

KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE IN BIOTECHNOLOGY

SBC 206: INTRODUCTION TO BIOPHYSICS

DATE: MONDAY, 26TH MARCH 2012

TIME: 8.00 A.M. – 10.00 A.M.

Section A: Answer all twenty questions. Tick the right choice or fill in the missing gap. Each question is one mark.

1. What describes radiation with a wavelength of 340nm?
 - (a) Ultraviolet radiation.
 - (b) Visible radiation
 - (c) Near infrared radiation
 - (d) far infrared radiation

2. Ultraviolet radiation will frequently induce which of the following molecular transitions:
 - (a) Inner shell electronic transition.
 - (b) Valence electronic transition
 - (c) Molecular vibrational transition
 - (d) Molecular rotational transition

3. The process in which energy is emitted as radiation after a chemically induced electronic transition is known as fluorescence BECAUSE fluorescence is of longer wavelength than that which is initially induced
 - (a) TRUE
 - (b) FALSE

4. Which of the following spectroscopic technique involve the measurement of absorbed radiation?
- (a) Fluorescence.
 - (b) Flame emission spectroscopy
 - (c) Atomic absorption spectroscopy
 - (d) Nuclear magnetic resonance spectroscopy
6. Which EM radiation is involved with ionization?
- (a) Near UV and visible
 - (b) Near IR and IR
 - (c) Microwaves
 - (d) None
7. Which of the following statement is not true concerning everyday examples of photochemistry.
- (a) Formation of vitamin D
 - (b) Photosynthesis
 - (c) Degradation of plastics
 - (d) Blackening of silver grains by γ -rays
8. Isotopes emit three type of radioactivity except
- (a) α particles
 - (b) β particles
 - (c) γ particles
 - (d) positron particles
9. A laser is a device that emits light through a process of optical transmission based on the stimulated emission of photons.
- (a) TRUE
 - (b) FALSE

10. Lasers are used in a research in the areas of laser ablation, laser annealing, laser scattering but not in interferometry

(a) TRUE

(b) FALSE

11. Rhodopsin- has a maximum absorption spectra approximately 500 nm that shifts to 550 nm in strong light -the absorption maximum of iodopsin.

(a) TRUE

(b) FALSE

12. A conformation change of retinal from '11 cis' to 'all trans' causes detachment of the chromophore from opsin via a process called

13. Single wavelength lasers produce radiation in only one *mode* having slightly different frequencies (wavelengths) and often not in a single polarization

(a) TRUE

(b) FALSE

14. Chemiluminescence is emission of radiation catalyzed enzymatically and the initial electronic transition being endergonic.

(a) TRUE

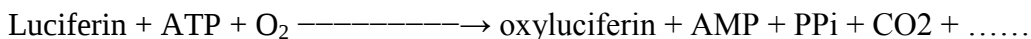
(b) FALSE

15. The electron in laser is in an excited state and when accompanied by a photon of precisely same energy arrive the former returns to its original ground state leading to emission of only one coherent photon.

(a) TRUE

(b) FALSE

16. Complete the following reaction:



17. During photosynthesis electrons from P700 flow cyclically during insufficient NADP⁺ and accept electrons from reduced
18. The dipole moment of water provides a.....for interaction with microwave electric fields in a microwave oven.
19. If a molecule has no permanent dipole moment, it is possible to induce a dipole moment by the application of an external
20. An atom emits radiation to release some extra energy when electrons jump from a state of high energy to a state of lower energy.
 - (a) TRUE
 - (b) FALSE

Section B: Answer ALL six questions. Each question is five marks

1. Laser technology is based on [optical amplification](#) based on the [stimulated emission](#) of [photons](#) and their subsequent coherence. Explain
2. Chemiluminescence is based on the ability of luciferase to oxidize aldehydes. Discuss.
3. Explain energy transduction through the reactive centres and how it leads to a proton motive gradient.
4. Exposure of humans to ultraviolet radiation manifests as early and late effects. Discuss
5. Interaction of microwave radiation with the electric dipole and magnetic dipole transition moments of water manifests as boiling. Explain
6. Ionization radiation is useful in alleviating human suffering. Discuss

Section C: Answer only TWO questions. Each question is 10 marks

1. Describe the role of rhodopsin and vitamin A during light transduction in the retina
2. Explain the emission of ionization radiation through decay (20).
3. Explain the interaction of the electromagnetic radiation with matter
