LECTURE 8

1) ⇒ NOTES .... SELF STUDY

4) ⇒ SELF STUDY ....

5) ⇒ SEE XLS

6) ⇒ REFER TO J. SHAH BOOK EXTRACT

NUMERICAL QUESTIONS FOLLOW .... ⇒

LECTURE 8

2). FROM NOTES $v_0 = a\sqrt{\frac{C}{M}}$

so $C = M\frac{v_s^2}{a^2}$ where $M = 28\,M_p$
$a = 5.43\ \text{Å}$
$v_s = 2.2\times10^5\ \text{cm.s}^{-1}$

$$C = M\frac{v_s^2}{a^2} = 28\times1.672\times10^{-27}\times\frac{(2.2\times10^5)^2}{(5.43\times10^{-10})^2}$$

(n.b now in SI).

$$= 0.77\ \text{N.m}^{-1}$$

(units!) $M\frac{v_s^2}{a^2} \Rightarrow \text{kg}\,\frac{\text{m}^2\,\text{s}^{-2}}{\text{m}^2}$

$N = \text{kg.m.s}^{-2}$ so units are N m^{-1}

LECTURE 6

3) $\lambda = 514.5\ nm$ ⇒ LASER
$\lambda = 524.2\ nm$ } PHONON RELATED PEAKS
$\lambda = 525.4\ nm$ }

$E = h\nu$ $\quad \lambda\nu = c$ so $E = \frac{hc}{\lambda}$ $\quad h = 6.6261 \times 10^{-34}\ m^2 kg s^{-1}$
$c = 2.9979 \times 10^8\ ms^{-1}$

LASER ⇒ $E = \frac{6.6261 \times 2.9979 \times 10^{-34} \times 10^9}{514.5 \times 10^{-9}}$ J

$= \frac{6.6261 \times 2.9979}{5.145} \times 10^{-19}$ J

$= 3.8609 \times 10^{-19}$ J ... convert to eV

$1\ J = \frac{1}{1.6022 \times 10^{-19}} = 6.2415 \times 10^{18}\ eV.$

∴ LASER ENERGY $= \frac{3.8609}{1.6022}\ eV = 2.4098\ eV.$

PHONON FEATURE @ 524.2 nm ... ENERGY $= \frac{6.6261 \times 2.9979}{5.242} \times 10^{-19}$ J

$= 2.3652\ eV$

PHONON FEATURE @ 525.4 nm ..... ENERGY $= \frac{6.6261 \times 2.9979}{5.254} \times 10^{-19}$ J

$= 2.3598\ eV$

LECTURE 8

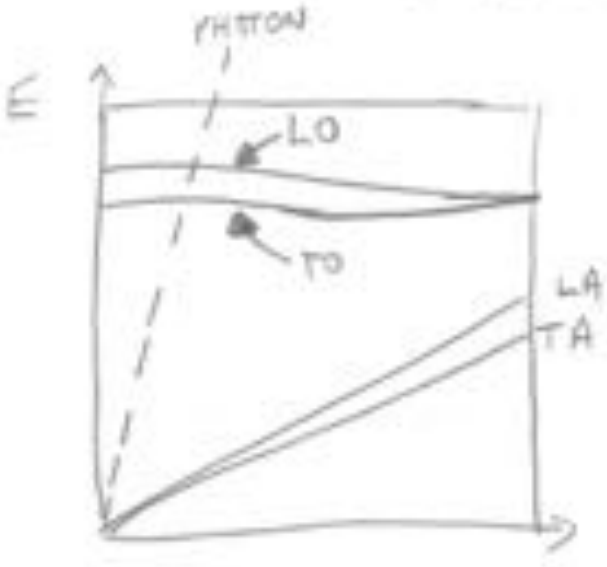
3) CONTD.

ΔE LASER, 524·2 nm FEATURE = 2·4098 − 2·3652 eV
= 44·6 meV.

ΔE LASER, 525·4 nm FEATURE = 2·4082 − 2·3588 eV
= 51·0 meV.

ORIGIN OF FEATURES?

STOKES SCATTERING — PHONON EMISSION TO REDUCE ENERGY OF EMITTED PHOTON



⇐ PHONON DISPERSION

PHOTON

SO 524·2 nm FEATURE (LOWER ENERGY, OPTICALLY ACTIVE PHONON) IS ATTRIBUTED TO TO - STOKES SCATTERING

525·4nm FEATURE (HIGHER ENERGY .....) IS ATTRIBUTED TO LO - STOKES SCATTERING.