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University Examinations 2023/2024

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE IN MEDICAL LABORATORY

HML 3422: LABORATORY MAINTENANCE

DATE: APRIL 2024

TIME: 3 HOURS

INSTRUCTIONS:

- (i) The paper consists of **Three** Sections
 - (ii) Section A: Multiple Choice Questions
 - (iii) Section B: Short Answer Questions
 - (iv) Section C: Long Answer Questions
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SECTION A: MULTIPLE CHOICE QUESTIONS (ANSWER ALL QUESTIONS IN THIS SECTION)

1. Which of the following best describes lab maintenance?
 - a) A process of designing new laboratory equipment
 - b) A process of preserving lab specimens
 - c) Activities performed in the lab to ensure equipment are in good working condition
 - d) A process of conducting experiments in the lab
 2. Which of the following activities are typically included in an equipment maintenance plan?
 - a) Designing new equipment
 - b) Cleaning, calibration, repairing, or replacing broken or outdated equipment
 - c) Conducting experiments
 - d) Analyzing test results
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3. Which of the following are steps for implementing a maintenance program for laboratory equipment?
- a) Selecting the newest equipment available
 - b) Cleaning the laboratory space
 - c) Conducting regular inspections and assessments of equipment
 - d) Ignoring manufacturer guidelines for maintenance
4. Which of the following factors should be considered when setting up equipment maintenance schedules?
- a) Weather conditions
 - b) Manufacturer recommendations
 - c) Employee lunch breaks
 - d) Public holidays
5. Which of the following are features of good Standard Operating Procedures (SOPs) for the lab?
- a) Lengthy and complex instructions
 - b) Lack of clarity and specificity
 - c) Concise and clear instructions
 - d) Subjective and variable procedures
6. Which of the following are fundamental principles of a waste management program?
- a) Accumulation and hoarding
 - b) Proper segregation and storage
 - c) Random disposal
 - d) Ignoring environmental regulations
7. Which of the following steps are typically involved in drawing a waste management plan?
- a) Identifying waste management regulations and ignoring them
 - b) Selecting the nearest landfill for waste disposal
 - c) Assessing types and quantities of waste generated
 - d) Implementing random waste disposal practices
8. What is the first step to take in the event of spills of infectious biological material on the floor?
- a) Change gowns and clothes that are visibly soiled immediately
 - b) Warn other colleagues present and protect the contaminated area

- c) Wear disposable gloves and goggles
 - d) Cover the contaminated area with absorbent paper soaked with disinfectant
9. What safety precaution should be taken when working with substances that generate vapors in a water bath?
- a) Place the water bath near an electrical outlet
 - b) Work in a closed environment
 - c) Place the water bath in a well-ventilated area or under a chemical hood
 - d) Use the water bath without any protective gear
10. What is the risk level associated with pathogens classified as biosafety level 2?
- a) High individual risk, low community risk
 - b) No individual and community risk
 - c) Moderate individual risk, limited community risk
 - d) High individual risk, high community risk
11. What is the recommended frequency for routine maintenance of a biological safety cabinet?
- a) Weekly
 - b) Monthly
 - c) Annually
 - d) All of the above
12. Which law of motion do centrifuges practically apply?
- a) Keplerts laws
 - b) Newton's law of universal gravitation
 - c) Newton's first law of motion
 - d) Newton's second law of motion
13. How should you hold a pipette while pipetting?
- a) With the thumb and forefinger on the top of the pipette
 - b) With the thumb and forefinger on the middle of the pipette
 - c) With the thumb and forefinger on the bottom of the pipette
 - d) With the entire hand around the pipette
14. What is the main mechanism by which an autoclave sterilizes items?
- a) Radiation
 - b) Filtration

- c) Moist heat under pressure
 - d) Dry heat
15. Which law describes the relationship between the concentration of a sample and the intensity of light transmitted through it?
- a) Boyle's Law
 - b) Charles's Law
 - c) Beer-Lambert Law
 - d) Avogadro's Law
16. What is the primary function of a spectrophotometer?
- a) To measure the concentration of a substance in a solution
 - b) To refrigerate samples in a laboratory
 - c) To visualize microscopic organisms
 - d) To analyse DNA sequences
17. What protective gear should be worn if aerosols are present during spills or contamination?
- a) Disposable gloves
 - b) Respirator for protection from particles (FFPI or FFP2)
 - c) Goggles
 - d) All of the above
18. What information should be recorded in an inventory logbook for laboratory equipment?
- a) Manufacturer's website URL
 - b) Average daily usage
 - c) Part name and number
 - d) Date of calibration
19. When should laboratory equipment be retired?
- a) When it is no longer needed for research
 - b) When it reaches a certain age, regardless of functionality
 - c) When experts indicate it cannot be repaired or is out-of-date
 - d) When it exceeds its warranty period
20. What precaution should be taken when moving microscopes?
- a) Ensure they are exposed to vibrations
 - b) Avoid moving them from their installation position

- c) Move them frequently to prevent dust accumulation
- d) Store them without any dust protection

**SECTION B: SHORT ANSWERED QUESTIONS (ANSWER ALL THE QUESTIONS)
(40 MARKS)**

- 1. Explain types of lab equipment maintenance and repair (5 marks)
- 2. Outline factors to consider when setting up equipment maintenance schedules (5 marks)
- 3. State five benefits of equipment management program (5 marks)
- 4. State steps when implementing of waste management plan (5 marks)
- 5. Explain pipettes and operation principles of the pipettes (5 marks)
- 6. State routine maintenance practices of a biosafety cabinet (5 marks)
- 7. Explain operation principles of a spectrophotometer. (5 marks)
- 8. Describe two implicit concepts of Beer Lambert's law (5 marks)

**SECTION C: LONG ANSWERED QUESTIONS (ANSWER Two QUESTIONS)
(40 MARKS)**

QUESTION 1

- a) Define laboratory maintenance (2 marks)
- b) State steps for Implementing a maintenance program for laboratory equipment (8 marks)
- c) Explain the benefits of a good equipment management program in the laboratory (10 marks)

QUESTION 2

- a) Discuss operational principle of a pipettes (10 marks)
- b) Design a maintenance plan of air displacement pipettes (10 marks)

QUESTION 3

- a) Explain the steps when drawing waste management plan in the laboratory (8 marks)
- b) Incineration is one of the methods used in waste management and disposal. You been called up on to help in designing of a small incinerator for a laboratory waste. Design an incinerator clearly labelling different compartments. (8 marks)
- c) State two advantages and two disadvantages of an incinerator (4 marks)

