

Example test (similar questions will be used in the sharp tests)

ONE OR NO ANSWER IS TRUE!

Solution time: 40 min.

1. If an electron “jumps” from K shell to L shell, this event can be denoted as
 - a) radioactivity
 - b) excitation
 - c) ionisation
 - d) deexcitation
 - e) photoelectric effect

2. The activity of a radioactive sample is 10 curie. It means that
 - a) 10 nuclei of undecayed radionuclide are present in the sample
 - b) 10 nuclei decayed since the beginning of observation
 - c) 10 nuclei decay per 1 second in the sample
 - d) 10 J of energy is released per 1 second in the sample
 - e) 10 nuclei decay during each half-life

3. An X-ray photon interacts with an atom, a photon of lower energy is formed and one electron is liberated from the atom. Such a process is called
 - a) beta-decay
 - b) photoelectric effect
 - c) Compton scatter
 - d) bremsstrahlung
 - e) thermoemission of an electron

4. In a solution with very low pH, the electric charge of a protein macromolecule is
 - a) negative
 - b) positive
 - c) zero
 - d) equal to isoelectric point
 - e) equal to the zeta-potential

5. The thermodynamic temperature of a perfect gas is always directly proportional to the:
 - a) number of gas molecules.
 - b) average kinetic energy of the gas molecules.
 - c) number of atoms in the gas molecule
 - d) thermal conductivity of the gas
 - e) gas pressure.

6. Surface tension is defined by the formula:
(R – resistance, I – current, A – area, F – force, l – length, p – pressure)
 - a) $\sigma = R.I$
 - b) $\sigma = R/A$
 - c) $\sigma = p.A$
 - d) $\sigma = F.l$
 - e) $\sigma = F/l$

7. The unit of the diffusion flux density is:
 - a) $\text{mol.m}^{-2}.\text{s}^{-1}$
 - b) mol.s^{-1}
 - c) s
 - d) s^{-1}
 - e) dimensionless

8. Water flows through a rigid tube, the radius of which is 1 cm. What will be the velocity of flow in a part of the tube with a radius of 3 cm?
 - a) 3 m.s^{-1}
 - b) one third of the original value
 - c) one sixth of the original value
 - d) three-times bigger than the original value
 - e) six-times bigger than the original value.

9. In spirometry, we often measure the:
 - a) amount of breathing gases exchanged by the lungs per second
 - b) amount of work done by lungs
 - c) movements of the diaphragm
 - d) residual volume of the lungs
 - e) vital capacity of the lungs

10. Which of the following is true for sound intensities equal to 1 mW.m^{-2} ?

- a) This sound cannot be heard at 1000 Hz.
- b) the respective intensity level equals 90 dB.
- c) the respective intensity level equals 1 dB.
- d) Such a sound is definitely outside the range of hearing
- e) the corresponding loudness level always equals 90 phons

11. A point light source with luminous intensity of 2 cd illuminates normally a screen in distance of 2 m. What is the illumination of the screen?

- a) 1 lumen
- b) 0.5 lumen
- c) 1 lux
- d) 2 lux
- e) 0.5 lux

12. A toric lens is used for the correction of:

- a) myopia
- b) astigmatism
- c) hyperopia
- d) both myopia and hyperopia
- e) protanopia

13. Which of the following statements is true?

- a) Ultrasound can damage DNA like ionizing radiation.
- b) The main ultrasound effect on living tissue is an increase of action potentials.
- c) Ultrasound can harm the patient due to coagulation of blood.
- d) Low-frequency ultrasound cannot harm the patient.
- e) High-frequency ultrasound can harm the patient.

14. Light with wavelength of 550 nm is

- a) ultraviolet
- b) violet
- c) blue-green
- d) red
- e) infrared

15. The unit “gray” differs from the unit “sievert”

- a) in physical dimension
- b) in definition
- c) in order of magnitude
- d) only in the USA
- e) in no way (different names for the same unit)

16. The Wilson central terminal is used

- a) as an indifferent electrode in ECG
- b) as a different electrode in ECG
- c) for tuning of the pacemaker
- d) for amplification of the ECG signal
- e) for connection of different tools in electrosurgery

17. The absorbance is directly proportional to the

- a) transmittance of the solution
- b) wavelength of the light used
- c) intensity of the light used
- d) temperature of the solution
- e) concentration of the solution

18. Numerical aperture of the microscope is defined by the formula

- a) $NA = \lambda/n \cdot \sin\alpha$
- b) $NA = n \cdot \sin\alpha$
- c) $NA = n/\sin\alpha$
- d) $NA = \sin\alpha$
- e) $NA = \Delta/d$

19. Which imaging method is contraindicated (not allowed) for patients with a titanium dental implant?

- a) CT
- b) MRI
- c) PET
- d) SPECT
- e) mammography

20. To obtain the best sonograms of the eye, we should use a:

- a) linear probe
- b) probe working at low frequency
- c) probe working at high frequency
- d) CW Doppler device
- e) TM-mode device

21. The contrast agents used in ultrasonography:
 a) improve penetration of ultrasound through tissues b) improve resolution of details
 d) increase visibility of blood vessels and heart chambers
 e) lower echogenicity of blood f) remove the aliasing effect in Doppler measurement

22. Increased voltage between the anode and cathode of an X-ray tube allows to:
 a) to examine thicker patients b) to shorten exposure times
 c) to avoid use of contrast agents d) to improve visibility of some soft tissues
 e) to examine the patients with titanium implants inside the body

23. In MRI, the patient is irradiated by:
 a) the so-called Larmor radiation b) flux of magnetic density
 c) microwaves d) radiofrequency waves e) the so-called resonance radiation

24. The main purpose of a linear accelerator in medicine is the:
 a) irradiation of patients by electron beams b) irradiation of patients by photon beams
 c) irradiation of patients by antiparticles d) production of technetium
 e) production of radionuclides for PET

25. Which of the following PC peripherals cannot be used as an output device?
 a) earphones b) scanner c) data projector
 d) loudspeaker e) All of the above statements are true.

Right answers: 1b) 2- 3c) 4b) 5b) 6e) 7a) 8- 9e) 10b) 11e) 12b) 13e) 14c) 15b) 16a) 17e) 18b) 19- 20c) 21d) 22a) 23d) 24b) 25b)

Organisation of exams – Academic year 2009/2010

a) General rules

1. The students start exams with writing a test, which result will be also used for “calculation” of final mark. If passed, students continue with oral part, which consists of two questions.
2. No written or electronic aids are allowed during the written or oral part of the exam (mobiles, I-pods, mp3-players and other electronic devices **must be turned off**). All necessary calculations can be done without a calculator (paper sheets will be available).
3. Breaking of the second rule can result in failing the exam

b) Classification of the written test:

The test consists of 25 multi-choice questions. Five possibilities are always given, **one or none of them is true**.

Number of right answers	mark	result	note
23-25	A	Exam continues	
21-22	B	Exam continues	
19-20	C	Exam continues	
17-18	D	Exam continues	
14-16	E	Exam continues	
12-13	F	failed	Possibility to continue only in the 3rd attempt
0-11	F	failed	No possibility to continue with exam