

Department of Nuclear Physics
University of Madras

Syllabus and Model Pattern for M.Sc. Physics Entrance Examination

Syllabus: Standard UG level Physics primarily consisting of Mathematical Physics, Mechanics, Heat and Thermodynamics, Acoustics, Solid State Physics, Electricity and Magnetism, Optics, Electronics, Modern Physics, Atomic and Nuclear Physics.

Model Pattern

Part A (25 x 1 = 25 marks)

Each **correct** answer carries **ONE** mark.
An **unanswered** question carries **ZERO** mark.
Each **wrong** answer carries **MINUS $\frac{1}{3}$** mark

1. Paramagnetic curie point $\theta = \underline{\hspace{2cm}}$?
a) $\frac{\lambda\mu N}{3k_B}$ b) $\frac{\lambda\mu N}{k_B T}$ c) $\frac{\lambda\mu^2 N}{3k_B}$ d) $\frac{\lambda\mu^2 N}{k_B}$
2. The spacing between principal planes of NaCl crystal is 2.82 Å. It is found that first order Bragg reflection occurs at an angle of 10°. What is the wavelength of X-rays?
a) 0.98 Å b) 0.49 Å c) 1.43 Å d) 0.62 Å
3. Find the relative permeability of a ferromagnetic material, if a field of strength 300 A/m produces a magnetization 4500 A/m in it.
a) 15 b) 16 c) 14 d) 1.5
4. Calculate the work function of sodium, in electron-volts, given that the threshold wavelength is 6700 Å.
a) 2.85 eV b) 2.96 eV c) 1.27 eV d) 1.85 eV
5. Identify the correct statement for the following vectors $\vec{a} = -3\hat{i} + 2\hat{j}$ and $\vec{b} = \hat{i} + 2\hat{j}$.
a) Both vectors are linearly dependent
b) Both vectors are orthogonal
c) Both vectors are linearly independent
d) Both vectors are normalized

Part B (25 x 3 = 75 marks)

Each correct answer carries **THREE** marks.
An **unanswered** question carries **ZERO** mark.
Each **wrong** answer carries **MINUS ONE** mark

1. At two points P and Q on screen in Young's double slit experiment, waves from slits S_1 and S_2 have a path difference of 0 and $\lambda/4$, respectively. The ratio of intensities at P and Q will be _____.

a) 3:2 b) $\sqrt{2}:1$ c) 2:1 d) 4:1

2. If the matrix $A = \begin{pmatrix} -2 & -4 & 2 \\ -2 & 1 & 2 \\ 4 & 2 & 5 \end{pmatrix}$, then which of the following is not its eigen value?

a) 3 b) 2 c) 6 d) -5

3. Half-lives of two radioactive elements A and B are 20 min and 40 min, respectively. Initially, the samples have equal number of nuclei. After 80 min, the ratio of decayed number of A and B nuclei will be _____.

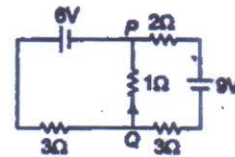
a) 5: 4 b) 4: 1 c) 1:4 d) 1: 16

4. If electric potential due to some charge distribution is given by $V = \frac{3}{r^2}$, when r is radial distance, then find electric field at (1,1,1).

a) $\frac{2}{\sqrt{3}}(\hat{i} + \hat{j} + \hat{k})$ b) $\frac{2}{3}(\hat{i} + \hat{j} + \hat{k})$ c) $\frac{2}{3}$ d) 0

5. In the circuit given below, the current in 1Ω resistor is _____.

a) 1.3 A b) -1.3 A
c) 0.13 A d) -0.13 A



6. The velocity of a particle is $v = v_0 + gt + ft^2$. If its position is $x=0$ at time $t=0$, then its displacement after unit time ($t=1$) is _____.

a) $v_0 + 2g + 3f$ b) $v_0 + 3g + 2f$
c) $v_0 + \frac{g}{2} + \frac{f}{3}$ d) $v_0 + \frac{g}{3} + \frac{f}{2}$

K. Ravichandran