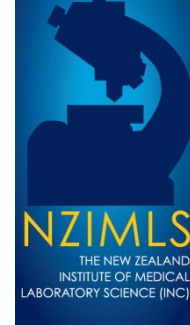


EXAMINATION FOR QUALIFIED MEDICAL LABORATORY TECHNICIAN



Candidate Name:

Candidate Number:

Subject: MICROBIOLOGY

Examination Date: 8 October 2022

Time Allowed: 3 hours – 9.30am – 12.40pm
10 minutes extra time for reading the paper

General Instructions

1. Total marks for paper = 100.
2. Marks for each question are as indicated,
3. The paper consists of:

	<i>Common</i>	<i>Discipline Specific</i>
Section A, questions 1-30 = Total Marks 15	<i>6 Marks</i>	<i>9 Marks</i>
Section B, questions 31-36 = Total Marks 10	<i>5 Marks</i>	<i>5 Marks</i>
Section C, questions 37-38 = Total Marks 10	<i>4 Marks</i>	<i>6 Marks</i>
Section D, questions 40-43 = Total Marks 05	<i>5 Marks</i>	<i>0</i>
Section E, questions 44-61 = Total Marks 40	<i>10 Marks</i>	<i>30 Marks</i>
Section F, questions 62-63 = Total Marks 20	<i>0</i>	<i>20 Marks</i>
4. All questions are to be attempted.
5. Use of calculator is permitted.
6. Write all answers into this booklet.

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WORD DEFINITIONS	
Calculate	Perform a mathematical process to get the answer
Classify	Be able to designate to a group
Compare	Detail both the differences and the similarities
Complete	Finish, have all the necessary parts
Convert	Express in alternative units
Define	State meaning clearly and concisely
Describe	Give a complete account demonstrating a thorough practical knowledge
Discuss	Give details, explaining both the positives and negatives
Distinguish	To briefly point out the main differences
Expand	To express at length or in a greater detail
Identify	Recognise according to established criteria
Indicate	Briefly point out
Interpret	Express the results of a test or series of tests in a meaningful format
Label	Give a name to
List	Headings only
Match	Find one that closely resembles another
Name	A word or group of words used to describe or evaluate
Outline	Write brief notes incorporating the essential facts
State	Give the relevant points briefly

SECTION A

Section A – Question 1 to Question 30 = Total Marks: 15

Multi choice questions

Multi choice questions – choose one answer for each question

(0.5mark per correct answer)

Circle the letter for the correct answer

Example. Which of the below is a primary colour?

- a. Green
- b. Purple
- ☒ c. Red
- d. Orange

C.1 Approximately what percent alcohol is in a standard use hand sanitiser?

- a. 95%
- b. 75%
- c. 30%
- d. 10%

C.2 The patella is part of which human joint?

- a. Shoulder
- b. Elbow
- c. Knee
- d. Wrist

C.3 An anticoagulant is used to:

- a. stop blood clotting
- b. stop blood haemolysing
- c. help blood separating
- d. separate red cells and plasma

- C.4 Which of the following is **NOT** listed in the Health and Safety at Work Act 2015 as “Duties of Workers”?
- a. take reasonable care for his or her own health and safety
 - b. take reasonable care that his or her acts or omissions do not adversely affect the health and safety of other persons
 - c. co-operate with any reasonable policy or procedure of the PCBU (person conducting a business or undertaking) relating to Health and Safety at the workplace that has been notified to workers
 - d. issue provisional improvement notices
- C.5 Which of the following statements is true of an acidic solution?
- a. has a pH less than 7
 - b. is caustic
 - c. has a pH greater than 7
 - d. is Isotonic
- C.6 The reference interval for a given test is based on the results that are seen in what percent of the healthy population?
- a. 5%
 - b. 10%
 - c. 90%
 - d. 95%
- C.7 Treating all blood and body fluids as potentially infectious is an example of:
- a. Laboratory standard operating procedures
 - b. CDC guidelines
 - c. Standard precautions
 - d. Health and safety requirements
- C.8 Which laboratory department is primarily responsible for the diagnosis of leukaemia?
- a. Haematology
 - b. Histology
 - c. Blood Transfusion
 - d. Biochemistry

C.9 Hormones are produced by which bodily system?

- a. Lymphatic
- b. Cardiovascular
- c. Endocrine
- d. Digestive

C.10 Formalin is a laboratory fluid used to

- a. Preserve tissue samples
- b. Wash histology cutting knives
- c. Clean benches
- d. Decontaminate centrifuges

C.11 A chemical that is described as a carcinogen poses what specific risk?

- a. It may burn the skin
- b. It may cause cancer
- c. It may poison the liver
- d. It may cause loss of vision.

C.12 The practice of enforcing document management standards within the workplace is referred to as:

- a. Quality management
- b. Quality control
- c. IANZ requirements
- d. Document control

D.13 When setting up a system for isolation of a specific group of organisms that results in the oxygen level to be below 1%, and the CO₂ level to be 9%-13%, indicate which type of organism is being isolated.

- a. Obligate aerobes
- b. Obligate anaerobes
- c. Capnophilic
- d. Microaerophilic

- D.14 Identify two positive carbohydrate reactions expected in the identification of *Neisseria gonorrhoeae*.
- Glucose positive, lactose positive
 - Glucose negative, lactose negative
 - Glucose positive, maltose positive
 - Glucose positive, maltose negative
- D.15 When adhering to IANZ standards a fridge/freezer in a microbiology department needs to have spatial temperature checks. How often do these checks need to occur?
- Every three years
 - Quarterly
 - Annually
 - Biannually
- D.16 Lactophenol cotton blue is made from the aniline dye cotton blue. It is used for the distinction of?
- Bacteria
 - Parasites
 - Fungi
 - Viruses
- D.17 A selective media may have antibiotics or chemicals added to suppress the normal flora and enrichments to encourage bacteria that is being looked for in isolation. Name the selective agar in the list below.
- Chocolate agar
 - Selenite F broth
 - Aztreonam agar
 - MacConkey agar
- D.18 Lowenstein media is supplemented with glycerol and egg mixture. These substances provide fatty acids and protein which is required for the growth of?
- Neisseria gonorrhoeae*
 - Mycobacterium tuberculosis*
 - Listeria monocytogenes*
 - Bordetella pertussis*

D.19 Motility in microorganisms is:

- a. random molecular collisions with the cell that cause the cell to vibrate about a more or less fixed point.
- b. movement of the medium as well as the cells when heated.
- c. ability to move relative to some other point of reference, change direction and probably leave the field of view.
- d. remains in one location with no movement at all.

D.20 Lim broth is used to grow which bacteria?

- a. *Streptococcus pyogenes*
- b. *Streptococcus agalactiae*
- c. *Streptococcus dysgalactiae*
- d. *Streptococcus anginosus*

D.21 When using a disc diffusion susceptibility method, the standardized inoculum must be equivalent to a 0.5 McFarland STD. 0.5 equates to:

- a. $\times 10^6$ CFU's
- b. $\times 10^4$ CFU's
- c. $\times 10^9$ CFU's
- d. $\times 10^8$ CFU's

D.22 Name two organisms that are oxidase positive:

- a. *Aeromonas* spp. and *Enterobacter* spp.
- b. *Neisseria* spp. and *Enterococcus* spp.
- c. *Pseudomonas* spp. and *Campylobacter* spp.
- d. *Haemophilus* spp. and *Citrobacter* spp.

D.23 The type of drug resistant bacteria that are found in the gastrointestinal tract of humans is:

- a. MRSA
- b. CRO
- c. VRE
- d. ESBL producers

D.24 Identify the specific stain for Mycobacteria:

- a. Ziehl-Neelsen
- b. Trichrome
- c. Iron-haematoxylin
- d. Giemsa

D.25 Which abbreviation is CORRECT?

- a. UTI-upper tract infection
- b. SROM-sudden rupture of membranes
- c. COAD- chronic obstructive arterial disease
- d. TAT-test and time

D.26 Chlamydia are obligate organisms that can grow only within the cell and hence are:

- a. Exogenic
- b. Intercellular
- c. Endogenic
- d. Intracellular

D.27 The laboratory features and urease test results for *Trichophyton rubrum* should typically be:

- a. Urease positive, with no reverse pigment on Lactrimel agar
- b. Urease negative, with wine-red reverse pigment on Lactrimel agar
- c. Urease positive, with wine-red reverse pigment on Lactrimel agar
- d. Urease negative, with no reverse pigment on Lactrimel agar

D.28 What antibiotic disc can be used to identify *Streptococcus pneumoniae*?

- a. Optochin
- b. Bacitracin
- c. Oxacillin
- d. Penicillin

D.29 A MALDI-TOF is a mass spectrometer analyser used to identify bacteria. What does MALDI-TOF stand for?

- a. Multi-Assisted Laser Desorption Ionization-Time of Flight
- b. Mass-Assisted Laser Desorption Ionization -Time of Flight
- c. Matrix-Assisted Laser Desorption Ionization -Time of Flight
- d. Matrix-Associated Laser Desorption Ionization -Time of Flight

D.30 The causative agent of whooping cough is:

- a. *Bordetella pertussis*
- b. *Haemophilus influenzae*
- c. *Haemophilus parainfluenzae*
- d. *Bordetella parapertussis*

END OF SECTION

SECTION B

Labelling of diagrams e.g. anatomy, hazard identification, instrument



Section B – Question 31 to Question 36 = Total Marks: 10

(Answer all questions)

C.31 Name the following hazard symbols

(0.5 marks per correct answer)

(C.31: 1 mark)

a.		b.	
----	---	----	--

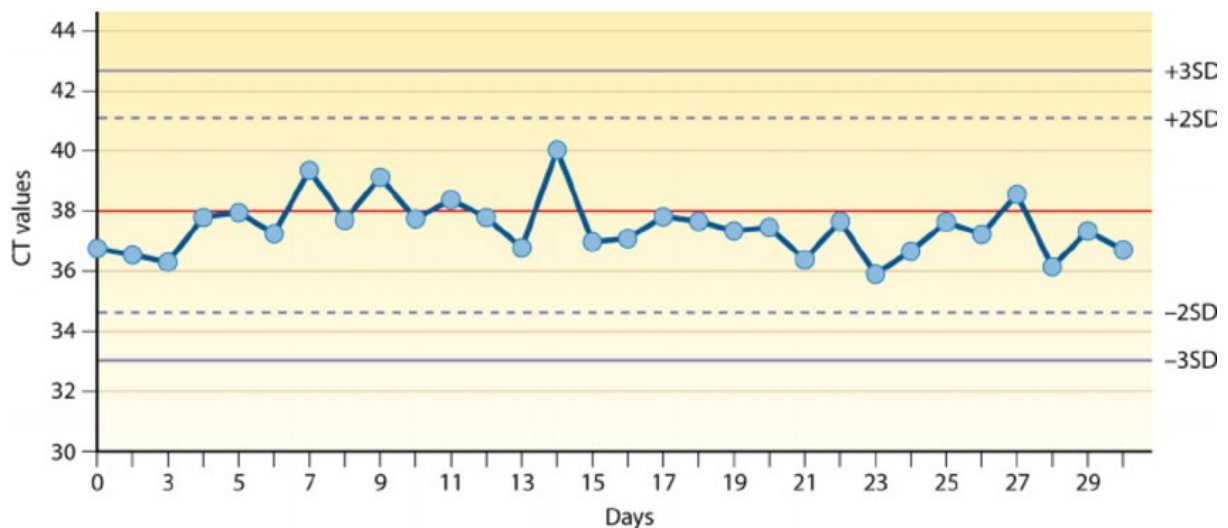
a. _____

b. _____

C.32 Name the type of graph:

(0.5 marks per correct answer)

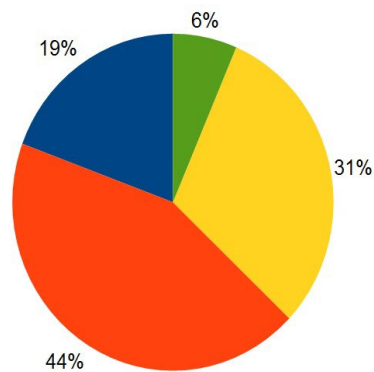
(C.32: 1.5 marks)



Type of graph: _____

Name the axis: CT values = _____ axis

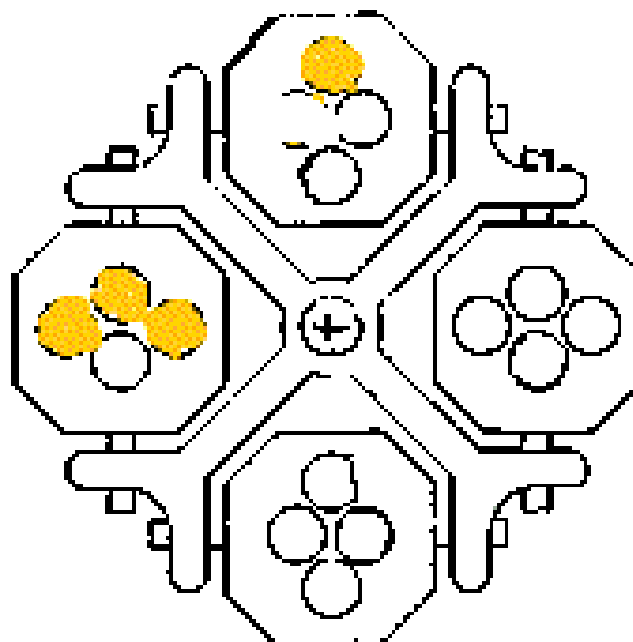
Days = _____ axis



- C.34 The yellow dots represent blood tubes in a swing out centrifuge rotor, assume all tubes are filled to the same level.

You have 4 more tubes to centrifuge, indicate on the rotor where they need to be positioned.

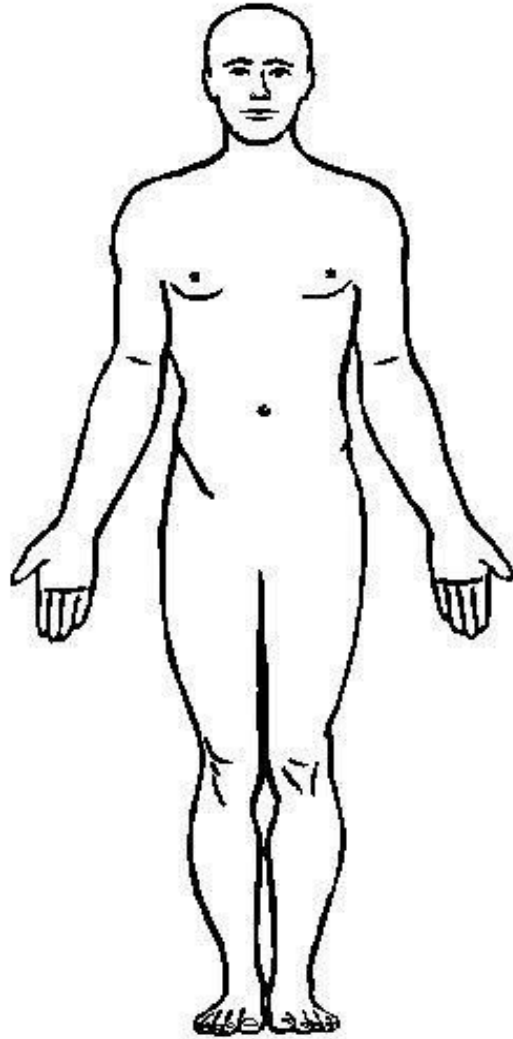
(C.34: 0.5 mark)



C.35 On the diagram, show the location of the following:

(C.35: 1.5 marks)

- a. Femoral artery
- b. Jugular vein
- c. Median cubital vein



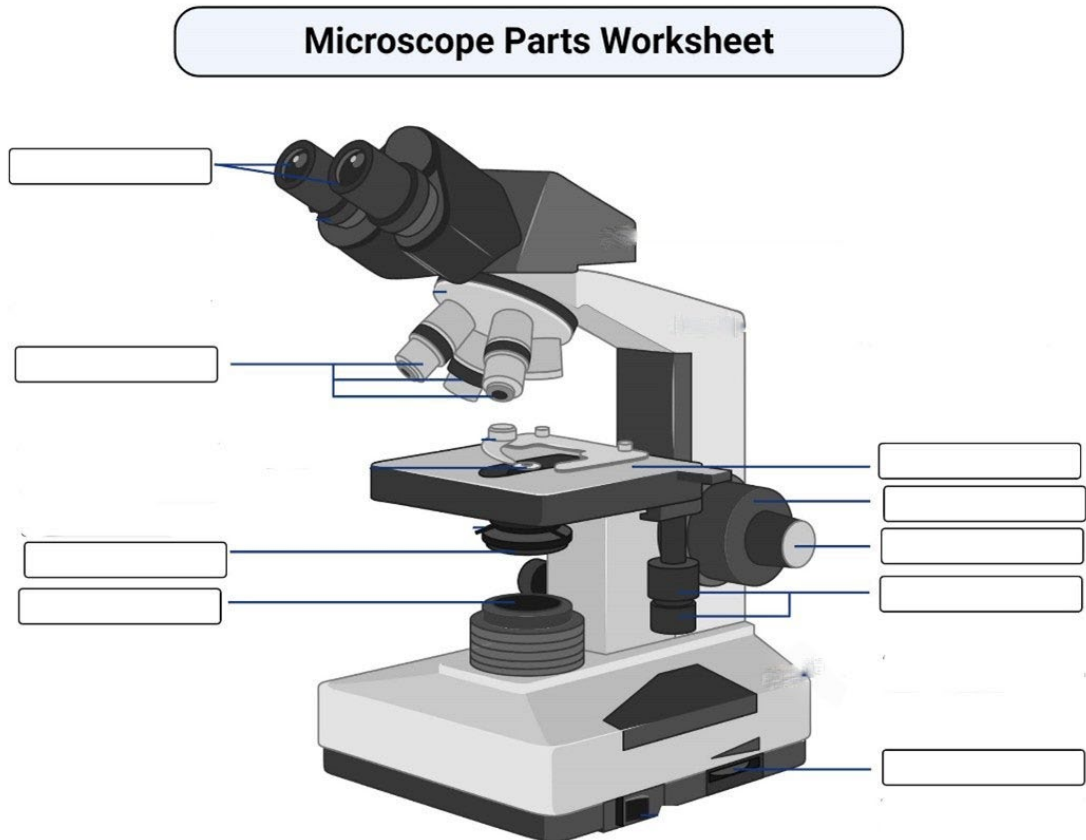
D.36 Name the parts of the microscope in the diagram below.

(0.5 marks per correct (0.5 marks per correct answer)

(D.36: 4.5 marks)

What is the lens objective that you use with oil immersion?

(0.5 marks)



END OF SECTION

SECTION C

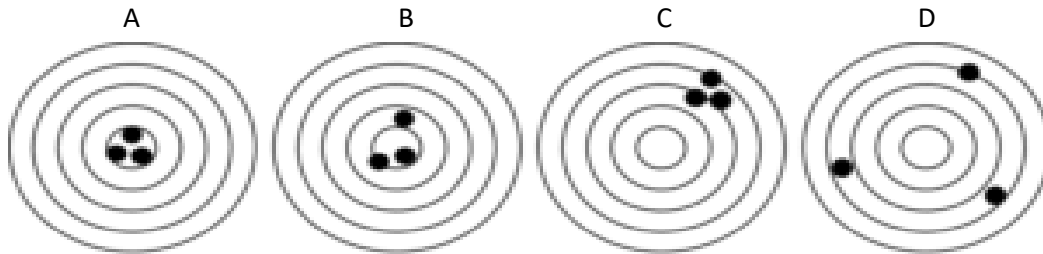
Tables, match column definition

Section C – Question 37 to Question 39 = Total Marks: 10

(Answer all questions)

C.37 Select the correct letter for each description:

(C.37: 2 marks)



Description Letter

Low Accuracy / High Precision = _____

High Accuracy / Low Precision = _____

Low Accuracy / Low Precision = _____

High Accuracy / High Precision = _____

C.38 Match Column A to Column B, and write your answers in the table below:
(Roman Numerals only required):

(C.38: 2 marks)

Column A	Column B
Medical Sciences Council	i. Certifies laboratory quality systems
International Accreditation New Zealand	ii. Issues Annual Practising Certificate
New Zealand Institute of Medical Laboratory Science	iii. Patients' rights for service
Health and disability commission	iv. Professional affairs and education

Column A	Column B (Roman numerals only required)
Medical Sciences Council	
International Accreditation New Zealand	
New Zealand Institute of Medical Laboratory Science	
Health and disability commission	

D.39 Match the most likely causative organism from List A to the most likely disease/description in List B.

(0.5 marks each)

(D.39: 6 marks)

A	B
1. <i>Legionella longbeachae</i>	i. Ringworm
2. <i>Candida albicans</i>	ii Soil transmitted helminths
3. <i>Ascaris lumbricoides</i>	iii Enterocolitis
4. <i>Propionibacterium acnes</i>	iv Hospital acquired infection
5. <i>Trichomonas vaginalis</i>	v Pneumonia associated with potting mix
6. <i>Cryptosporidium species</i>	vi Balanitis
7. <i>Yersinia enterocolitica</i>	vii Rheumatic fever
8. <i>Microsporum canis</i>	viii Blepharitis
9. <i>Pseudomonas aeruginosa</i>	ix Cellulitis
10. <i>Streptococcus pneumoniae</i>	x Adolescent facial condition
11. <i>Streptococcus pyogenes</i>	xi Coccidian protozoa
12. <i>Staphylococcus aureus</i>	xii Abnormal green discharge

A	B (Roman numeral only required)
1. <i>Legionella longbeachae</i>	
2. <i>Candida albicans</i>	
3. <i>Ascaris lumbricoides</i>	
4. <i>Propionibacterium acnes</i>	
5. <i>Trichomonas vaginalis</i>	
6. <i>Cryptosporidium species</i>	
7. <i>Yersinia enterocolitica</i>	
8. <i>Microsporum canis</i>	
9. <i>Pseudomonas aeruginosa</i>	
10. <i>Streptococcus pneumoniae</i>	
11. <i>Streptococcus pyogenes</i>	
12. <i>Staphylococcus aureus</i>	

END OF SECTION

SECTION D

Calculations

Section D – Question 40 to Question 43 = Total Marks: 5

Calculations

C.40 A Glucose Tolerance Test dose is 75g glucose in 350mL water. This test requires the patient to fast for 12 hours before drinking the solution. A blood test is then collected 120 minutes after the drinking the solution. **(C.40: 1.5 marks)**

a. Calculate the percentage glucose in solution. (*Show working*) (0.5 mark)

a. _____

b. If the patient finished their evening meal at 2115 hrs, state the earliest time they can present for the test the following day. (0.5 mark)

b. _____

c. If the patient drinks the solution at 1010 hrs, state the time the blood test is required. (0.5 mark)

c. _____

C.41 Refer to daily fridge temperature monitoring record below. **(C.41: 1 mark)**

Day of the week	Monday	Tuesday	Wednesday	Thursday	Friday
Daily Fridge temperature.	4.6	3.8	3.1	9.3	5.1

a. Calculate the mean recorded temperature for the week. (*Show calculations*)

a. _____

C.42 Convert the following:

(C.42: 1.5 marks)

- a) 4.5 mL to _____ μL
b) 1.125kg to _____ g
c) 1500 μmol to _____ mmol

C.43 Calculate how many grams of sodium chloride (NaCl) are required to make 1.0L of a 2 Molar solution?

(Show calculations)

(C.43: 1 mark)

Atomic Weight of sodium (Na) = 23

Atomic Weight of chlorine (Cl) = 35.5

END OF SECTION

SECTION E

Short answer questions (answers = one or more words, short sentences)

Section E – Question 44 to Question 61 = Total Marks: 40

Short Answer Questions

C.44 List the activities that registered laboratory staff must do to comply with the HPCA act?

(C.44: 1 mark)

C.45 Outline cultural competency as it relates to medical laboratory science?

(C.45: 2 marks)

C.46 Outline Total Quality Management in the medical laboratory setting

(C.46: 2 marks)

C.47 Describe the procedures taken when dealing with a blood spill in the laboratory or phlebotomy clinic? **(C.47: 2 marks)**

C.48 Define Occupational Overuse Syndrome in a medical laboratory workplace. Name a common cause and who should you speak to if you suffer from it? **(C.48: 1.5 marks)**

C.49 On removing a reagent or product from a laboratory fridge, it is found to be a room temperature. What is the correct process to follow? **(C.49: 1.5 marks)**

D.50 Outline the 10 steps of how to set a microscope for Kohler illumination.

(0.5 marks per correct answer)

(D.50: 5 marks)

D.51 Briefly describe the principles of operation of an anaerobic jar or cabinet. Name a biological control AND chemical indicator for this device.

(D.51: 2 marks)

D.52 Complete the following table with the expected results using the symbols +, - , +/-

(1 mark per organism-each organism has to have ALL tests correct for 1 mark.)

(D.52: 4 marks)

	H ₂ S	INDOLE	CITRATE	UREA	OXIDASE
<i>E. coli</i>					
<i>Proteus mirabilis</i>					
<i>Salmonella spp.</i>					
<i>Shigella sonnei</i>					

D.53 Name the organism in the images.

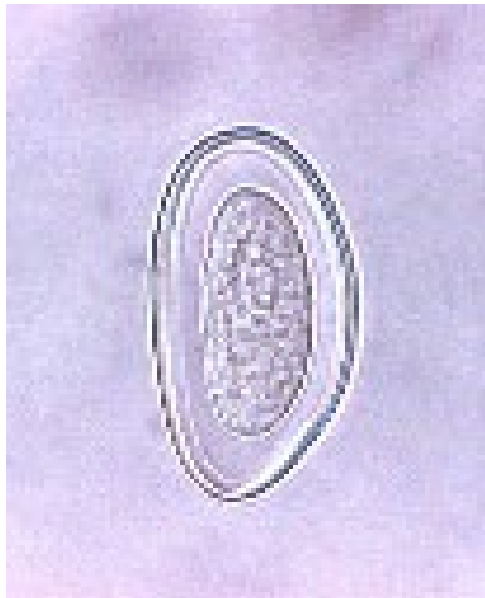
(0.5 marks each)
(D.53: 2.5 marks)

a.



a. _____

b.



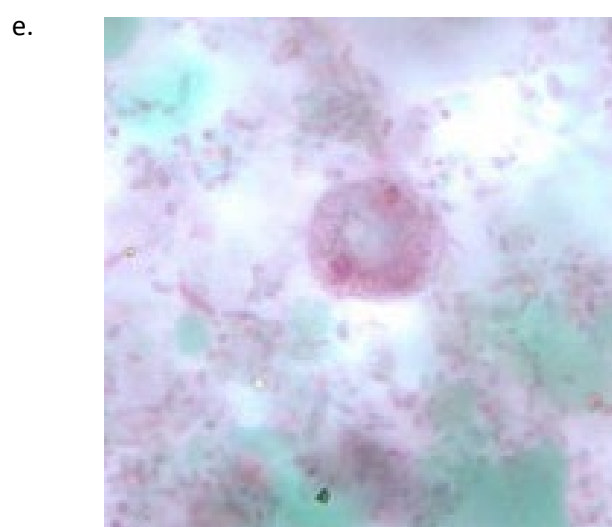
b. _____



c. _____



d. _____



e. _____

D.54 ELISA tests are used in the microbiology laboratory for micro-organism testing.

(D.54: 2.5 marks)

- a. What does ELISA stand for? *(0.5 marks)*

- b. Name a specimen that would be used for this test. *(0.5 marks)*

- c. What organism/s are you looking for? *(0.5 marks)*

- d. Name two errors that may occur during the process rendering the test invalid. *(1 mark)*

D.55 Name the organism being looked for by the use of these discs/tests.

(0.5 marks each)

(D.55: 3 marks)

- a. Bile Solubility

- b. XV factor growth

- c. Bacitracin

- d. Coagulase positive

- e. PYR positive

- f. Cefoxitin

D.56 Define hemoptysis and name the bacterial causative organism.

(D.56: 1 mark)

D.57 What is the chemical name for oxidase reagent?

(D.57: 1 mark)

D.58 Name and describe a rapid test to detect beta-lactamase. Name a positive and Negative control for this test.

(D.58: 2 marks)

D.59 Expand the acronym MRSA.

(D.59: 0.5 marks)

D.60 Name the specimen or sample type where you would expect to find the following:

(0.5 marks each)

(D.60: 2.5 marks)

a. Calcium pyrophosphate crystals

b. Calcium oxalate crystals

c. *Trichuris trichura*

d. *Malazzia furfur*

D.61 Describe the growth requirements, gram stain appearance, colony appearance and site of infection for the following Organisms.

(2 marks each)

(D.61: 4 marks)

a. *Yersinia enterocolitica*

b. *Haemophilus influenzae*

END OF SECTION

ESSAY

Section F – Question 62 to Question 63 = Total Marks: 20

Essay Questions

ESSAY

Section F – Question 62 to Question 63 = Total Marks: 20

Essay Questions

ESSAY

Section F – Question 62 to Question 63 = Total Marks: 20

Essay Questions

D.62 An 18-year-old university student presents in the ED with severe headaches. A CSF is sent to the laboratory for analysis.

In essay format discuss the procedure for processing this sample, including safe handling, causative organism from Gram stain shown, growth requirements and methods of identification. **(D.62: 10 marks)**

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

D.63 In essay format, discuss a manual method of disc diffusion susceptibility testing used in a microbiology department, including an outline of factors that could affect the results of the agar method. (D.63: 10 marks)

[illegible]

This image shows a full page of blank, lined paper. It features approximately 28 evenly spaced horizontal grey lines across its entire width, providing a guide for handwriting or typing. The background is a clean, solid white color.

