



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2011/2012
SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR
OF SCIENCE (MEDICAL LABORATORY SCIENCE)

HML 207: MEDICAL PHYSICS II

DATE: Tuesday, 27th March, 2012

TIME: 2.00 p.m. – 4.00 p.m.

Section A: Answer all questions in this section.

1. Sketch the graphs to show how the intensity of X-rays from an X-ray tube varies with frequency for a tube operating at two different voltages. Indicate on your graph which curve represents the higher voltage. (5 mks)
2. List 5 qualities of a good diagnostic radiograph. (5 mks)
3. Outline briefly how in vivo kidney function may be determined using radio-immuno assays. (5 mks).

Section B: Answer only one question from this section

4. a) Describe the use and qualities of radioactive tracers in medicine. (12 mks)
b) Show how technetium is generated (8 mks)
5. With the aid of a diagram, describe the structure and function of various parts of the eye. (20 mks)

Section C: Multiple Choice Questions

Answer all questions from this section. Each question is worth ½ mark.

1. Most of the electrical power supplied to an X-ray tube is converted to:
 - a) Anode
 - b) Electrons
 - c) Heat
 - d) Positrons
2. Choose the best option to explain this: copper found in the cathode ray tube is favoured to contain coolant because:
 - a) It has a higher melting point compared to tungsten
 - b) It has a much higher thermal conductivity and much higher melting point compared to tungsten
 - c) It has a very high melting point but low thermal conductivity but low thermal conductivity compared to tungsten
 - d) It has a much higher thermal conductivity but lower melting point compared to tungsten.
3. The spot from which X-rays originate is called the
 - a) Cold spot

- b) Focal spot
 - c) Hot spot
 - d) Beam focus
4. The higher the tube voltage:
- a) The smaller the value of minimum wavelength
 - b) The higher the value of minimum wavelength
 - c) The wavelength remains invariable
 - d) None of the above
5. As the cathode ray tube voltage is lowered:
- a) The photon energy decreases
 - b) The relative intensity increases
 - c) The current increases
 - d) Sharp peaks characteristic of the target metal are observed
6. A lead grid is used while taking a radio graph in order to:
- a) Filter out low energy X-rays
 - b) To ensure the beam is no wider than necessary to obtain the X-ray image
 - c) To prevent X-rays scattered by the tissue and bone from reaching the film
 - d) To increase the speed of the film and hence reduce the radiation dose
7. In radiography, a cassette is a light tight robust container which will do all of the following except:
- a) Protect the film and screen from damage during use
 - b) Protect the film from visible light since this will blacken the film
 - c) Hold the film and intensifying screens in close contact
 - d) Quicken film development through fluorescence
8. The isotopes of an element have different masses due to different numbers of:
- a) neutrons
 - b) protons
 - c) electrons
 - d) atomic number
9. Brachytherapy is:
- a) Long range radiation therapy
 - b) Positron emission tomography
 - c) Short range radiation therapy
 - d) Identification of cold spots

10. Boron Neutron Capture therapy using boron-10 concentrates in:
- a) Pancreatic benign tumours
 - b) Ovarian malignant tumours
 - c) Bone marrow stem cell replacement
 - d) Malignant brain tumours
11. Fluoro-deoxy glucose is readily incorporated into the cell without being broken down and is a good indicator of:
- a) Glycolytic pathway
 - b) Cell metabolism
 - c) Bone dissolution
 - d) Brain haemorrhage
12. The time taken for the activity of a radioactive isotope to decrease to half its initial activity is known as:
- a) biological half life
 - b) the effective half life
 - c) the chemical half life
 - d) the physical half life
13. The unit of the absorbed radiation dose is the:
- a) sievert
 - b) gray
 - c) Joule/Gray
 - d) Watt
14. In magnetic resonance imaging, the frequency of the precession of the hydrogen nucleus is proportional to the :
- a) internal flux density
 - b) magnetic moments
 - c) external flux density
 - d) All of the above
15. The protective transparent layer in front of the eye with a fixed curvature is known as:
- a) iris
 - b) cornea
 - c) choroid
 - d) conjunctiva membrane

16. What controls the amount of light entering the eye?

- a) the retina
- b) cornea
- c) iris
- d) rods

17. The size and closeness of retinal cells determines the

- a) quantum efficiency of the eye
- b) the accommodation range of the eye
- c) the near and far points of the eye
- d) resolution of the eye

18. The decrease of intensity of sound with distance as a sound wave moves through a substance is referred to as:

- a) acoustic impedance
- b) attenuation
- c) sound porosis
- d) intensity level

19. The role of the Eustachian tube in the ear is:

- a) to equalize pressures
- b) to perceive gravitational pull
- c) to link the ear to the auditory nerve
- d) to enable the hammer and the anvil to contact each other

20. At each joint, and separate the bones

- a) tendons, synovial fluid
- b) ligaments and tendons
- c) cartilage and synovial fluid
- d) cartilage and ligaments

21. Tendons are strong against:

- a) tension
- b) compression
- c) shear forces
- d) none of the above

22. Lifting by bending over imposes very large stress on the:

- a) hip joint
- b) lumbar discs

- c) knee joints
- d) elbow joints

23. When walking on a low friction surface to avoid slipping, one should take:

- a) small steps
- b) long steps
- c) the heel along the surface
- d) none of the above

24. For diagnostic purposes, X-ray tubes operate between

- a) 200-300 K_v
- b) 30-50 kV
- c) 50-380 kV
- d) 200-380 kV

25. What is used to increase the speed of the film and reduce radiation dose?

- a) beam definers
- b) collimator
- c) gamma camera
- d) intensifying screen

26. When a positron emitting radionuclide combines with an electron, there is emission of:

- a) β^- radiation
- b) γ - radiation
- c) α - radiation
- d) X -radiation

27. Radiographs taken with a high kV have

- a) low contrast
- b) high contrast
- c) pseudo-artifacts
- d) relatively low current output

28. What type of lens corrects short-sightedness?

- a) concave
- b) convex
- c) bifocal
- d) resolution

29. What type of joint is the hip joint?

- a) fulcrum
- b) ball and socket
- c) mortice and tenon
- d) dove tail

30. Long-sightedness is corrected by

- a) concave lens
- b) convex lens
- c) bifocal lens
- d) all of the above