DON'T BETRAY YOURSELF!

PLEASE TRY TO FIND YOUR OWN SOLUTION BEFORE READING THE KEY!

www.biotec.tu-dresden.de/teaching
KEY TO SELF-ASSESSMENT TEST

Question 1
Answer yes

Question 2
Answer polymer: synonym = macromolecule; A molecule of high relative molecular mass, the structure of which essentially comprises the multiple repetition of units derived, actually or conceptually, from molecules of low relative molecular mass.

Question 3
Answer $\frac{\pi}{2}$
Comment Basic integration techniques must be known.

Question 4
Answer $\begin{pmatrix} 2x \\ -2y \\ 0 \end{pmatrix}$
Comment The student has to know calculus (normal and partial derivatives) and vector calculus (gradient).

Question 5
Answer http://en.wikipedia.org/wiki/Cytoskeleton

Question 6
Answer $x_1 = \pm \sqrt{\frac{1}{2}} \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ and $x_2 = \pm \sqrt{\frac{1}{2}} \begin{pmatrix} 1 \\ -1 \end{pmatrix}$
Comment to solve this problem the student has to know vector analysis (vectors, scalar products) and linear algebra (matrices, determinants, linear equations, eigenvalue problems)

Question 7
Answer carbon is element number 6 in the periodic table of elements with it electronic www.biotec.tu-dresden.de/teaching
ground state: 1s² 2s² 2p²; this means it has 4 valence electrons ([He]2s² 2p²), so it forms 4 bonds in virtually all its compounds e.g. 4 single bonds, then molecule orbital is sp³ hybridized.

Question 8
Answer \[ x + \omega^2 x = 0 \]
Comment Lagrange formalism and Euler-Lagrange equations must be known.

Question 9
Answer This is the momentum operator.
Comment basic knowledge of quantum mechanics

Question 10
Answer One can classify 3 major types of forces:
- Coulomb forces (electrostatics of charges and dipoles)
- polarisation forces (induced dipoles; also know as van der Waals forces or London dispersion)
- hydrogen bonds (sometimes referred as almost chemical bond)
Comment Basics on intermolecular interactions are essential to understand assembly and function of complex biological nanoscale and microscale objects.

Question 11
Answer Yes.
Comment Prepares the student that he has to work with the computer and do programming.

Question 12
Answer \[ \kappa = -\frac{1}{V} \frac{\partial V}{\partial p} = \frac{1}{p} \] (with ideal gas equation \( pV = NkT \))
Comment Basic thermodynamic knowledge.

Question 13
Question 14

Answer 1-1/16 = 15/16 (simplest solution via complementary event – no disease in four successive cases).

Comment Basic knowledge of combinatorics and probability calculations.

Question 15

Answer The change of entropy between two thermodynamic equilibrium states $a$ and $b$ is given by

$$ S = \int_{a}^{b} \frac{dQ}{T} $$

where the integral is taken over a reversible process from $a$ to $b$.

Comment Basic thermodynamic knowledge.