Roll Number		

SET B

INDIAN SCHOOL MUSCAT
FIRST PRELIMINARY EXAMINATION
PHYSICS

CLASS: XII Sub.Code: 042 Time Allotted: 3 Hrs

06.01.2019 Max.Marks: 70

General Instructions:

1. All questions are compulsory. There are 27 questions in all.

2. This question paper has five sections: Section A, Section B, Section C and Section D.

3. Section A contains five questions of one mark each, Section B contains seven questions of two marks each, Section C contains twelve questions of three marks each, Section D contains three questions of five marks each.

4. There is no overall choice. However, internal choices have been provided in two questions of one mark, two questions of two marks, four questions of three marks and three questions of five marks weightage. You have to attempt only one of the choices in such questions.

5. You may use the following values of physical constants wherever necessary.
$\varepsilon_0 = 8.854 \times 10^{-12} C^2 N^{-1} m^{-2}$, $g = 9.8 m/s^2$, *density of water* $= 1000 kg/m^3$

SECTION A

1 How much work is done in moving a 500μC of charge between two points on an equipotential surface at a potential of 4V? 1

2 What is the function of a band pass filter used in a modulator for obtaining AM signal? 1

OR

What are Universal Logic Gates? Why are they called so?

3 Which of the following a proton or a beta particle will describe the smallest circle when projected with same velocity perpendicular to the same magnetic field? 1

4 A biconcave lens made of a transparent material of refractive index 1.25 is immersed in water of refractive index 1·33. Will the lens behave as a converging or a diverging lens? Give reason. 1

OR

How does the angle of minimum deviation of a glass prism vary, if the incident violet light is replaced by red light? Give reason.

5 Define temperature coefficient of resistivity. 1

SECTION B

6 Name the experiment which verified the wave nature of electrons. Which phenomenon was observed in this experiment using an electron beam? 2

7 (i) State law of radioactive decay. 2
(ii) Plot a graph showing the number (N) of undecayed nuclei as a function of time (t) for a given radioactive sample having half life $T_{1/2}$.

8 For an amplitude modulated wave, the maximum amplitude is found to be 10V while the minimum amplitude is found to be 2V. Determine the modulation index. 2

9 A biconvex lens has a focal length 2/3 times the radius of curvature of either surface. Calculate the refractive index of lens material. 2

10 Explain the term 'drift velocity' of electrons in a conductor. Hence obtain the expression for the current through a conductor in terms of 'drift velocity'. 2

OR

Describe briefly, with the help of a circuit diagram, how a potentiometer is used to determine the internal resistance of a cell.

11 A bulb B and an inductor L are connected in series to the AC mains. The bulb glows with some brightness. How will the glow of the bulb change when a i) a soft iron core ii) bismuth core is introduced inside the inductor? Give reasons. 2

12 State Lenz's law. "The Lenz's law is a consequence of the principle of conservation of energy." Justify this statement. 2

OR

Why is the use of a.c. voltage preferred over d.c. voltage? Give two reasons.

SECTION C

13 With the help of a labelled diagram, state the underlying principle of a cyclotron. Explain clearly how it works to accelerate the charged particles. 3

OR

Draw a labeled diagram of a moving coil galvanometer. Describe briefly its principle and working.

14 Sketch a graph showing the variation of binding energy per nucleon as a function of mass number A for large number of nuclei. Using this graph state clearly how the release in energy in the processes of nuclear fission and nuclear fusion can be explained. 3

15 (i) How does the stopping potential of a Photo cell change, when 3
a) the intensity of the incident radiation is halved?
b) frequency of incident radiation increases ?
(ii) Two beams, one of red light and the other of blue light, of the same intensity are incident on a metallic surface to emit photoelectrons. Which one of the two beams emit electrons of greater kinetic energy?

16 Give reasons for the following: 3
(i) For ground wave transmission, size of antenna should be comparable to the wavelength of the signal, e.g. $\lambda/4$
(ii) Audio signals converted into electromagnetic waves and they are not transmitted as such directly.
(iii) The amplitude of modulating signal is kept less than that of the carrier wave.

OR

(i) Optical and radio telescopes are built on the ground but X-ray astronomy is possible only from satellites orbiting the Earth. Why?
(ii)Why short wave band is used for long distance radio broad cast?
(iii) Is it necessary for a transmitting antenna to be at the same height as that of the receiving antenna for line-of-sight communication?

17 What is the effect on the interference fringes in a Young's double slit experiment due to each of the following operations: 3
(i) The screen is moved away from the plane of the slits
(ii) The source slit is moved closer to the double-slit plane
(iii) The monochromatic source is replaced by a source of white light.

18 (i) Write two characteristic features to distinguish between extrinsic and intrinsic semiconductors. 3
(ii) What is the phase relation between the input signal and the output in a transistor amplifier?
(iii) State one difference between solar cell and photodiode.

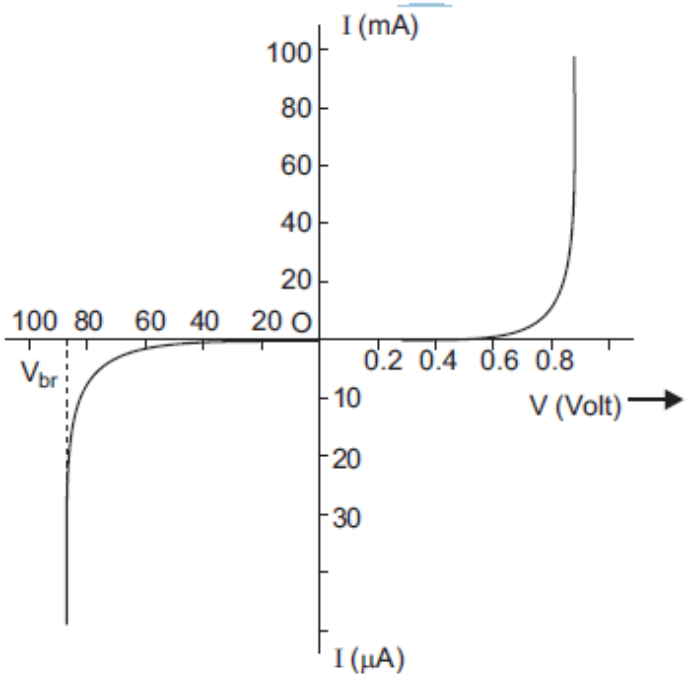
19 (i) Name the phenomenon on which the working of an optical fibre is based. 3
(ii) What are necessary conditions for this phenomenon to occur?
(iii) Draw a diagram to show the behaviour of plane wavefronts as they pass through a thin convex lens.

OR

(i) Draw a labeled diagram of reflecting type telescope.
(ii) Write any two advantages of reflecting type telescope over refracting type.

20 Name the following constituent radiations of electromagnetic spectrum which i) produce intense heating effect ii) is absorbed by ozone layer in the atmosphere.iii) used to study crystal structure. Write one application of each of them. 3

21 The figure adjoining shows the V-I characteristics of a semiconductor diode. 3
(i) Identify the semiconductor diode used.
(ii) Draw the circuit diagram to obtain the given characteristic of this device.



(iii) Briefly explain how this diode can be used as a voltage regulator.

22 A parallel plate capacitor is charged by a battery. After some time the battery is disconnected and a dielectric slab of dielectric constant K is inserted between the plates. How would (i) the capacitance, (ii) the electric field between the plates and (iii) the energy stored in the capacitor, be affected? Justify your answer. 3

23 (i) Why do magnetic lines of force form continuous closed loops? 3
(ii) A small magnet is pivoted to move freely in the magnetic meridian. At what place on the Earth will the magnet be vertical?
(iii) Define the terms magnetic inclination and horizontal component of Earth's magnetic field at a place.

OR

Using Biot-Savart law derive an expression for the magnetic field due to a circular coil carrying current at a point along its axis.

24 A cell of emf 'E' and internal resistance 'r' is connected across a variable resistor 'R'. Plot a graph showing variation of terminal voltage 'V' of the cell versus the current 'I'. Using the plot, show how the emf of the cell and its internal resistance can be determined. 3

SECTION D

25 (i) Use Huygen's principle to show how a plane wavefront propagates from a denser to a rarer medium. Hence, verify Snell's law of refraction. 5

(ii) State two conditions for two light sources to be coherent.

(iii) Light of wavelength 5000 Å falls on a plane reflecting surface. What are the wavelength and frequency of the reflected light? For what angle of incidence is the reflected ray normal to the incident ray?

OR

(i) Draw a ray diagram for the formation of image of a point object by a thin double convex lens having radii of curvature R_1 and R_2. Hence derive lens maker's formula for a double convex lens.

(ii) An object of size 3.0cm is placed 14cm in front of a concave lens of focal length 21cm. Describe the image produced by the lens. What happens if the object is moved further away?

26 (i) Using Gauss's law, prove that the electric field at a point due to a uniformly charged infinite plane sheet is independent of the distance from it. 5

(ii) Sketch the pattern of electric field lines due to a conducting sphere having negative charge in it.

(iii) Two point charges $q_A = 3\ \mu C$ and $q_B = -3\ \mu C$ are located 20 cm apart in vacuum.

(a) What is the electric field at the midpoint O of the line AB joining the two charges?

(b) If a negative test charge of magnitude 1.5×10^{-9} C is placed at this point, what is the force experienced by the test charge?

OR

(i) Derive an expression for the electric potential due to an electric dipole at any point on its axis.

(ii) Mention one contrasting feature of electric potential of a dipole at a point as compared to that due to a single charge.

(iii) Determine the electrostatic potential energy of a system consisting of two charges 7 μC and –2 μC (and with no external field) placed at (–9 cm, 0, 0) and (9 cm, 0, 0) respectively. How much work is required to separate the two charges infinitely away from each other?

27 (i) State the underlying principle of a transformer. 5

(ii) How is the large scale transmission of electric energy over long distance done with the use of transformers?

(iii) Write any two sources of energy loss in a transformer.

(iv) At a hydroelectric power plant, the water pressure head is at a height of 300 m and the water flow available is 100 $m^3 s^{-1}$. If the turbine generator efficiency is 60%, estimate the electric power available from the plant.

OR

(i) Derive an expression for the impedance of a series LCR circuit connected to an AC supply of variable frequency.
(ii) Explain briefly the phenomenon of resonance in the circuit can be used in the tuning mechanism of a radio or a TV set.
(iii) Obtain the resonant frequency ω_r of a series *LCR* circuit with $L = 2.0$H, $C = 32$ μF and $R = 10$ Ω. What is the *Q*-value of this circuit?

End of the Question Paper