

2011-PH-'53-65'

EE24BTECH11007 - Arnav Makarand Yadnopavit

In a one-dimensional harmonic oscillator, φ_0 , φ_1 and φ_2 are respectively the ground, first, and the second excited states. These three states are normalized and are orthogonal to one another. ψ_1 and ψ_2 are two states defined by

$$\psi_1 = \varphi_0 - 2\varphi_1 + \varphi_2$$

$$\psi_2 = \varphi_0 - \varphi_1 + \alpha\varphi_2$$

where α is a constant.

52) The value of α for which ψ_2 is orthogonal to ψ_1 is

- a) 2 b) 1 c) -1 d) -2

53) For the value α determined Q.1, expectation value of energy of oscillator in the state ψ_2 is

- a) $\hbar\omega$ b) $3\hbar\omega/2$ c) $3\hbar\omega$ d) $9\hbar\omega/2$

A plane electromagnetic wave has the magnetic field given by

$$\mathbf{B}(x, y, z, t) = B_o \sin \left[(x + y) \frac{k}{\sqrt{2}} + \omega t \right] \hat{k}$$

where k is the wave number and \hat{i} , \hat{j} , \hat{k} are the Cartesian unit vectors in x , y , and z directions, respectively.

54) The electric field $\mathbf{E}(x, y, z, t)$ corresponding to the above wave is given by:

- a) $cB_o \sin \left[(x + y) \frac{k}{\sqrt{2}} + \omega t \right] \frac{\hat{i} - \hat{j}}{\sqrt{2}}$ c) $cB_o \sin \left[(x + y) \frac{k}{\sqrt{2}} + \omega t \right] \hat{i}$
b) $cB_o \sin \left[(x + y) \frac{k}{\sqrt{2}} + \omega t \right] \frac{\hat{i} + \hat{j}}{\sqrt{2}}$ d) $cB_o \sin \left[(x + y) \frac{k}{\sqrt{2}} + \omega t \right] \hat{j}$

55) The average Poynting vector is given by:

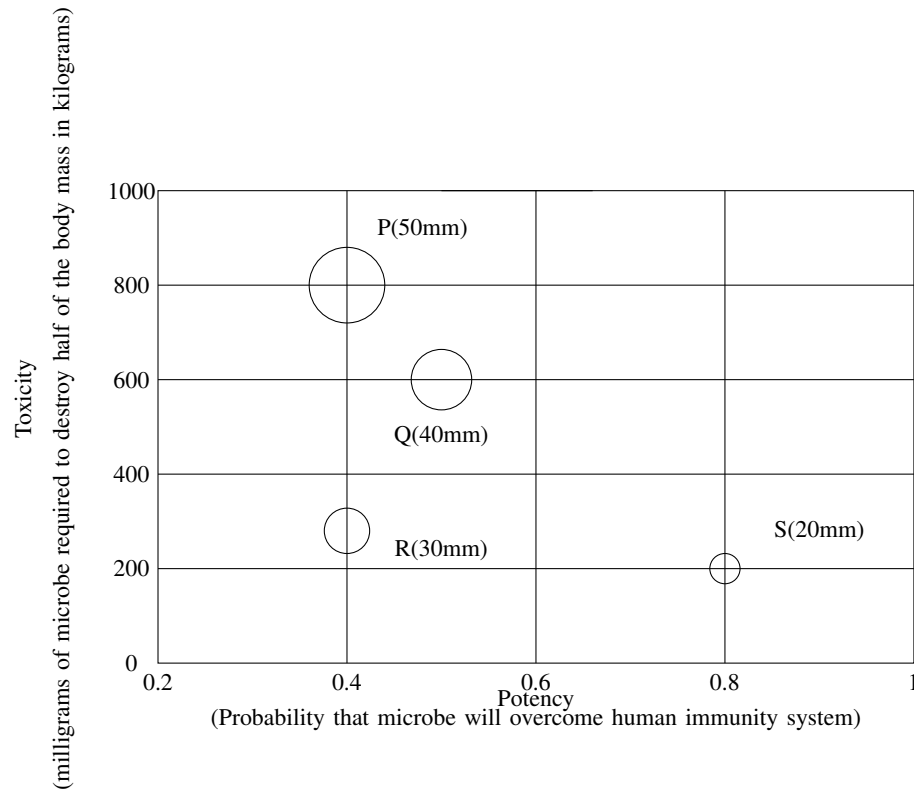
- a) $\frac{cB_o^2}{2\mu_o} \frac{(\hat{i} - \hat{j})}{\sqrt{2}}$ c) $\frac{cB_o^2}{2\mu_o} \frac{(\hat{i} + \hat{j})}{\sqrt{2}}$
b) $-\frac{cB_o^2}{2\mu_o} \frac{(\hat{i} - \hat{j})}{\sqrt{2}}$ d) $-\frac{cB_o^2}{2\mu_o} \frac{(\hat{i} + \hat{j})}{\sqrt{2}}$

56) Choose the most appropriate word from the options given below to complete the following sentence:
If you are trying to make a strong impression on your audience, you cannot do so by being understated, tentative or _____.

- a) hyperbolic
b) restrained
c) argumentative
d) indifferent

57) Choose the most appropriate word(s) from the options given below to complete the following sentence:

I contemplated _____ Singapore for my vacation but decided against it.



A pharmaceutical company is contemplating the development of a vaccine against the most dangerous microbe. Which microbe should the company target in its first attempt?

- a) P b) Q c) R d) S

64) Few school curricula include a unit on how to deal with bereavement and grief, and yet all students at some point in their lives suffer from losses through death and parting.

Based on the above passage which topic would not be included in a unit on bereavement?

- a) how to write a letter of condolence
 b) what emotional stages are passed through in the healing process
 c) what the leading causes of death are
 d) how to give support to a grieving friend

65) A container originally contains 10 litres of pure spirit. From this container 1 litre of spirit is replaced with 1 litre of water. Subsequently, 1 litre of the mixture is again replaced with 1 litre of water and this process is repeated one more time. How much spirit is now left in the container?

- a) 7.58 litres c) 7 litres
 b) 7.84 litres d) 7.29 litres