10th Class 2020		
Physics	Group-II	Paper-II
Time: 1.45 Hours	(Subjective Type)	Max. Marks: 48

(Part-I)

2. Write short answers to any Five (5) questions: (10)

(i) What are the damped oscillations?

Ans The oscillations of a system in the presence of some resistive force are damped oscillations.

(ii) Prove that: $v = f\lambda$

Ans The velocity of wave is defined as:

$$\text{Velocity} = \frac{\text{distance}}{\text{time}}$$

$$v = \frac{d}{t}$$

If time taken by the wave in moving from one point to another is equal to its time period T, then the distance covered by the wave will be equal to one wavelength, hence we can write

$$v = \frac{\lambda}{T}$$

But time period T, is reciprocal of the frequency f, *i.e.*, $T = \frac{1}{f}$.

Hence proved

$$v = f\lambda$$

(iii) Define wave.

Ans A wave is a disturbance in the medium which causes the particles of the medium to undergo vibratory motion about their mean position in equal intervals of time.

(iv) **Define the intensity of sound.**

Ans "Sound energy passing per second through a unit area held perpendicular to direction of propagation of sound waves is called intensity of sound."

(v) **What do you mean by reverberation?**

Ans Sometimes, when sound reflects from the walls, ceiling, and floor of a room, the reflecting surfaces are too reflective and the sound becomes garbled. This is due to multiple reflections called reverberations.

(vi) **What are the ultrasonic waves?**

Ans Sounds of frequency higher than 20,000 Hz which are inaudible to normal human ear are called ultrasound or ultrasonics. The waves produced by these are called ultrasonic waves.

(vii) **Define irregular reflection of light.**

Ans Most of the objects in everyday world are not smooth on the microscopic level. The rough surfaces of these objects reflect the rays of light in many directions. Such type of reflection is called irregular reflection.

(viii) **Define resolving power of an instrument.**

Ans The resolving power of an instrument is its ability to distinguish between two closely placed objects or point sources. In order to see objects, that are close together, we use an instrument of high resolving power. For example, we use high resolving power microscope to see tiny organisms and telescope to view distant stars.

3. Write short answers to any Five (5) questions: (10)

(i) **Define electric field intensity. Also write its unit.**

Ans "The strength of electric field at any point in space is known as electric field intensity."

Its formula is:

$$E = \frac{F}{q_0}$$

Unit: Its unit is $N\ C^{-1}$.

(ii) What do you know about paper capacitor?

Ans Paper capacitor is an example of fixed capacitors. The paper capacitor has a cylindrical shape. Usually, an oiled or greased paper or a thin plastic sheet is used as a dielectric between two aluminium foils. The paper or plastic sheet is firmly rolled in the form of a cylinder and is then enclosed into a plastic case.

(iii) Describe Ohm's law.

Ans The current passing through a conductor is directly proportional to the potential difference applied across its ends, provided the temperature and physical state of the conductor do not change.

(iv) Differentiate between direct current and alternating current.

Ans The current derived from a cell or a battery is direct current or D.C since it is unidirectional.

On the contrary, such a current that changes direction after equal intervals of time is called alternating current or A.C.

(v) Define resistivity. Write its formula.

Ans Specific resistance is called resistivity. And the property of a substance which offers opposition to the flow of current through it is called its resistance. The formula of resistivity is:

$$R = \rho \frac{1}{s}$$

Here, ρ is the constant of proportionality, which is specific resistance.

(vi) Write the principle of A.C. generator.

Ans When a coil rotates in a magnetic field, the induced current in it continuously changes from maximum to minimum value and from minimum to maximum value, and so on. This is the basic principle on which an A.C generator works.

(vii) Define electromagnetic induction.

Ans The production of an electric current across a conductor moving through a magnetic field is called electromagnetic induction.

(viii) Give difference between step-up and step-down transformer.

Ans If the secondary voltage is larger than the primary voltage, the transformer is called a step-up transformer.

If the secondary voltage is smaller than the primary voltage, that is called step-down transformer.

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4. Write short answers to any Five (5) questions: (10)

(i) Differentiate between data and information.

Ans Data are facts and figures that are used by programs to produce useful information. On the other hand, processed data is called information.

(ii) What are logic gates?

Ans Logic gates are the circuits which implement the various logic operations. These are digital circuits which have one or more inputs but only one output.

(iii) Write down name of four electronic devices.

Ans Following are name of four electronic devices:

1. Fuse
2. Circuit Breaker
3. Earthwire
4. Capacitor

(iv) Define analogue and digital electronics.

Ans The branch of electronics consisting of circuits which process analogue quantities is called analogue electronics.

On the other hand, the branch of electronics consisting of circuits which process digital quantities is called digital electronics.

(v) Write two advantages of e-mail.

Ans Two advantages of e-mail are:

1. Versatile:

Pictures or other files can also be sent through e-mail.

2. Fast communication:

We can send messages anywhere in world instantly.

(vi) Define nuclear transmutation.

Ans The spontaneous process in which a parent unstable nuclide changes into a more stable daughter nuclide with the emission of radiations is called nuclear transmutation.

(vii) What is electron volt? Write its relation with joule.

Ans If one joule of work is done against the electric field in bringing one coulomb positive charge from infinity to a point in the electric field, then the potential at that point will be one electron volt.

Its relation with joule is $1\ v = 1\ J\ C^{-1}$.

(viii) **Write two properties of beta particle.**

Ans Two properties of beta particle are:

1. Beta radiation is a stream of high-energy electrons.
2. An unstable nuclei with excess of neutrons may eject beta radiations.

(Part-II)

NOTE: Attempt any Two (2) questions.

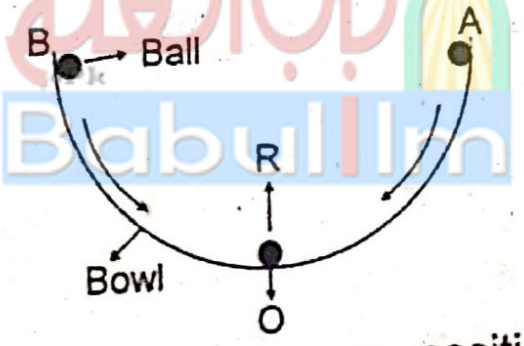
Q.5.(a) Prove that motion of a ball in a ball and bowl system is simple harmonic motion. (4)

Ans **Simple Harmonic Motion:**

"The acceleration of a vibrating body is directly proportional to the displacement covered by the body and always directed towards mean position." *i.e.*, $a \propto -x$.

Ball and Bowl System:

The motion of a ball placed in a bowl is an example of simple harmonic motion as shown in the following figure:



When the ball is at the mean position O, that is, at the centre of the bowl, net force acting on the ball is zero. In this position, weight of the ball acts downward and is equal to upward normal force of the surface of the bowl. Hence there is no motion. Now if we bring the ball to position A and then release it, the ball will start moving towards the mean position O due to the restoring force caused by its weight. At position O, the ball gets maximum speed and due to inertia, it moves towards the extreme position B. While going towards the position B, the speed of the ball decreases due to the restoring force which acts

towards the mean position. At the position B, the ball stops for a while and then again moves towards the mean position O under the action of restoring force. This to and fro motion of the ball continues about the mean position O till all its energy is lost due to friction. Thus the to and fro motion of the ball about a mean position placed in a bowl is an example of simple harmonic motion.

(b) The power of a convex lens is 5 D. At what distance, the object should be placed from the lens so that its real and two times larger image is formed? (5)

Ans Power of lens is:

$$P = 5\ D$$

Magnification:

$$M = 2$$

Object Distance:

$$P = ?$$

We know:

$$P = \frac{1}{f(m)}$$

$$f = \frac{1}{P}$$

$$f = \frac{1}{5} = 0.2$$

$$f = 20\ m$$

$$\text{Magnification} = 2 = \frac{I}{0} = \frac{q}{p}$$

$$\Rightarrow \quad \frac{q}{p} = 2$$

$$q = 2p$$

The lens equation:

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$$

By putting given conditions, we get

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{2p}$$

$$\frac{1}{f} = \frac{2+1}{2p}$$

$$\Rightarrow \quad p = \frac{3f}{2}$$

By putting the values, we get

$$p = \frac{3 \times 20}{2}$$

$$\boxed{p = 30 \text{ cm}}$$

Q.6.(a) Discuss the main features of series combination of resistors. **(4)**

Ans For Answer see Paper 2019 (Group-II), Q.6.(a).

(b) The charge of how many negatively charged particles would be equal to 100 μC. Assume charge on one negative particle is 1.6×10^{-19} C. **(5)**

Ans For Answer see Paper 2019 (Group-II), Q.6.(b).

Q.7.(a) Explain the process of thermionic emission in detail. **(4)**

Ans **Thermionic Emission:**

The process of emission of electrons from the hot metal surfaces is called thermionic emission. Metals contain a large number of free electrons. At room temperature, electrons cannot escape the metal surface due to attractive forces of the atomic nucleus. If the metal is heated to a high temperature, some of the free electrons may gain sufficient energy to escape the metal surface.

Thermionic emission can also be produced by electrically heating a fine tungsten filament. Typical values of the voltage and current used are 6 V and 0.3 A, respectively.

(b) Carbon-14 has a half-life of 5730 years. How long will it take for the quantity of carbon-14 in a sample to drop to one-eighth of the initial quantity? (5)

Ans Half-life of Cobalt = $T_{1/2}$ = 5730 years

Original Activity = A_0

On Activity $A_{0/2} = A_{0/2} = T_{r/2}$ = 5730 years

On Activity $A_{0/4} = A_{0/4} = 2T_{1/2} = 2 \times 5730$

$= 11460$ years

On Activity $A_{0/8} = A_{0/8} = 3T_{1/2} = 3 \times 5730$

$= 17190$ years

So, original sample will remain 1.72×10^4.