

Entrance exam for NM study - test A
Bioengineering 2021

Date:

Assigned registration number:

Test evaluation	Maximum number of points	Earned number of points	Note
Task [1]	10		
Task [2]	10		
Task [3]	10		
Task [4]	20		
Task [5]	10		
Task [6]	10		
Task [7]	10		
Task [8]	10		
Task [9]	10		
Overall evaluation:			

Total points earned:

Instructions for the test elaboration:

Write on stamped papers, each with your assigned registration number. Don't sign it with your name, please!

The maximum total number of points is 100, their distribution for individual tasks can be found in the task assignment.

The recommended time to complete the test is 45 minutes.

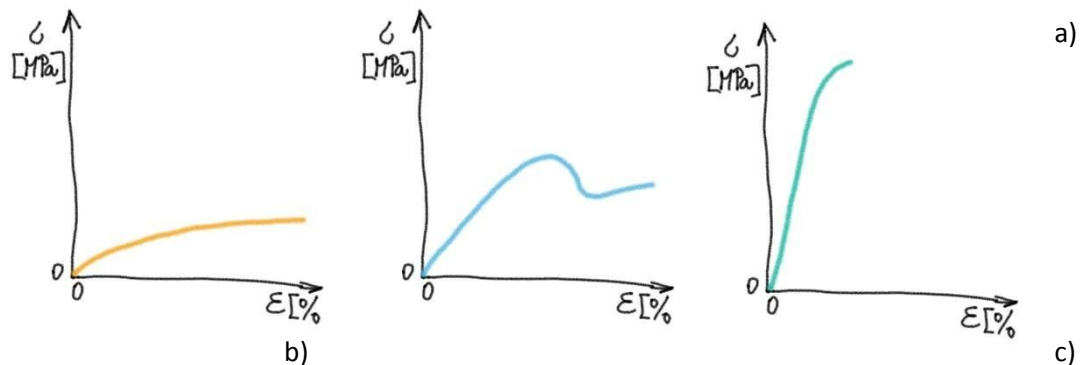
Clearly indicate the final results in the case of numerical examples within a drawn box and with the number and letter identification of the relevant part of the task - for example 2 a),...

All calculation tasks need to be solved in general first, then perform a numerical calculation.

The test contains a total of 9 tasks.

Task [1] (10 points)

Which of the following graphs represents the behaviour of a brittle material?



Task [2] (10 points)

Which claims concerning the exceptional properties of water is not true?

- a) The highest density of water in all states is at about 4°C
- b) Water possess the lowest surface tension of all liquids
- c) Water in the form of ice has a lower density than a liquid water
- d) The viscosity of water decreases with increasing temperature

Task [3] (10 points)

What statement has a force for polymeric materials (there may be more than one answer)?

- a) There is no 100% crystalline form of polymeric material
- b) There is no electrically conductive polymeric material
- c) There is no polymeric material that can be melted

Task [4] (20 points)

Poločas rozpadu prvku X je $T_x = 5$ let, poločas rozpadu prvku Y je $T_Y = 30$ let. Označme $p(t)$ poměr počtů částic typu X a Y (p je funkce času). Necht' $p(0) = 1$.

- a) Najděte tvar této funkce pro obecný čas t
- b) Najděte čas τ , ve kterém platí $p(\tau) = 0,25$.

The half-life of an element X is $T_x = 5$ years, the half-life of an element Y is $T_y = 30$ years. Let $p(t)$ be the ratio of the numbers of X and Y type particles (p is a function of time). Let $p(0) = 1$.

- a) Find the form of this function for the general time t
- b) Find the time τ in which $p(\tau) = 0.25$.

Task [5] (10 points)

State the relation for the kinetic energy of a body moving in a rectilinear uniform motion and explain the quantities used in the relation.

Task [6] (10 points)

State the first theorem of thermodynamics and explain the quantities used.

Task [7] (10 points)

The basis of biomembranes in a eukaryotic cell are:

- a) peptidoglycans
- b) polysaccharides
- c) murein
- d) chitin
- e) phospholipids and proteins
- f) cellulose

Task [8] (10 points)

Which of the following structures occurs in prokaryotic as well as in eukaryotic cells?

- a) nucleus
- b) mitochondria
- c) Golgi apparatus
- d) ribosome

Task [9] (10 points)

Explain the term antigen and describe the role of antigen knowledge in combating the pandemic COVID-19 disease.

"The admission to the study is conditioned by the entrance exam in the form of a written test of knowledge relating to the required field of study, i.e. basics of bioengineering. Candidates will be enrolled without the entrance examination in the case that they will meet at least one of the following conditions. Either his or her average of grades for the entire bachelor's study is less or equal to 2.0, or he or she receives an average grade from the bachelor defense and professional discussion from the state final examination (bachelor's) is less or equal to 2.0 ."