PHYSICS		TIME : 20 MINUTES
GROUP : FIRST		MARKS :17

OBJECTIVE

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 marks in that question.

QUESTION NO. 1   DGK–1–24

1. A particle of mass m and charge q is released from rest in a uniform of electric field E. The K.E attained by the particle after moving a distance ' d ' is

   (A) $\dfrac{Ed}{q}$ (B) qE^2d (C) qEd (D) $\dfrac{qE}{d^2}$

2. Two charges are placed at a certain distance a part in vacuum. If a dielectric slab is placed between them , the force between them

   (A) Will increase   (B) Will decrease   (C) Will remain unchanged

   (D) May increase or decrease depending on the material of the slab

3. If the current passing through a conductor is reduced to half, then heat produced becomes

   (A) 2 times   (B) Remains the same   (C) $1/4$ times   (D) Becomes half

4. Weber ampere per meter is equal to

   (A) Joule   (B) Newton   (C) Tesla   (D) Henry

5. An electron is moving in a circle of radius ' r ' in a uniform magnetic field B suddenly the field is reduced to $\dfrac{B}{2}$ .The radius of circle now becomes

   (A) $r/2$ (B) $r/4$ (C) 2 r   (D) $4/r$

6. Which of the following quantity remains unchanged in a transformer ?

   (A) Voltage   (B) Current   (C) Power   (D) Frequency

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

   (A) 0° (B) 30° (C) 45° (D) 60°

8. In R-L-C series circuit the phase angle between X_L and X_C is

   (A) $\tan^{-1}\left(\dfrac{WL}{R}\right)$ (B) $\tan^{-1}\dfrac{1}{wRC}$ (C) $\tan^{-1}\left(\dfrac{Z}{R}\right)$ (D) π

9. The power factor of an A.C circuit has

   (A) SI unit ampere   (B) SI unit volt   (C) SI unit watt   (D) Zero

10. Curie temperature for iron is about

    (A) 750 K   (B) 570 K   (C) 1023 K   (D) 378 K

11. The value of input resistance of op – amp is of the order of

    (A) Few Ohms   (B) Milli Ohms   (C) Kilo Ohms   (D) Mega Ohms

12. A device which converts a physical quantity into voltage is called a

    (A) Sensor   (B) Inverter   (C) Amplifier   (D) Photodiode

13. We can never accurately describe all aspects of subatomic particles simultaneously. It is correct according to

    (A) Uncertainty principle   (B) de – Broglie theory   (C) Einstein theory   (D) Photoelectric effect

14. If one photon is obtained in annihilation of matter then which of the following conservation law not hold

    (A) Energy   (B) Momentum   (C) Charge   (D) All these law would not hold

15. In the Bohr's model of the hydrogen atom , the lowest orbit corresponds to

    (A) Infinite energy   (B) Maximum energy   (C) Minimum energy   (D) Zero energy

16. Mass equivalent of 931 Mev energy is

    (A) 6.02×10^{-31} Kg   (B) 1.66×10^{-27} Kg   (C) 1.67×10^{-27} Kg   (D) 6.02×10^{-27} Kg

17. If energy of γ-radiation is less than 0.5 Mev the dominant process is

    (A) Photoelectric effect   (B) Compton effect   (C) Pair production   (D) Black body radiation

QUESTION NO. 2 Write short answers any Eight (8) of the following DGK-1-24   16

i	What is the effect of medium between the charges on Coulomb's force ? Explain
ii	Describe four properties of electric field lines.
iii	Electric lines of force never cross. Why ?
iv	Do electrons tend to go to region of high potential or of low potential ?
v	Define magnetic flux and magnetic flux density.
vi	Define right hand rule for the determination of direction of magnetic field of current carrying wire.
vii	How can a current loop be used to determine the presence of magnetic field in a given region of space ?
viii	How can you use a magnetic field to separate isotopes of chemical element ?
ix	For what purpose bromine is mixed in principal gas in Geiger tube ?
x	Write down two advantages of solid state detector.
xi	What do we mean by the term critical mass ?
xii	A particle which produces more ionization is less penetrating. Why ?

QUESTION NO. 3 Write short answers any Eight (8) of the following   16

i	What is Wheatstone bridge ? How it can be used to determine unknown resistance ?
ii	What are the difficulties in testing whether the filament of a lighted bulb obeys Ohm's law ?
iii	Give some application of thermistor ?
iv	Explain the conditions under which electromagnetic waves are produced from the source ?
v	How the reception of a particular radio station is selected on your radio set ?
vi	What is choke ? Give its uses.
vii	Discuss the mechanism of electrical conduction by Holes and electrons in a pure semiconductor element.
viii	Differentiate between intrinsic and extrinsic semiconductor.
ix	What are crystalline and polymeric solids.
x	Why is the base current in a transistor is very small ?
xi	Why charge carrier are not present in the depletion region ?
xii	How reverse biasing of semiconductor diode occure ? Show by diagram.

QUESTION NO. 4 Write short answers any Six (6) of the following   12

i	Four unmarked wires emerge from a transformer. What steps would you take to determine the turns ratio ?
ii	Can an electric motor be used to drive an electric generator with the output from the generator being used to operate the motor ?
iii	Find the energy stored in an inductor of inductance 100 mH carrying a current of 2 A.
iv	Which has the lower energy quanta ? Radiowaves or x – rays
v	Is it possible to create a single electron from energy ? Explain.
vi	State uncertainty principle in terms of position and momentum of a particle. Also write its mathematical expression.
vii	Write down the postulates of special theory of relativity.
viii	Is energy conserved when an atom emits a photon of light ?
ix	Find the speed of an electron in the first Bohr orbit.

SECTION-II

Note: Attempt any Three questions from this section (Part A = 5 Marks & Part B = 3 Marks   8 x 3 = 24)

Q.5.(A)	What is Electromotive force ? Derive the relation of terminal potential difference.
(B)	In Bohr's atomic model of Hydrogen atom, the electron is in an orbit around the nuclear proton at a distance of 5.29×10^{-11} m with a speed of 2.18×10^{6} ms^{-1}. Find the electric potential that a proton exerts at this distance.
Q.6.(A)	State Ampare's law. Calculate the magnetic field due to current carrying solenoid.
(B)	A solenoid has 250 turns and its self inductance is 2.4 mH. What is the flux through each turn when the current is 2 A ? What is the induced emf when the current changes at 20 As^{-1} ?
Q.7.(A)	Prove that the closed loop gain of OP – AMP as inverting amplifier is given by $G = -\dfrac{R_2}{R_1}$
(B)	An iron core coil of 2.0 H and 50 Ω is placed in series with a resistance of 450 Ω. An A.C supply of 100V, 50 Hz is connected across the circuit. Find the current flowing in the coil.
Q.8.(A)	Define magnetic hysteresis. Write a note on hysteresis loop, its main features and its applications.
(B)	What is the mass of a 70 kg man in a space rocket traveling at 0.8 c from us as measured from earth
Q.9.(A)	How does uncertainty principle explain that electrons cannot exist inside the nucleus ?
(B)	The half life of $_{38}Sr^{91}$ is 9.70 hours. Find its decay constant.

OBJECTIVE

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 marks in that question.

QUESTION NO. 1

DGK-2-24

1	A test charge experiences force due to applied electric field
	(A) Parallel (B) Anti - Parallel (C) Perpendicular (D) Oblique
2	Unit +ve charge is placed over a spherical hollow surface, flux crossing it outwards is
	(A) $\frac{1}{\varepsilon_o}$ (B) Zero (C) $\frac{2}{\varepsilon_o}$ (D) $2\varepsilon_o$
3	Heat energy is converted to electrical energy by
	(A) Primary cells (B) Thermo-couples (C) Solar cells (D) Generators
4	A high speed graph plotting device is
	(A) Voltmeter (B) Galvanometer (C) Ammeter (D) C.R.O
5	Lamp and scale arrangement is used in galvanometers to measure deflection
	(A) Stable (B) Dead beat (C) Sensitive (D) Astatic
6	The behaviour is like resistors in alternating current
	(A) Capacitor (B) Motor (C) Inductor (D) Generator
7	A transformer with many secondary coils is used for
	(A) Door bell (B) TV receiver (C) Power transmission (D) Transistor radio
8	An alternating quantity can be represented by a
	(A) Static vector (B) Rotating vector (C) Scalar (D) Straight line
9	At resonance, the voltage of inductor and capacitor in series RLC circuit are
	(A) In phase (B) Out of phase (C) Perpendicular (D) Oblique
10	The reverse current to reduce the magnetization to zero is called
	(A) Retentive (B) Remanance (C) Coercive (D) Magnetization
11	A fast switching device responding in nano – seconds is
	(A) PN Junction (B) Photo diode (C) LED (D) Photo – voltaic cell
12	When output of non – inverting amplifier is fed back directly to inverting input, gain is
	(A) Zero (B) R_2/R_1 (C) One (D) $1 - \frac{R_2}{R_1}$
13	Second postulate of special theory of relativity is
	(A) Wrong (B) Virtual (C) Experimental fact (D) Sometimes correct
14	For low energy quanta, dominant properties are
	(A) Particle nature (B) Wave nature (C) Dual nature (D) Multi nature
15	Longest wavelength of Paschen series is (R_H = Rydberg's constant)
	(A) $9/R_H$ (B) $144/7R_H$ (C) $1/R_H$ (D) $400/9R_H$
16	For a radioactive sample of initial population No, decayed fraction after 4 half – lives is
	(A) $1/16$ (B) $1/4$ (C) $3/4$ (D) $15/16$
17	The energy output per nucleon in fusion is greater than energy output per nucleon in fission
	(A) 25 times (B) 6 to 7 times (C) 17 times (D) 200 times

QUESTION NO. 2 Write short answers any Eight (8) of the following   16

i	Summarize the properties of electric field lines.
ii	Find electric field intensity inside a hallow charged spheres.
iii	The potential is constant throughout a given region of space. Is the electric field zero or non zero in this region ? Explain
iv	Define capacitance of a capacitor. Also define its unit.
v	Draw circuit diagram of conversion of galvanometer into an Ohm meter.
vi	Write down any two uses of C.R.O
vii	How can we use a magnetic field to separate isotopes of chemical element ?
viii	Why the voltmeter should have a high resistance ?
ix	If someone swallow an α - source and a β- source which would be more dangerous to him ? Explain Why ?
x	Why are heavy nuclei unstable ?
xi	Comment on some radiations in the environment added by human activities.
xii	What is radiography ? Explain briefly.

QUESTION NO. 3 Write short answers any Eight (8) of the following   16

i	Describe the circuit which will give a continuously varying potential ?
ii	Why does the resistance of a conductor rise with temperature ?
iii	What is temperature coefficient of resistance ? Give its mathematical form.
iv	What is inductor ? When does it behave as a choke ?
v	Write the properties of parallel resonance circuit at resonant frequency.
vi	What is meant by A.M and F.M
vii	Define crystal lattice. Illustrate yours answer with example.
viii	Distinguish between crystalline, amorphous and polymeric substances ?
ix	What is coercivity in a ferromagnetic materials ?
x	Define rectification. How many types of rectification ?
xi	Give the truth table of XOR – Gate ?
xii	Why ordinary silicon diodes do not emit light ?

QUESTION NO. 4 Write short answers any Six (6) of the following   12

i	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 ?
ii	Derive an expression $\mathcal{E} = - N\dfrac{\Delta\Phi}{\Delta t}$
iii	What is the cause of induced emf ?
iv	Photon A has twice the energy of photon B. What is the ratio of the momentum of A to that of B ?
v	What advantages an electron microscope has over an optical microscope ?
vi	Write some important results of photoelectric effect.
vii	An electron is accelerated through a potential difference of 50 V. Calculate its de-Broglie wavelength.
viii	What is meant by a line spectrum ? Explain , how line spectrum can be used for the identification of elements ?
ix	What do you mean by spectroscopy ? What are the main types of spectra ?

SECTION-II

Note: Attempt any Three questions from this section   (Part A = 5Marks & Part B=3Marks   8 x 3 = 24)

Q.5.(A)	What is Electromotive force and terminal potential difference ? Explain
(B)	A capacitor has a capacitance of 2.5 x 10^{-8} F. In the charging process , electrons are removed from one plate and placed on the other one. When potential difference between the plates is 450 V, how many electrons have been transferred ? (e = 1.6 x 10^{-19} C)
Q.6.(A)	State Lenz's law. Explain how energy conserved in case of movement of bar magnet and metal rod placed on parallel metal rails in uniform magnetic field.
(B)	How fast must a proton move in magnetic field of 2.50 x 10^{-3} T. Such that the magnetic force is equal to its weight.
Q.7.(A)	Define rectification. Explain half wave rectification and full wave rectification in detail.
(B)	What is the resonance frequency of a circuit which includes a coil of inductance 2.5 H and a capacitance 40 μF ?
Q.8.(A)	What is Compton effect ? Calculate the Compton wavelength OR Compton shift at an angle $\theta = 90^{o}$
(B)	A 1.0 m long copper wire is subjected to stretching force and its length increases by 20 cm. Calculate the tensile strain and the percent elongation which the wire undergoes.
Q.9.(A)	What is nuclear reactor ? Describe function of its main parts.
(B)	An electron jumps from a level $E_i = -3.5 \times 10^{-19}$ J to $E_f = -1.20 \times 10^{-18}$ J. What is the wavelength of the emitted light ?