The Stern-Gerlach Experiment[1]

Speed of the Silver Atoms

A.1 (0.5 pt)

Value of $v_z =$

The Basic Expression

B.1 (2 pt)

Δx =

The Inhomogeneous Magnetic Field

C.1 (1.5 pt)

$\vec{B}(x, y, 0)$ =

[1] H. S. Mani (former Director, HRI, Prayagraj) and Gautam Datta (DAIICT, Gandhinagar) were the principal authors of this problem. The contributions of the Academic Committee, Academic Development Group, and the International Board are gratefully acknowledged.

C.2 (0.5 pt)

Direction at point R :

Direction at point P_0 :

C.3 (0.5 pt)

In the air gap region $\vec{B}(x, 0, 0)$ =

The Force

D.1 (0.5 pt)

F_x =

The Field and the Field Gradient

E.1 (2 pt)

B_P =

dB_P/dx =

The magnetic moment of the silver atom

F.1 (1.5 pt)

μ_s =

The spread in the line on the screen

G.1 (0.5 pt)

δx =

Error in the evaluation of the magnetic moment of the solver atom

H.1 $(0.5\ \mathrm{pt})$

$\delta\mu_s$ =

A Mechanical Model for Phase Transitions[1]

A.1 (0.5 pt)
Equations of motion

B.1 (1.0 pt)
Equilibrium angle(s)

$\theta_0 =$

B.2 (0.5 pt)
Sketch of θ_0.

[1]Sitikantha Das (IIT Kharagpur) and Pramendra Ranjan Singh (Principal, Narayan College, J.P. University) were the principal authors of this problem. The contributions of the Academic Committee, Academic Development Group, and the International Board are gratefully acknowledged.

B.3 $(0.5\ \mathrm{pt})$
Sketch of the magnitude of the normal reaction

B.4 $(1.0\ \mathrm{pt})$
The potential

$P =$

$Q =$

$S =$

B.5 $(1.0\ \mathrm{pt})$
The coefficients

$a(\omega) =$

$b(\omega) =$

B.6 (1.0 pt)

Representative plots of the potential

B.7 (1.0 pt)

Bead analogues

$\mathcal{M} \longrightarrow$

$T/T_c \longrightarrow$

$\beta =$

B.8 (1.0 pt)

Oscillation frequency

Ω_0=

B.9 (1.0 pt)
Sketch of Ω_0

C.1 (1.0 pt)
Condition for equilibrium angles

$x =$

$y =$

C.2 (0.5 pt)
Representative values for θ_0
(a) θ_0 =

(b) θ_0 =

Maxwell, Rayleigh and Mount Everest: THE ANSWERSHEET[1]

Oscillation of the electron cloud:

A.1 (0.5 pt)
The equation for the motion for y

$\ddot{y} =$

A.2 (0.5 pt)
The amplitude

$y_0 =$

A.3 (0.5 pt)
The magnitude of the dipole moment of the air molecule

$p(t) =$

A.4 (0.5 pt)
Expression for ω_0

$\omega_0 =$

Power radiated:

B.1 (1 pt)
Power radiated s in terms of dipole moment

$s =$

[1] Amitabh Virmani (CMI, Chennai) and A. C. Biyani (retired Govt. Nagarjuna P.G. College of Science. Raipur) were the principal authors of this problem. The contributions of the Academic Committee, Academic Development Group, and the International Board are gratefully acknowledged.

B.2 (0.2 pt)
Power radiated s in terms of E_0

$s =$

Attenuation of the Intensity $I(x)$ with distance x

C.1 (1 pt)
The Equation for the Intensity attenuation

$\frac{dI}{dx} =$

C.2 (0.5 pt)
The Equation for the intensity $I(x)$

$I(x) =$

C.3 (0.3 pt)
Estimation of attenuation length L

The expression $L =$

The numerical value L =

Height H' of the Mountains as seen by an observer :

D.1 $(2\ \mathrm{pt})$

The Figure

$H' =$

Mt. Kanchenjunga H' =

Mt. Everest H' =

E.1 $(1\ \mathrm{pt})$

$$\frac{I_{\text{Everest}}}{I_{\text{Kanchenjunga}}} =$$

Visibility of Mt Everest

Attenuation length L_p due to aerosol pollution:

F.1 (1 pt)

The expression $L_p =$

The numerical value L_p =

Relative intensity and Visibility of Mt. Kanchenjunga and Mt. Everest:

G.1 (1 pt)

Mt Kanchenjunga

$\frac{I_K}{I_{\text{ref}}} =$

Visibility of Mt. Kanchenjunga

Mt Everest

$\frac{I_E}{I_{\text{ref}}} =$

Visibility of Mt. Everest