# CAREER POINT

## MOCK TEST PAPER

## CENTRAL BOARD OF SENIOR SECONDARY EXAMINATION

**SET-1**

**Series CPC**

**Code No. 16/1/P**

Roll No. | | | | | | | | |

Candidates must write the Code on the title page of the answer-book

- Please check that this question paper contains 7 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate
- Please check that this question paper contains **26** questions.
- Please write down the Serial Number of the question before attempting it.
- 15 minute time has been allotted to read this question paper. The students will read the question paper only and will not write any answer on the answer-book during this period.

# PHYSICS (Theory)

**Time allowed: 3 hours** **Maximum Marks : 70**

**P.T.O**

***General Instructions* :**

***(i)*** *__All__ questions are compulsory. There are __26__ questions in all.*

***(ii)*** *This question paper has __five__ sections : Section A, Section B, Section C, Section D and Section E.*

***(iii)*** *Section A contains __five__ questions of __one__ mark each, Section B contains __five__ questions of __two__ marks each, Section C contains __twelve__ questions of __three__ marks each, Section D contains one value based question of __four__ marks and Section E contains __three__ questions of __five__ marks each*

***(iv)*** *There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the given choice in such questions.*

***(v)*** *Use of calculators is not permitted. However, you may use log tables if necessary.*

***(vi)*** *You may use the following values of physical constants wherever necessary.*

$c = 3 \times 10^{8} ms^{-1}$

$h = 6.63 \times 10^{-34}\ J\ s$

$e = 1.6 \times 10^{-19}\ C$

$\mu_0 = 4\pi \times 10^{-7}\ TmA^{-1}$

$\frac{1}{4\pi\varepsilon_0} = 9 \times 10^{9}\ Nm^2/C^{-2}$

$m_e = 9.1 \times 10^{-31}$ kg

Mass of neutron = $1.675 \times 10^{-27}$ kg

Mass of photon = $1.673 \times 10^{-27}$ kg

Avogadro's number = $6.023 \times 10^{23}$ per gram mole

Boltzamann constant = $1.38 \times 10^{-23}\ JK^{-1}$

# SECTION A

**Q.1** What is the value of phase change in total internal reflection ? **[1]**

**Q.2** If ultraviolet radiation are incidenting over a metal surface. Now it is replaced with X-rays then what happens to kinetic energy of emitted electrons. **[1]**

**Q.3** Define decay constant. **[1]**

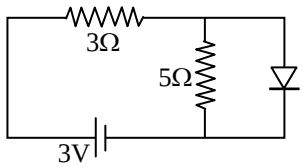
**Q.4** If a substance can decay by two methods and half life for two methods is $T_1$ and $T_2$. Now if the substance decays by both methods then calculate effective half-life. **[1]**

**Q.5** The maximum velocity of electrons, emitted from a metal surface of negligible work function, is 'V', when frequency of light falling on it is 'f'. What will be the maximum velocity when the incident light frequency is made '4f' ? **[1]**

# SECTION B

**Q.6** What is the momentum of photon of energy 3 MeV. **[2]**

**Q.7** Find current in 3Ω resistor in given circuit. **[2]**




**Q.8** A change of 8 mA in the emitter current brings a change of 7.9 mA in collector current. How much change in base current is required to have same change of 7.9 mA in collector current ? Find values of $\alpha$ & $\beta$. **[2]**

**Q.9** Draw circuit diagram for AND gate and write its truth table. **[2]**

**Q.10** If height of antennae is H and radius of earth is Re then derive a relation for distance upto which signals can be sent. **[2]**

# SECTION C

**Q.11** Derive the expression for the electric potential at any point along the axial line of an electric dipole ? **[3]**

**Q.12** Draw a labelled diagram of a moving coil galvanometer. State the principle on which it works. Deduce an expression for the torque acting on a rectangular current carrying loop kept in a uniform magnetic field. Write two factors on which the current sensitivity of a moving coil galvanometer depends. **[3]**

**Q.13** Prove that an ideal inductor does not dissipate power in an a.c. circuit. **[3]**

**Q.14** In the double slit experiment, the pattern on the screen is actually a superposition of single slit diffraction from each slit and the double slit interference pattern. In what way is the diffraction from each slit related to the interference pattern in a double slit experiment ? Explain.

Hence draw the intensity distribution curve, obtained on the screen, in the double slit experiment

(i) when the width of each slit is comparable to wavelength of monochromatic light used

(ii) when the width of each slit is relatively large compared to wave length of monochromatic light **[3]**

**Q.15** Derive the expression for the radius of the $n^{th}$ orbit of hydrogen atom using Bohr's postulates. Show graphically the (nature of) variation of the radius of orbit with the principal quantum number, n.

**OR**

What is the frequency of radiation emitted when a hydrogen atom de-excites from level $x$ to level $(x - 1)$ ? For large $x$, show that this frequency equals the classical frequency of revolution of the electron in the orbit. **[3]**

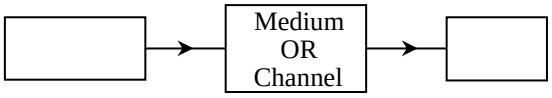
**Q.16** Give reason for each of the following observation.

(i) The resultant intensity at any point on the screen varies between zero and four times the intensity, due to one slit, in Young's double slit experiment

(ii) A few coloured fringes, around a central white region, are observed on the screen, when the source of monochromatic light is replaced by white light in Young's double slit experiment

(iii) The intensity of light transmitted by a polaroid is half the intensity of the light incident on it **[3]**

**Q.17** Complete the following block diagram depicting the essential elements of a basic communication system.



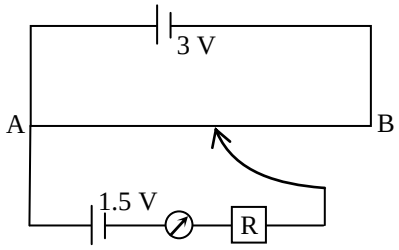

Name the two basic modes of communication. Which of these modes is used for telephonic communication ?

**OR**

Is it necessary for the transmitting antenna and the receiving antenna to be of the same height for line of sight communication ? Find an expression for maximum line of sight distance $d_m$ between these two antennas of heights $h_T$ and $h_R$. **[3]**

**Q.18** Derive an expression for the resistivity of a good conductor, in terms of the relaxation time of electrons. **[3]**

**Q.19** A potentiometer wire of length 1 m is connected to a driver cell of emf 3 V as shown in the figure. When a cell of 1.5 V emf is used in the secondary circuit, the balance point is found to be 60 cm. On replacing this cell and using a cell of unknown emf, the balance point shifts to 80 cm. **[3]**




(i) Calculate unknown emf of the cell

(ii) Explain with reason, whether the circuit works, if the driver cell is replaced with a cell of emf 1 V

(iii) Does the high resistance R, used in the secondary circuit affect the balance point ? Justify your answer.

**Q.20** Define magnetic flux. Give its SI unit. **[3]**

**Q.21** Explain, with the help of a neat and labelled diagram, the principle, construction and working of a transformer. **[3]**

**Q.22** Write any four characteristics of electromagnetic waves. Give two uses each of

(i) Radio-waves

(ii) Micro-waves **[3]**

# SECTION D

**Q.23** Sunita and her friends visited an exhibition . The policeman asked them to pass through a metal detector. Sunita's friends were initially scared of it. Sunita, however, explained to them the purpose and working of the metal detector.

Answer the following questions :

(a) On what principle does a metal detector work ?

(b) Why does the detector emit sound when a person carrying any metallic object walks through it ?

(c) State any two qualities which Sunita displayed while explaining the purpose of walking through the detector.

# SECTION E

**Q.24** Draw a ray diagram for a compound microscope. Derive an expression for the magnifying power when the final image is formed at the least distance of distinct vision. State the expression for the magnifying power when the image is formed at infinity. Why is the focal length of the objective lens of a compound microscope kept quit small ?

**OR**

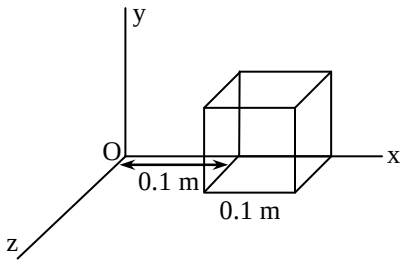
Derive the lens formula giving the relation between u, v and *f* for a thin convex lens. Define the term 'linear magnification' and draw a graph showing the variation of linear magnification with image distance for a thin convex lens. How can this graph be used for finding the focal length of the lens ? **[5]**

**Q.25** (a) Define electric flux. Write its SI units

(b) The electric field components due to a charge inside the cube of side 0.1 m are as shown

$E_x = \alpha x$, where $\alpha = 500$ N/C-m

$E_y = 0$, $E_z = 0$




Calculate (i) the flux through the cube, and (ii) the charge inside the cube. **[5]**

**Q.26** Explain briefly, with the help of a labelled diagram, the basic principle of the working of an a.c. generator.

In an a.c. generator, coil of N turns and area A is rotated at v revolutions per second in a uniform magnetic field B. Write the expression for the emf produced.

A 100 turn coil of area 0.1 $m^2$ rotates at half a revolution per second. It is placed in a magnetic field 0.01 T perpendicular to the axis of rotation of the coil. Calculate the maximum voltage generated in the coil. **[5]**