explain orbital and spin angular momentum.   5

    (b) A block of mass 4.0 kg is dropped from height of 0.80 m on to a spring of spring constant $k = 1960\ Nm^{-1}$. Find the maximum distance through which the spring will be compressed?   3

8. (a) Define pressure of gas. Prove that pressure exerted by the gas is directly proportional to the average translational kinetic energy of the gas molecules.   5

    (b) How large must a heating duct be if air moving along it can replenish the air in a room of $300\ m^3$ volume every 15 min.? Assume the air's density remains constant.   3

9. (a) Explain Young's Double slit experiment to study the phenomenon of interference of light.   5

    (b) An astronomical telescope having magnifying power of 5 consist of two thin lenses 24 cm apart. Find the focal lengths of the lenses.   3

_____ (To be filled in by the candidate)

(Academic Sessions 2020 – 2022 to 2022 – 2024)

PHYSICS   224-1st Annual-(INTER PART – II)   Time Allowed : 20 Minutes
Q.PAPER – II (Objective Type)   GROUP – II   Maximum Marks : 17
PAPER CODE = 8476   LHR-2-24

Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	What is the critical temperature of Yttrium Barium Copper Oxide ($YBa_2Cu_3.O_7$) :
	(A) 4.2 K (B) 110 K (C) 163 K (D) 7.2 K
2	One henry (H) is defined as :
	(A) $1H = 1VS^{-1}A^{-1}$ (B) $1H = 1VSA$ (C) $1H = 1VSA^{-1}$ (D) $1H = 1VS^{-1}A$
3	Choose the photon of highest energy among the following :
	(A) X-rays (B) Infrared (C) Radiowaves (D) Gamma rays
4	A particle having a charge of 2e falls through a potential difference of 3V. The energy acquired by it will be :
	(A) 5 eV (B) 1.5 eV (C) 6 eV (D) 0.6 eV
5	SI unit of equivalent dose is :
	(A) Sievert (B) Gray (C) Rad (D) Curie
6	If peak value of AC voltage is 100 V, then the peak to peak value will be :
	(A) 200 V (B) 50 V (C) 70 V (D) 1000 V
7	The direction of magnetic lines of force around a straight current carrying conductor is found by :
	(A) Ampere's law (B) Coulomb's law (C) Lenz's law (D) Right hand rule
8	Which of the following is the correct relation between electric intensity E and potential difference ΔV :
	(A) $E = -\dfrac{\Delta V}{\Delta r}$ (B) $\Delta V = -\dfrac{E}{\Delta r}$ (C) $E = \Delta V + \Delta r$ (D) $E = \dfrac{\Delta V^2}{\Delta r^2}$
9	Which of the following requires no external bias for its operation :
	(A) LED (B) Photo diode (C) Photo-voltaic cell (D) Transistor
10	The energy of K_α X-rays is :
	(A) $hf_{k\alpha} = E_M - E_K$ (B) $hf_{k\alpha} = E_L - E_K$ (C) $hf_{k\alpha} = E_K - E_M$ (D) $hf_{k\alpha} = E_N - E_M$
11	The power factor of a series resonance circuit at resonance frequency is :
	(A) Zero (B) Infinite (C) 2 (D) 1
12	In AVO meter, the part which connects the galvanometer with the relevant measuring circuit is known as :
	(A) Range switch (B) Diode (C) Ground (D) Function selector
13	How much time is required for the complete decay of a radioactive element :
	(A) Five half lives (B) Two half lives (C) Ten half lives (D) Infinite
14	Choose the device which converts electrical energy into mechanical energy :
	(A) Motor (B) Generator (C) Transformer (D) Inductor
15	The current-voltage graph of an ohmic material is :
	(A) Curve (B) Straight line (C) Parabolic (D) Circular
16	The phase shift between the input and output of a common-emitter transistor amplifier is :
	(A) 90° (B) 180° (C) 60° (D) 45°
17	Which of the following factor is called Compton Wavelength :
	(A) $\dfrac{h}{m_o c}$ (B) $\dfrac{m_o c}{h}$ (C) $\dfrac{hc}{m_o}$ (D) $\dfrac{m_o}{hc}$

Roll No. _____ (To be filled in by the candidate)

PHYSICS   224-1st Annual-(INTER PART – II)   Time Allowed : 2.40 hours

PAPER – II (Essay Type)   GROUP – II   Maximum Marks : 68

LHR-2-24

SECTION – I

2. Write short answers to any EIGHT (8) questions :   16

  (i)   Do electrons tend to go to region of high potential or of low potential?

  (ii)   How can you identify that which plate of a capacitor is positively charged?

  (iii) Define electric potential. Write its SI unit.

  (iv)   How Millikan concluded that minimum value of the charge is the charge on an electron?

  (v)   Why a voltmeter should have a very high resistance?

  (vi)   Why does the picture on a TV screen become distorted when a magnet is brought near the screen?

  (vii) State Ampere's law. Write its mathematical form.

  (viii) How the path of electrons is made visible in glass tube to measure e/m ratio?

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

  (x)   How can radioactivity help in treatment of cancer?

  (xi)   How do gamma rays photon interact with matter at low and high energy?

  (xii) How did James Chadwick discover a neutron?

3. Write short answers to any EIGHT (8) questions :   16

  (i)   How can a rheostat be used as a potential divider? Draw also diagram.

  (ii)   Do bends in a wire affect its electrical resistance? Explain.

  (iii) Explain thermistors, their construction and shapes.

  (iv)   Define inductive reactance and capacitive reactance. Also write mathematical formula of each.

  (v)   At what frequency will an inductor of 1 H have a reactance of 500 Ω ?

  (vi)   How reception of a particular radio station is selected on your radio set?

  (vii) Give a comparison of crystalline and amorphous solids briefly.

  (viii) Differentiate between elasticity and plasticity.

  (ix)   What is meant by paramagnetic and ferromagnetic substances?

  (x)   What is the effect of forward biasing and reverse biasing of a diode on the width of depletion region?

  (xi)   Draw circuit diagram of full wave rectifier.

  (xii) Why is the base current in a transistor very small?

4. Write short answers to any SIX (6) questions :   12

  (i)   State the Lenz's law and explain the significance of -ve sign in Faraday's law.

  (ii)   Does the induced emf always acts to decrease the magnetic flux through a circuit?

(Turn Over)

4. (iii) What is the efficiency of a transformer? Describe methods to increase it.

    (iv) As a solid is heated and begins to glow, why does it first appear red?

    (v) Write two properties of intensity distribution diagram.

    (vi) When does the light behave as a particle and when does it behave as a wave?

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

   (viii) Bohr's theory of hydrogen atom is based upon several assumptions. Do any of these contradict classical physics?

    (ix) Differentiate between spontaneous and stimulated emissions.

SECTION – II

Note : **Attempt any THREE questions.**

5. (a) Derive an expression for the energy stored in a capacitor.   5

    (b) The resistance of an iron wire at $0\ ^{o}C$ is $1\times10^{4}\Omega$. What is the resistance at $500\ ^{o}C$ if the temperature co-efficient of resistance of iron is $5.2\times10^{-3}K^{-1}$?   3

6. (a) State Ampere's law. Calculate the magnetic field due to current carrying solenoid.   5

    (b) A circular coil has 15 turns of radius 2 cm each. The plane of the coil lies at 40° to the uniform magnetic field of 0.2 T. If the field is increased by 0.5 T in 0.2 s, find the magnitude of induced emf.   3

7. (a) Discuss the behaviour of an inductor in an A.C. circuit and write expression for inductive reactance.   5

    (b) In a certain circuit, the transistor has a collector current of 10 mA and a base current of $40\mu A$. What is the current gain of transistor?   3

8. (a) What is meant by strain energy? Derive the relation for strain energy in deformed materials.   5

    (b) X-rays of wavelength 22 pm are scattered from a carbon target. The scattered radiation being viewed at 85° to the incident beam. What is Compton Shift?   3

9. (a) How de-Broglie's interpret Bohr's 2nd postulate that an angular momentum is equal to integral multiple of $\dfrac{h}{2\pi}$?   5

    (b) A sheet of lead 5.0 mm thick reduces the intensity of a beam of γ-rays by a factor 0.4. Find half value thickness of lead sheet which will reduce the intensity of half of its initial value.   3