CANDIDATE NUMBER.....

AFRICA UNIVERSITY
A United Methodist-Related Institution

"Investing in Africa's Future"

COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES
DEPARTMENT OF BIOMEDICAL AND LABORATORY SCIENCES

NSLS100: LABORATORY PRINCIPLES

END OF FIRST SEMESTER EXAMINATIONS

NOVEMBER 2024
LECTURER: Mr Z CHIWODZA

DURATION: 3 HOURS

INSTRUCTIONS

1. Write your candidate number on the space provided on top of each page
2. Answer **all** questions in sections A on the question paper.
3. Answer **all** questions in section B on separate answer sheets provided.
4. Answer any **3** questions in section C on separate answer sheets provided
5. The mark allocation for each question is indicated at the end of the question
6. Credit will be given for logical, systematic and neat presentations in sections B and C

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SECTION A : MULTIPLE CHOICE [40 MARKS]

- **Answer all questions by encircling the correct response T for TRUE or F for FALSE for each statement in all the questions**
- **Each correct response is allocated HALF MARK**

1. The following disciplines are part of Medical Diagnostic Laboratory
   - T F a) Microbiology
   - T F b) Chemical Pathology
   - T F c) Clinical Pharmacology
   - T F d) Serology

2. The following are Good Clinical Laboratory Practices
   - T F a) Testing a patient for HIV without consent
   - T F b) Competency assessment for all new staff
   - T F c) Long turn-around times of results
   - T F d) Quality assurance program

3. Concerning the four pillars of Biomedical Ethics
   - T F a) patients have the right to get tested or withdraw from a test
   - T F b) results should not be disclosed to any other party without the patients approval.
   - T F c) guardians can choose for a minor whether or not to have a procedure done
   - T F d) all patient samples should be treated equally

4. Westgard Rules include the following
   - T F a) 1:2S
   - T F b) 1:4S
   - T F c) R:4S
   - T F d) 4:1S

5. The following are ways of reducing transmission of infectious agents from the laboratory
   - T F a) Disinfecting benches after finishing work
   - T F b) Wearing laboratory coats and scrubs outside the laboratory
   - T F c) Wearing gloves at all times in the laboratory
   - T F d) disposing sample waste together with office litter

6. Biosafety and Bio-security in a laboratory entails that
   - T F a) waste should be segregated
   - T F b) biohazardous material should be autoclaved or incinerated
   - T F c) Samples should be transported in triple packaging
   - T F d) Lab personnel use a BSC Class II for materials that may cause respiratory infections

7.

Fig 1

The sign in Fig 1 is used on

T F a) Acids and Alkalis
T F b) Harmful substances chemical that cause fumes
T F c) Corrosive substances
T F d) Biohazard materials

8. Risk analysis in a laboratory

T F a) Improves safety for staff
T F b) Should only be done when the lab is opened for the first time
T F c) Improves customer satisfaction
T F d) Should never be documented

9. The following pieces of equipment are essential for a medical laboratory

T F a) Fire extinguishers, fire blankets and fire buckets
T F b) Eyewash station
T F c) First aid kit
T F d) Heaters

10. The Levy-Jennings Charts

T F a) should be used only when results get out of range
T F b) for chemistry machines only
T F c) should be documented and stored in office under lock and key
T F d) do not contribute to good quality results for patients

11. Which statement best describes how to prepare a 1%(v/v) NaClO solution from a 10%(v/v) NaClO

T F a) Mix 1 part NaClO with 9 parts water
T F b) Mix 9 parts NaClO with 1 part water
T F c) Mix 1 part NaClO with 10 parts water
T F d) Mix 10 parts NaClO with 90 parts water

12. A new test is said to have a Specificity of 95%, this means that out of a 100 tests

T F a) 95 will be false positives
T F b) 95 will be false negatives
T F c) 5 will be false positives
T F d) 5 will be false negatives

13. The results from a validation tests showed the following:-

True Positives	15
True Negatives	13
False Positives	04
False Negatives	01

Calculate the Specificity

T F a) 76.5%
T F b) 92.9%
T F c) 78.9%
T F d) 93.8%

14. Failing to carry out daily Quality Control could result in

T F a) Degrading of the laboratory to a lower Bio-safety level
T F b) Loss of credibility of the laboratory
T F c) Death of a patient
T F d) Legal action against the laboratory

15. A good Quality Management System could result in

T F a) Lower repair costs for machines
T F b) Shorter turn-around times of results
T F c) Good customer satisfaction
T F d) Medical laboratory scientists getting higher salaries

16. With regards to the 5S

T F a) Laboratory surfaces should be kept clean
T F b) Cupboards should be labeled to show the contents
T F c) Unnecessary items should be removed from the workbenches
T F d) Regular reviews should be done to ensure standards are still applicable

17. When using a micro-pipette

T F a) Its volume can be adjusted beyond its range of measurement
T F b) It is not necessary to keep it upright
T F c) Recycle all tips
T F d) You can use a P200 disposable tip on a 1000µl micro-pipette

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18. With regards to a Laboratory Request Form, the following information is mandatory

T F a) Sex
T F b) Age
T F c) Clinical Data
T F d) Signature of patient to show consent for the test being done

19. With regards to stock management, the following parameters should be visible on the stock card

T F a) Maximum stock-level
T F b) Minimum stock-level
T F c) Emergency order point
T F d) Lead time

20. Ergonomics in the medical laboratory supports consideration of the following

T F a) good lighting and temperature control
T F b) functional equipment.
T F c) Number of laboratory personnel working in the laboratory
T F d) Functional relationships between departments

SECTION B [20 MARKS]

Answer all questions on separate answer sheets provided

1. State the principle of use of the following machines used in the laboratory
   a) Balance
   b) Incubator
   c) Autoclave
   d) Microtome
   e) Spectrophotometer
   f) Micropipette

   [6 marks]

2. State the Bio-safety level associated with the following precautions
   a) Requires full-body, air-supplied suits and high-efficiency particulate air (HEPA) filtration.
   b) Basic safety practices such as hand washing and use of PPE like gloves.
   c) Use of bio-safety cabinets, controlled access, and negative air pressure rooms.
   d) Bio-safety cabinets, restricted access, and incineration of contaminated sharps. **[4marks]**

3. Show with working, how you will prepare:-

1 litre of 0.4 mol/l H_2SO_4 from a stock solution of H_2SO_4 which has a label with the following information: 70% H_2SO_4
MW 98.08
1L = 1.84Kg (Density) **[5 marks]**

4. Briefly outline the first aid steps you would take for the following situations**:**

a) Minor burn
b) Severe bleeding
c) Fainting
d) Chemical spill on skin
e) Choking

[5 marks]

SECTION C [75 marks]

Answer any 3 questions from this section on separate answer sheets provided

1. Discuss what is involved in a good Quality Management System of a medical laboratory and how it enhances good patient outcomes. [25]

2. You have been called to consult on establishing safety in a Medical Laboratory. What key issues will you highlight and how will each issue be linked to better patient management [25]

3. In country **Z**, the healthcare system does not recognize the importance of a Medical Laboratory. Write an essay showing the importance of a Medical Laboratory in the healthcare system. [25]

4. You have been tasked to help set up a new laboratory
   a) Discuss 6 issues to think about when designing a medical laboratory and how each one contributes to good business for a laboratory. [15]
   b) Describe the key elements in a laboratory report form. [10]

5. Two new tests for Malaria have been proposed for use in the country.
Robust Diagnostic kit costs $20 dollars per kit, and NewAge cost $24 dollars per kit. Each kit has 25 tests. The validation results of these two new kits are as shown in Table 1

Table 1

GOLD STANDARD	Robust Diagnostics	NewAge Laboratories
POSITIVE	POSITIVE	POSITIVE
NEGATIVE	NEGATIVE	NEGATIVE
POSITIVE	NEGATIVE	NEGATIVE
POSITIVE	POSITIVE	POSITIVE
POSITIVE	POSITIVE	POSITIVE
POSITIVE	POSITIVE	POSITIVE
NEGATIVE	POSITIVE	NEGATIVE
POSITIVE	NEGATIVE	POSITIVE
NEGATIVE	NEGATIVE	NEGATIVE

a) Which test kit would you recommend based on the validation results? Justify your answer.[10]
b) Given that you have chosen one of these kits and you were responsible for managing stock in a medical laboratory, what key issues would you address? Discuss how managing these issues could impact patient care. [15]