

1. Name five divisions of the clinical laboratory, in well organized work. In which divisions or division of the clinical laboratory has the applicant had the most training? Outline the nature of the practical training. In what division has the applicant had little or no training?
2. Define: meniscus, artefact, bacterial antigen, pyogenic, autolysis, hemolytic
3. Define: metastasis, virulence, aspiration, Negri bodies, pyrexia.
4. Define: pediatrics, otology, neurology, psychiatry, orthopedics, pathology, gynecology, radiography, gastro-enterology, ophthalmology.
5. Define: cylindroid, hypochlorhyria, physiological leukocytosis, hemoglobinuria, symbiosis.
- 6.

Clinical

1. Define: endotoxin, chromogenic, anaerobic, attenuation symbiosis.
2. Name six organisms representing normal respiratory flora.

Hematology

1. Name the procedures included in the routine examination of the blood.
2. Distinguish by drawing: squamous epithelial cell, normal erythrocyte, normal lymphocyte, blood platelet, and pus cell.

Urinalysis

1. Name seven factors which should be included in the routine examination of the urine.

Serology

1. Name serological tests in the clinical diagnosis of syphilis, undulant fever, typhoid, and paratyphoid.

Tissue Technic

1. What is the most satisfactory fixing fluid for tissues?

- I. Make a sketch of the blood counting chamber and label the dimension of the square surface of each representative dimension.  
Using the ordinary counting chamber, how do you estimate the total number of cells per cubic mm in spinal fluid?
- II. 1. Make a diagrammatic sketch of white cells, included in the Schilling classification of neutrophiles.  
2. Without multiplying the first two digits of the red count by 2, give the formula for calculating the % of red cells in a count.
- III. Define: Thrombocyte; leukopenia; normoblast; reticulocyte.
- IV. What is the normal number of polymorphonuclear cells per cu. mm. of blood and the normal number of lymphocytes per cu. mm? Express as a simple fraction or ration the relation of red blood cells to white blood cells per cu mm of normal blood.
- V. Name three protein constituents of blood plasma and give their normal values in grams %.  
Name three non-protein constituents of bollo plasma and give their normal values in grams %.
- VI. 1. Give two methods of preparing the filtrate for routine chemical analysis of blood  
2. Give the technique for determination of sulfanilamide either in the blood or urine and designate all chemical reagents by their chemical names.
- VII. How do you preform a Friedman test for pregnancy?
- VIII. What cultural media and what method of cultivation would you use in the following:
1. Throat culture for diphtheria *Loeffler's serum*
  2. Blood culture
  3. Culture of urine for Brucella abortus *10% formalin*
  4. Culture of stool for E.typhi
  5. Culture of fluid for gonocci
- IX. 1. Why is dimethyl-amino-azobenzol or Topfer's reagent used as an indicator in the titration of free HCl in gastric juice and phenolphthalein in total acidity?  
2. Name three different and distinct types of test meals.
- X. Make a large and distinct drawing of each of the following:
1. Ovum of necator americanus
  2. Ovum of trichocephalus trichiuris
  3. Ovum of ascaris lumbricoides
  4. Ovum of enterobius vermicularis
  5. Ovum of hymenolopis nana
  6. Ovum of taenia saginata
  7. Larva of strongyloides stercoralis
  8. Cyst of endomoeba histolytica
  9. Cyst of endomoeba coli
- XI. Differentiate between pH and titratable acidity of a solution.

REGISTRY EXAMINATION APRIL 1938 Answer only ten questions

1. List the cells included in the Schilling differential. State briefly the principle involved in the fragility test.
2. Define: normoblast; thrombocyte; macrocytosis; neutropenia. Give the value of the % of the normal leukocyte count.
3. Outline one method for each of the following: platelet count; Hg determination; (an acid hematin method); reticulocyte count; volume index.
4. What is the fundamental difference in leukocytosis and leukemia?
5. Give the normal values for the following constituents in the blood: sugar, cholesterol, non-protein nitrogen, creatinine, chlorides.
6. What is the difference in absolute and relative leukocytosis?
7. What is the principle of the glucose tolerance test? Define hypoglycemia, hemolysis, blood plasma, blood serum, and anti-coagulant.
8. Name three important pathological microscopic constituents of urine excluding epithelial cells and crystals. What procedures should be included in the examination of the catheterized specimen from the right and left kidneys?
9. Define: Glycosuria, hematuria, albuminuria, polyuria, and pyuria.
10. Define: antibody, antigen, toxin, agglutination, and complement.
11. What is the reaction of Gram's stain on the following:  
Neisseriae gonorrhoeae                      Staph aureus  
E. typhi    Strept hemolyticus  
E. coli
12. What is the best culture media for the following: strept hemolyticus, cornebacterium diphtheriae, E. typhi.
13. What organisms are used in the agglutination tests for the following: Typhoid fever, undulant fever, typhus fever.

OCTOBER 1938 Answer only ten questions.

- I. What are the normal calcium values (and phosphorus) of human serum? List the NPN constituents of the blood.
- II. Define the following:
  1. Reticulocytosis
  2. Myeloblasts
  3. Thrombocytopenia
  4. Shift to the right of neutrophils
  5. Achlorhydria
  6. Microcytic hypochromic anemia
  7. Color index
  8. Prothrombin time
  9. Volume index
  10. Leukemia
- III. Give one method of the following:
  1. Heterophile antibody test
  2. Sedimentation test
  3. Clot retraction time
  4. Coagulation time
  5. Color index
- IV. Outline how you would prepare the following:
  1. Normal sulfuric acid
  2. Nutrient agar from the original constituents
  3. Protein free blood filtrate
  4. Stock agar standard solution
  5. a satisfactory anti-coagulant for blood
- V. 1. Show by diagram the blood groups according to the Moss, Jansky, and International classifications.  
2. Give one method for cross-matching of blood.
- VI. List the procedures ordinarily included in the following examinations: 1. Gastric analysis 2. Complete examination of the spinal fluid.
- VII. Give the technique of the following:
  1. Quantitative examination for sugar in the urine
  2. Test for occult blood in the urine

VIII. Make a sketch of the following urinary constituents:

1. Pus cells
  2. Three types of epithelial cells
  3. Red blood cells
  4. Two types of casts
  5. Two types of urinary crystals
- IX. Name three tests of kidney function and give the technique for one.
- X. 1. Make a drawing of 5 types of intestinal parasitic ova.  
2. Give one method for concentration of ova.
- XI. On what type of cultural media should the following organisms be grown to obtain the best growth?
1. *Diplococcus pneumoniae*
  2. *Brucella mellitensis*
  3. *Mycobacterium tuberculosis*
  4. *Salmonella paratyphi*
  5. *Staph aureus*

Registry Exam      October 1937

Practical:

1. Do an icterus index. Titrate acid for normality with methyl red.
2. Do a quantitative urine sugar and quantitative albumin.
3. Do 2 urines albumin, sugar, and sediment.
4. Identify 4 GC smears and diagnose.  
Identify organisms on plates: (EMB or Endo) typhoid or coli.  
Hemolytic strept and viridans on blood agar.
5. Do a Neufeld typing.
6. Inoculate medias. Make smear, stain by grams and identify organisms.  
(Gram negative rods and staph)
7. Inoculate rabbit, guinea, pig, intracutaneously and intravenously.  
Examine G. pig for tb. (glands, liver, spots, etc.)
8. Examine ovaries for positive Friedmans.
9. Give different methods of sterilizing lab apparatus. (pounds pressure, time and temperature for autoclaving)
10. Take blood and count it. Identify cells in normal smear. Abnormal such as leukemia, P.A., with hypo, poik, aniso, micro, macro, etc.
11. Cut a paraffin block, mount and tell how to stain it, or cut and stain a frozen.
12. Do a Kahn, Kline (making up your own emulsion), or write a Kolmer, Wasserman. Read a Kahn or Wasserman.

REGISTRY EXAM    OCTOBER 1937

1. Diagram the ruled area of the counting chamber used to count red and white cells and give dimensions.
2. Give figures for the following:
  - a. Normal RBC
  - b. "        WBC
  - c. "        differential count
  - d. "        amount of HCl in stomach contents
  - e. "        number of leukocytes in spinal fluid.
3. Define the following
  - a. Hypochromic anemia
  - b. Macrocytic anemia
  - c. Leukemia
  - d. Infectious mononucleosis
  - e. Leukopenia
4. How would you prepare the following reagents
  - a. acid alcohol
  - b. physiologic salt solution
  - c. Normal oxalic acid
  - d. Wright's stain
5. List the reagents used in the following tests (do not give technique)
  - a. blood sugar
  - b. Gastric analysis (chemical)
  - c. Mastic test *esp. - human callus gold* *(Mastic test with alk. solution)*
  - d. acetone in urine
  - e. Wasserman test
6. Give the technique for Friedman's test for pregnancy
7. Give the technique for preparing a frozen section of tissue for microscopic examination.
8. Give the technique for the following:
  - a. Agglutination test for undulant fever
  - b. Kahn test for syphilis
9. Give the techniques for:
  - a. typing blood
  - b. cross matching bloodshow with drawings
  - a. a compatible test
  - b. agglutination of cells
  - c. Rouleaux formation
10. Give the reaction to gram's stain, suitable culture media for growth, and one cultural characteristic for the following organisms:
  - a. pneumococcus
  - b. E. typhi
  - c. Corynebacterium diphtheria
  - d. Neisseria intracellularis
  - e. Escherichia coli

REGISTRY EXAMINATION OCTOBER 1936

1. Urinalysis: Describe a) a recognized quantitative test for the determination of urine sugar  
b) a recognized quantitative test for urine albumin.  
describe 5 pathological elements which may be found in micro. exam.
2. Clinical: How would you differentiate between: a) B.coli b) B.typhosis, c) B paratyphosis A, d) B.paratyphosis B. What are the cultural characteristics of the diphtheria bacilli? What morphological and staining characteristics are of importance in their identification?
3. Hematology: Give a procedure for counting blood platelets. What is meant by clot retraction time, and how is it determined? Suppose you were in a house and have forgotten white blood cell pipette. State how you could use the RBC pipette to do a leukocyte count and give your computation in detail.
4. Serology: Give the details involved in the conducting of pre-transfusion tests for: a) determination of the blood group  
b) cross agglutination of compatibility (Use International Landsteiner nomenclature either alone or in addition to any one of the numeral nomenclatures)  
Name the controls used in the Comp-fixation test for syphilis. (Wass)
5. Blood chemistry: Name the non-protein constituents of the blood.
6. Tissue technique: Name two standard staining methods for tissues.

APRIL 1937

1. Describe the preparation of 2/3 N H<sub>2</sub>SO<sub>4</sub> and N/10 NaOH
2. Classify the blood groups according to the Moss, Jansky, and the International systems.
3. A. Give four methods of determining hemoglobin. Give the technique for the acid hematin test.  
B. What is the routine dilution of blood cells in the red and white Pipettes?  
C. What is the measurement of the smallest division of the ruled area in the counting chamber?
4. Define: heterophile antibody test, fragility test, icterus index, myeloblast, neutropenia, volume index, sedimentation test, thrombopenia, leukemia, polycythemia.
5. a. Give a technique for the PSP test or a concentration & dilution test for urinary function.  
b. Name four conditions which may cause cloudiness of the urine, and explain how to demonstrate them.
6. Give the normal figures for: blood sugar, non-protein nitrogen, uric acid creatinine; in urine, urea nitrogen; blood chlorides, blood creatinine, cholesterol.
7. Give the technique for glucose tolerance test.
8. Name the organisms used in the serum agglutination tests for: undulant fever, typhus fever, typhoid fever.
9. List procedures used in diagnosing Tubercle bacilli. How would you differentiate pneumococci?
10. Describe the Widal reaction.
11. Define: antigen, antibody, amboceptor, Give a method of obtaining each without reference to the Wasserman test.

REGISTRY EXAM OCTOBER 26, 1935

1. Describe briefly and systematically the nature of laboratory work in which the applicant is engaged. Name the divisions of the lab in question, and the general set-up of the laboratory.
2. Name 4 species of laboratory animals commonly used in the clinical lab. Name one important use for each species. Name 5 routes used in animal inoculation.
3. What is the difference between a vaccine and an anti-serum? What type of immunity does each produce?
4. What is meant by hydrogen ion concentration?
5. By what method is blood creatinine usually determined?
6. a. Describe technique used in staining by Grams method. Indicate Gram negative or Gram positive for each of the following:  
B. Coli, N. gonorrhoeae, B. influenzae, and Staph aureus.  
b. Describe the method of preparing suspected tb sputum for G. pig inoculation; for culture.
7. Describe three methods of determining the Hemoglobin content of the blood. State choice of hemoglobinometers.
8. What is meant by: a) Complement fixation test b) Flocculation test  
Give examples of each.
9. In what manner does the technique differ when temporary frozen sections and permanent frozen sections of tissue are prepared?
10. How may the urea content of the urine be determined quantitatively?

PRACTICAL

1. Demonstrate different means of sterilizing laboratory apparatus.
2. Make a subcutaneous injection of 0.1 cc of fluid into a guinea pig.  
Make an intradermal injection.
3. Distinguish between hemolytic and non-hemolytic streptococci in a blood culture.
4. Demonstrate the set-up for a Wasserman, Kahn, or a Kline.
5. Demonstrate the use of a colorimeter.  
(Written)
1. (Given above)

REGISTRY EXAM APRIL 1935

1. What is the Asheim-Zondek test?
2. Distinguish active and passive immunity.
3. Define: a) Trichina  
b) Monilia  
c) Trichomonas  
d) Coccidium  
e) a suspension
4. What is the purpose of the glucose tolerance test? How is it performed?
5. Name and describe 5 cells in an abnormal blood smear.
6. What is anti-human precipitin serum? For what is it used?
7. Describe the detection of acetone in urine.
8. What is the technique involved in typing the pneumococcus in sputum?

REGISTRY EXAMINATION APRIL 1934

1. Describe the laboratory in which the applicant is now employed. a) scope of work b) divisions c) the personnel d) major activities e) research  
In what division of the clinical laboratory has the applicant had special training or experience?
2. Name ten essential parts of the microscope.
3. Name the important excretory organs of the body.
4. Name four standard textbooks in clinical laboratory technic. State preference and reason for choice.
5. Bacteriology: a) describe the technic involved in the diagnosis of Tubercle bacilli in sputum, Gonococci, and diphtheria bacilli in the throat.  
b) name five pathogenic organisms which may be found in the spinal fluid. Describe the examination of the spinal fluid to determine the presence of each. State the different characteristics of each.
6. Hematology: Is blood a fluid or a tissue? Name the constituents of normal blood.
7. Urinalysis: Name and describe five distinctly different types of casts in urine.
8. Serology: For what practical purpose is human blood typing serum used? Describe the general technic?
9. Tissue technic: Name two special staining solutions for tissues and their uses.

APRIL 1936

1. Name six important texts and four manuals, as to clinical lab. methods. Name ten important examples of clinical materials which are frequently submitted to the clinical lab. for examination and tests. (Do not describe technics)
2. Describe the technic of the pregnancy test.
3. (a) How many types of pneumococci are recognized at present?  
(b) Describe the Neufeld reaction used in typing pneumococci.
4. Name five organisms which may be found in spinal fluid from cases of meningitis. Describe the technic used in examining spinal fluid from a case of epidemic meningitis.
5. Describe the technic used in determining the following: color index, volume percent, icterus index, Reticulocyte count, coagulation time.
6. What is the color index if the hemoglobin is 20% and the RBC is 800,000 cells per cu mm? What is the normal ratio of ~~WBCs~~ to RBC in human blood?
7. IN what procedures are the following reagents used? Nessler's, alkaline copper tartrate, 10% sodium tungstate, Folin-phenol reagent. (Dont describe)
8. Describe the qualitative and quantitative tests for albumin.
9. Name the reagents used in the routine staining and mounting of tissue sections and state the purpose involved in transfer of specimen thru each procedure.
10. List materials used in the Wasserman test. On what principle is it based? Name three other laboratory procedures used in the diagnosis of lues.



REGISTRY EXAMINATION October 1934

GENERAL

1. Discuss relationship of clinical lab. technician to the attending physician, patient and directing pathologist in accordance with the code of the Registry.
2. Name the diagnostic or susceptibility tests employed in these diseases: typhoid, leus, tuberculosis, diphtheria, and scarlet fever.
3. Define: hydrophobia, symbiosis, transfusion, monilia, autolysate.
4. Describe by drawing the anatomical relationship of the kidneys, ureters, bladder, and urethra.
5. Name ten well known micro-organisms which may be met in the clinical lab, indicate the comparative morphology of each by drawing. In each, mention the one important differential, cultural, microscopic, or serological characteristic and for each one, a common clinical source.
6. Define: reticulocyte, granulocytopenia, poikilocyte, hemopoeais, fibrinogen.
7. Define: Polyuria, albuminuria, glycosuria, oliguria, anuria.
8. Give the detail involved in conducting the Kahn precipitate test with serum or other precipitate of immunological test for leus.
9. Outline the procedure for preparing N/10 NaOH.
10. Outline the examination of the feces.
11. What organism causes amoebic dysentery and what is the general method involved in demonstrating its presence in the feces.

Practical Examination

1. Identify: Dubosque colorimeter, Hellige colorimeter, hanging drop slide, erlenmeyer flask, Florence flask, test tube of broth, test tube of Loeffler's serum agar, test tube of plain agar, saccharimeter, flask of colloidal gold.
2. Count a white cell count and a red cell count.
3. Identify 5-6 slides of bacteria.
4. Explain reaction of Wasserman.
5. Inject a guinea pig subcutaneously with 1 cc NaCl or watch a guinea pig post and name the organs.
6. Examine urine sediment, and specify the amount of albumin and sugar in a prepared test.
7. Name: centrifuge, autoclave, microtome.

PRACTICAL EXAMINATION for OCTOBER 1933 and APRIL 1934

1. Identify: Van Slyke apparatus, Arnold steam sterilizer, erlenmeyer flask, spectroscope, darkfield outfit, urea nitrogen aeration apparatus, Ostenwald Folin pipette, incubator, and mechanical stage.
2. Run albumin and sugar on urine specimens. Examine 2-3 urine sediments and report findings.
3. Tell how to take and count a white blood count and explain why you calculate as you do. Same for the RBC count. Identify normal WBC in a smear.
4. Read a blood sugar in a colorimeter.
5. Cut a tissue section (choice of paraffin or frozen) Tell how to run a tissue up for a paraffin block. Tell how to stain a paraffin section of frozen.
6. Wasserman or Kline technic.
7. Identify a GC smear, hemolytic strept, staph aureus, staph albus. Transplant a culture.

REGISTRY EXAMINATION MAY 1940 Answer 10 questions

MASTER COPY

I. Fill in the blood values for the normal adult male:

1. Hemoglobin
2. Erythrocytes
3. Leucocytes
4. Neutrophils
5. Stabs (single lobed)
6. Segmented (two or more lobes)
7. Lymphocytes
8. Platelets
9. Color index
10. Reticulocytes

II. Define: leukemia; thrombocytopenia; hyperchlorhydria; achylia gastrica; achlorhydria

What is meant by a shift to the left in a blood neutrophile count?

III. Give normal values for the following in the blood:

1. Sugar in 100 cc.
2. Urea nitrogen in 100 cc.
3. Cholesterol in 100 cc.
4. CO2 combining power of plasma per 100 cc.
5. Serum calcium per 100 cc.

IV. A. In blood pipette--- if drawn to .5 mark and diluting fluid to the 11 mark in the pipette, and the average number of leucocytes per sq. mm. in counting chamber is 19, what is leucocyte count per cu. mm.?

B. Calculate the following in degrees of gastric acidity: 10 cc. of gastric juice are titrated with N/10 NaOH with the following results:  
5 cc Topfer's end point. Free HCl \_\_\_\_\_ degrees  
7.5 cc to phenolphthalein end point Total acid \_\_\_\_\_ degrees

V. A. What are the important examinations made of the feces?  
B. What examinations should be made of cerebrospinal fluid from a case of suspected meningitis?

VI. A. Describe a technique of a urine test for pregnancy.  
B. Describe a test for urobilin in urine.

VII. A. List four laboratory procedures of value in diagnosis of hemolytic anemias.  
B. How may *Trepanema pallidum* be detected in tissue juice?

VIII. A. Make large drawings with labels of the following:  
a) Ova of two intestinal parasites  
b) Two intestinal protozoa

IX. A. Outline the procedures in determination of pneumococcus type of sputum.  
B. Is it possible to differentiate between virulent and non-virulent types of *C. diphtheriae* on basis of morphology, cultural characteristics or animal inoculation? If so, what are the essential differences?

X. 1. How many cc in an ounce?  
2. How many milligrams in 0.105 grams?  
3. How is 70% alcohol made from 90% alcohol? Show method of arriving at answer.  
4. How much diluting fluid is added to 0.5 cc serum to make a 1:200 dilution?  
5. How much NaCl is in a liter of Physiological saline?

XI. Give the reaction of the following organisms to Gram's stain:  
1. E. Coli  
2. Shigella dysenteriae  
3. E. typhosa  
4. Brucella abortus  
5. Neisseria intracellulata  
6. Borrelia Vincenti  
7. C. diphtheriae  
8. Clostridium welchii  
9. Hemophilus pertussis  
10. " influenzae

WRITTEN EXAMINATION

(Maximum time for written examination, 3 hours. Answer ten questions *only*.)

- I. A. 1. Make a large and distinct sketch of the proglottides of the beef and the pork tapeworms and indicate the differentiating points.  
 2. Make a large and distinct sketch of the ovum of each of these parasites.  
 B. 1. Discuss the differentiation of the vegetative forms of *Endamoeba histolytica* and *Endamoeba coli* in the stool.  
 2. Make a large and distinct sketch of the encysted form of each of these parasites.

- II. A. Describe the various steps in preparing chemically clean and sterile glassware.  
 B. Give two reasons for each of the following methods of sterilization:  
 1. Steam sterilization. 4. Chemical sterilization.  
 2. Dry sterilization. 5. Sterilization by boiling in water.  
 3. Fractional sterilization.

- III. Using the data given below concerning a blood examination, calculate the following values:  
 1. Color index. 4. Mean corpuscular volume.  
 2. Volume index. 5. Mean corpuscular hemoglobin.  
 3. Saturation index.

Hemoglobin, per cent	70	Differential count:	
Erythrocytes	3,000,000	Lymphocytes, per cent	30
Cell volume, per cent	38	Monocytes, per cent	10
Leukocytes	5,000	Eosinophil polymorphonuclears, per cent	3
		Neutrophil polymorphonuclears, per cent	57

- IV. Name five of the most important sources of error in each of the following tests: (arrange in the order of their importance)

- |   |                                    |
|---|------------------------------------|
| 1. Kline flocculation test.                           | 4. Erythrocyte sedimentation test. |
| 2. Basal metabolism estimation.                       | 5. Leukocyte count.                |
| 3. Friedman modification of the Aschheim-Zondek test. |                                    |

- V. List the materials necessary in the performance of the following tests:

- |                                   |  |
|-----------------------------------|--|
| 1. Heterophil antibody titration. | 4. Estimation of blood calcium.        |
| 2. Reticulocyte count.            | 5. Measurement of blood clotting time. |
| 3. Lange's colloidal gold test.   |  |

- VI. Name a suitable culture medium for each of the following: (choose ten of the twelve)

- |                                |                                 |
|--------------------------------|---------------------------------|
| 1. Haemophilus influenzae.     | 7. Neisseria gonorrhoeae.       |
| 2. Diplococcus pneumoniae.     | 8. Eberthella typhi.            |
| 3. Mycobacterium tuberculosis. | 9. Corynebacterium diphtheriae. |
| 4. Pasteurella tularensis.     | 10. Shigella dysenteriae.       |
| 5. Neisseria meningitidis.     | 11. Clostridium welchii.        |
| 6. Monilia albicans.           | 12. Mycosis interdigitale.      |

- VII. Define the following terms: (choose ten of the twelve)

- |                   |                           |
|-------------------|---------------------------|
| 1. Sicklemia.     | 7. Scolex.                |
| 2. Inspissate.    | 8. Virus.                 |
| 3. Bacteriophage. | 9. Polychromatophilia.    |
| 4. Amboceptor.    | 10. Granulocytopenia.     |
| 5. Schizont.      | 11. Opsonic index.        |
| 6. Achlorhydria.  | 12. Non-protein nitrogen. |

- VIII. List the various constituents in the following:

- |                                       |                    |
|---------------------------------------|--------------------|
| 1. Hayem's solution.                  | 4. Endo's agar.    |
| 2. Gram's iodine.                     | 5. Zenker's fluid. |
| 3. Benedict's solution (qualitative). |                    |

- IX. Give the normal values for the following: (choose ten of the twelve)

- |                          |   |
|--------------------------|---|
| 1. Bleeding time.        | 7. Blood creatinine.                      |
| 2. Clot retraction time. | 8. Blood uric acid.                       |
| 3. Icterus index.        | 9. Blood CO <sub>2</sub> combining power. |
| 4. Blood protein.        | 10. Reticulocyte count.                   |
| 5. Hematocrit reading.   | 11. Thrombocyte count.                    |
| 6. Blood sugar.          | 12. pH of fasting gastric contents.       |

- X. A. 1. Describe and compare the three common methods of identifying blood types: (Moss, Jansky, and International).  
 2. Give relative frequency of each blood type.  
 B. How would you choose a suitable donor if no typing serum were available and the types of neither donor nor recipient were known?

- XI. A. 1. Describe a method of preparing a vaccine from the pus from a boil.  
 2. Describe two methods of standardizing a vaccine.  
 B. Discuss five important precautions that are necessary in the preparation of a vaccine.

Name of Applicant \_\_\_\_\_

Name of Examiner \_\_\_\_\_ M.D.

PRACTICAL EXAMINATION

*Was unable to appear for Exam.*

Section 1. — BACTERIOLOGY (100%)

- A. Using suitably prepared smears: (50%)\* Grade.....%
  - 1. Identify as far as possible:
    - a. Mycobacterium tuberculosis.
    - b. Micrococcus catarrhalis.
    - c. Corynebacterium diphtheriae.
    - d. Haemophilus influenzae.
    - e. Escherichia coli.
  - 2. Name one bacterium which might be confused with each.
  - 3. Describe a method by which each may be differentiated.
- B. Demonstrate a method for the identification of gas formation in a culture: (20%)\* Grade.....%
  - 1. In fluid medium.
  - 2. In solid medium.
- C. Subculture from a single colony on a solid medium to both fluid and solid media. (30%)\* Grade.....%

Total Grade.....%

Section 2. — HEMATOLOGY (100%)

- A. 1. Demonstrate one method of hemoglobin determination (not the Tallqvist method). (50%)\* Grade.....%
  - 2. Point out five possible sources of error in the method used.
  - 3. Describe means of avoiding each of these sources of error.
- B. Using suitably prepared blood smears: (50%)\* Grade.....%
  - Identify each of the following, and give methods of differentiating:
    - a. A thrombocyte and a malarial parasite.
    - b. A monocyte and a large lymphocyte.
    - c. A normoblast and a small lymphocyte.
    - d. Toxic granulation and basophilic stippling.

Total Grade.....%

Section 3. — SEROLOGY (100%)

- A. 1. Demonstrate in detail one of the following tests: (70%)\* Grade.....%
  - a. Kolmer Wassermann test.
  - b. Kahn test.
  - c. Kline test.
  - d. Mazzini test.
  - e. Hinton test.
  - f. Eagle test.
- 2. Point out five possible sources of error in the test used.
- B. Perform a Widal test. (30%)\* Grade.....%

Total Grade.....%

Section 4. — BIOCHEMISTRY (100%)

- A. Demonstrate the estimation of free and combined hydrochloric acid in a specimen of gastric fluid. (20%)\* Grade.....%
- B. Using a colorimeter, point out four precautions necessary in its use. (40%)\* Grade.....%
- C. Given a fifteen per cent solution (15 grams in 100 cc. of solution) of sulphuric acid: (40%)\* Grade.....%
  - 1. Prepare 100 cc. of 1/10 normal strength solution.
  - 2. Verify the accuracy of this solution by titration with a standard base and suitable indicator. Total Grade.....%

Section 5. — CLINICAL MICROSCOPY AND HISTOLOGIC TECHNIQUE (100%)

- A. Using a microtome knife: (30%)\* Grade.....%
  - 1. Describe a method of sharpening the knife.
  - 2. Point out necessary precautions in the care of a microtome knife.
- B. Using a tissue specimen which is already mounted in a paraffin block: (50%)\* Grade.....%
  - 1. Cut and mount a section on a microscope slide.
  - 2. Point out five possible causes of defective sections.
- C. In a suitable urinary sediment, identify microscopically five different structures. (20%)\* Grade.....%

Total Grade.....%

\* Percentage figure in parenthesis is the maximum grade possible for that part of the examination.

WRITTEN EXAMINATION

(Maximum time for written examination, 3 hours. Answer ten questions *only*.)

I. Give normal values for the following: (10 out of 12)

- |                                    |                                  |
|------------------------------------|----------------------------------|
| 1. Cerebrospinal fluid protein.    | 7. Blood bilirubin.              |
| 2. Blood serum albumin.            | 8. Basal metabolic rate.         |
| 3. Blood phosphatase.              | 9. Blood plasma fibrinogen.      |
| 4. Urine pH.                       | 10. Blood non-protein nitrogen.  |
| 5. Erythrocyte sedimentation rate. | 11. Blood urea nitrogen.         |
| 6. Blood calcium.                  | 12. Cerebrospinal fluid glucose. |

II. Define 10 of the following 12 terms:

- |                      |                          |
|----------------------|--------------------------|
| 1. Trophozoite.      | 7. Torula.               |
| 2. Iso-agglutinin.   | 8. Hapten.               |
| 3. Alkalosis.        | 9. Ketone body.          |
| 4. Helminth.         | 10. Achorion.            |
| 5. Globulin.         | 11. Glycosuria.          |
| 6. Specific gravity. | 12. Bence-Jones protein. |

III. Enumerate the constituents of the following:

1. Tsuchiya's reagent.
2. Zenker's fluid.
3. Giemsa's stain.
4. Lugol's solution.

IV. Differentiate between:

1. Molar and normal solutions.
2. Parasite and saprophyte.
3. Plasma and serum.
4. H and O antigens in the Widal reaction.
5. Volume index and mean corpuscular volume.

V. A. Describe the 2 **most important** sources of error in each of the following tests:

1. Basal metabolism test.
2. Blood urea determination.
3. Sedimentation rate.
4. Blood smear examination for malarial parasites.

B. Describe methods of avoiding each of these sources of error.

VI. A. Outline the Friedman modification of the Aschheim-Zondek test.

B. Enumerate the 5 **most important** precautions in the conduct of this test for the detection of pregnancy.

VII. A. If blood is drawn to the 0.3 mark and diluting fluid to the 101 mark in the erythrocyte diluting pipet and after suitable manipulations the average number of erythrocytes in each of the smallest squares of the counting chamber is 73, what is the erythrocyte count per cubic millimeter? Explain all calculations.

B. Name in the order of their importance the 5 **most important** sources of error in the conduct of an erythrocyte count.

VIII. A. Describe in outline form the urea clearance test.

B. Enumerate the 5 **most important** precautions in the conduct of this test.

IX. Name 5 blood tests which may be conducted on:

- A. Whole blood.
- B. Blood plasma.
- C. Blood serum.

X. A. Describe a routine for the examination of a stool specimen for parasites.

B. Name 5 parasites which may be detected in the stool on gross examination.

C. Name 5 parasites which may be detected in the stool on microscopic examination.

XI. A. Give the reaction of the following organisms to the Gram stain:

- |                                 |                            |
|---------------------------------|----------------------------|
| 1. Clostridium tetani.          | 6. Streptococcus fecalis.  |
| 2. Aerobacter aerogenes.        | 7. Shigella dysenteriae.   |
| 3. Neisseria catarrhalis.       | 8. Brucella abortus.       |
| 4. Hemophilus influenzae.       | 9. Eberthella typhosa.     |
| 5. Corynebacterium diphtheriae. | 10. Salmonella paratyphi-A |

B. Name a suitable culture medium for the cultivation of each of the above bacteria.

MASTER COPY

April, 1943

REGISTRY OF MEDICAL TECHNOLOGISTS  
AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS  
BALL MEMORIAL HOSPITAL  
MUNCIE, INDIANA

Name of Applicant \_\_\_\_\_

Name of Examiner \_\_\_\_\_ M.D.

WRITTEN EXAMINATION

(Maximum time for written examination, 3 hours. Answer ten questions *only*.)

I. A. Make a drawing at least an inch in greatest diameter of each of the following:

1. Endamoeba histolytica (vegetative form)
2. Taenia saginata (proglottid)
3. Trichomonas hominis
4. Ascaris lumbricoides (fertilized ovum)
5. Trichinella spiralis (encysted)

B. In the course of what examination would each of these forms be encountered?

II. Describe in detail a method for the determination of blood prothrombin time.

III. Define the following terms: (choose ten of the twelve)

- |                     |                        |
|---------------------|------------------------|
| 1. Leukemia         | 7. Schizont            |
| 2. Basic solution   | 8. Hydrolysis          |
| 3. Thermostable     | 9. Heterophil antibody |
| 4. Bacteriostatic   | 10. Amboceptor         |
| 5. Antigenic        | 11. Scolex             |
| 6. Molecular weight | 12. Anisocytosis       |

IV. List the apparatus and other materials used in the conduct of TWO of the following procedures:

1. Reticulocyte count
2. Erythrocyte fragility test
3. Heterophil antibody titration

V. Give the normal values for the following: (choose ten of the twelve)

- |                                 |                                 |
|---------------------------------|---------------------------------|
| 1. Serum globulin               | 7. Serum albumin-globulin ratio |
| 2. Serum phosphorus (inorganic) | 8. Blood creatinine             |
| 3. pH of urine                  | 9. Spinal fluid sugar           |
| 4. Erythrocyte diameter         | 10. Spinal fluid cell count     |
| 5. Spinal fluid total protein   | 11. Reticulocyte count          |
| 6. Urine urea                   | 12. Plasma fibrinogen           |

VI. A. How much of a 1 to 20 solution of sodium chloride would you use to make up three liters of a physiological saline solution?

B. How would you prepare a 25 percent solution of ethyl alcohol from 95 percent alcohol? (show calculations)

VII. Express the following values:

1. 325 micrograms in milligrams
2. 7.8 micra in centimeters
3. 4.82 cc. as liters
4. 0.0053 kilogram in grams
5. 0.110 gram in milligrams

VIII. Describe the conduct of a test for the virulence of a culture suspected of being *Corynebacterium diphtheriae*.

IX. Describe in detail the conduct of a basal metabolic rate determination. List the five sources of error which you consider most important, and give the methods of avoiding these errors.

X. Describe in general terms the principles involved in the conduct of each of the following procedures: (choose two of the three)

Example: Carbon dioxide estimation in blood plasma:

Principle: The carbon dioxide content of blood plasma is determined by adding to the plasma a strong acid and creating a partial vacuum to liberate the carbon dioxide gas, which is then measured in cubic centimeters at normal atmospheric pressure. This is recorded in cubic centimeters per 100 cc. of blood plasma.

1. Blood cholesterol determination
2. Blood urea nitrogen determination
3. Total plasma protein determination

XI. Describe in detail a method for the enumeration of blood platelets.

REGISTRY OF MEDICAL TECHNOLOGISTS  
 AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS  
 BALL MEMORIAL HOSPITAL  
 MUNCIE, INDIANA

Name of Applicant \_\_\_\_\_  
 Name of Examiner \_\_\_\_\_ M.D.

PRACTICAL EXAMINATION

Section 1. — BACTERIOLOGY (100%)

- A. Using stained smears: (50%) Grade .....%
1. Identify as far as possible:
    - a. Eberthella typhi
    - b. Clostridium welchii
    - c. Diplococcus pneumoniae
    - d. Neisseria meningitidis
    - e. Corynebacterium diphtheriae
  2. Discuss means of further identification.
- B. Using a sample of feces: (50%) Grade .....%
1. Demonstrate the preparation of suitable cultures for the identification of the presence of bacillary dysentery infection.
  2. Describe the subsequent steps in the identification of the particular strain of dysentery involved. Total Grade .....%

Section 2. — HEMATOLOGY (100%)

- A. 1. Perform an erythrocyte count. (60%) Grade .....%
2. Point out 4 important sources of error and demonstrate methods of eliminating these errors.
- B. Using suitable stained smears, identify each of the following and describe means of differentiation between: (40%) Grade .....%
1. A myelocyte and a monocyte
  2. A small lymphocyte and a normoblast
  3. A malarial parasite and a thrombocyte Total Grade .....%

Section 3. — SEROLOGY (100%)

- A. 1. Demonstrate in detail one of the following tests: (60%) Grade .....%
- |                           |                 |
|---------------------------|-----------------|
| a. Kolmer Wassermann test | d. Mazzini test |
| b. Kahn test              | e. Hinton test  |
| c. Kline test             | f. Eagle test   |
2. Discuss the purpose of each of the technical procedures and the various materials used.
- B. 1. Perform a test for the detection of hemolysins in a sample of blood serum. (40%) Grade .....%
2. Discuss the purpose of such a test. Total Grade .....%

Section 4. — BIOCHEMISTRY (100%)

- A. Using a suitable urine specimen, perform a quantitative estimation of sugar. (50%) Grade .....%
- B. 1. Perform a determination of the icterus index, using a standard colorimeter. (50%) Grade .....%
2. Point out 5 important sources of error in the performance of the test and describe methods of avoiding these errors. Total Grade .....%

Section 5. — CLINICAL MICROSCOPY AND HISTOLOGIC TECHNIC (100%)

- A. Using a tissue specimen embedded in a paraffin block: (70%) Grade .....%
1. Cut and mount a section on a microscope slide
  2. Point out 5 important causes for defective sections and describe methods of avoiding these defects.
- B. 1. Given 4 different cloudy urine specimens, identify the cause of the cloudiness in each case. (30%) Grade .....%
2. Perform a test for the detection of melanuria. Total Grade .....%

*Signat.*

REGISTRY OF MEDICAL TECHNOLOGISTS  
AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS

BALL MEMORIAL HOSPITAL  
MUNCIE, INDIANA

Name of Applicant \_\_\_\_\_

Name of Examiner \_\_\_\_\_, M.D.

## WRITTEN EXAMINATION

(Maximum time for written examination, 3 hours. Answer ten questions *only*.)

- I. Describe the conduct of the phenolsulfonphthalein test of renal function.
- II. List all apparatus and materials used in the conduct of **two** of the following procedures:
- Fractional gastric analysis
  - Estimation of spinal fluid total protein
  - Routine urinalysis
- III. Describe in general terms the principles involved in the conduct of each of the following procedures: (choose **two** of the three)
- Example: Carbon dioxide estimation in blood plasma:
- Principle: The carbon dioxide content of blood plasma is determined by adding to the plasma a strong acid and creating a partial vacuum to liberate the carbon dioxide gas, which is then measured in cubic centimeters at normal atmospheric pressure. This is recorded in cubic centimeters per 100 cc. of blood plasma.
- Blood prothrombin time
  - Urea clearance test
  - Blood sugar estimation
- IV. Describe the hemolytic system used in the complement fixation test and state clearly the functions of the various parts of the system.
- V. Describe the conduct of a glucose tolerance test.
- VI. Describe in detail a frozen section technic for the preparation of a permanent section for histologic examination, starting with the fresh tissue.
- VII. State the reaction to the Gram's stain and a suitable culture medium for each of the following organisms: (choose **ten** of the twelve)
- |                                |                               |
|--------------------------------|-------------------------------|
| 1. Eberthella typhosa          | 7. Neisseria catarrhalis      |
| 2. Brucella abortus            | 8. Pasteurella tularensis     |
| 3. Corynebacterium diphtheriae | 9. Mycobacterium tuberculosis |
| 4. Clostridium welchii         | 10. Bacillus anthracis        |
| 5. Haemophilus pertussis       | 11. Neisseria gonorrhoeae     |
| 6. Escherichia coli            | 12. Salmonella schottmulleri  |
- VIII. Define the following terms: (choose **ten** of the twelve)
- |                         |                        |
|-------------------------|------------------------|
| 1. Thrombocyte          | 7. Anticomplementary   |
| 2. Basal metabolic rate | 8. Ketonuria           |
| 3. Neutropenia          | 9. Felix-Weil reaction |
| 4. Bacteriolysis        | 10. H agglutinin       |
| 5. Alkalosis            | 11. Filariasis         |
| 6. Amylase              | 12. Rh factor          |
- IX. Give the normal values for the following: (choose **ten** of the twelve)
- |   |                              |
|---|------------------------------|
| 1. pH of fasting gastric contents       | 7. Icterus index             |
| 2. Total blood plasma proteins          | 8. Thrombocyte count         |
| 3. Blood carbon dioxide combining power | 9. Blood cell volume percent |
| 4. Clot retraction time                 | 10. Blood cholesterol        |
| 5. Blood uric acid                      | 11. Blood calcium            |
| 6. Blood non-protein nitrogen           | 12. Plasma chlorides         |
- X. A. Name two parasites which may be found:
- in the stool
  - in the blood
  - in the sputum
- B. Make a distinct drawing measuring at least one inch in greatest diameter of the form of each usually found.
- XI. A. If blood is drawn to the 0.4 mark and the diluting fluid to the 11 mark in the leukocyte diluting pipette and the average number of leukocytes in one square millimeter of the counting chamber is 13, what is the total leukocyte count per cubic millimeter of whole blood?
- B. How many grams of sodium chloride are necessary to prepare 346 cc. of a 0.6% solution?



REGISTRY OF MEDICAL TECHNOLOGISTS  
 AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS  
 BALL MEMORIAL HOSPITAL  
 MUNCIE, INDIANA

Name of Applicant \_\_\_\_\_  
 Name of Examiner \_\_\_\_\_, M.D.

PRACTICAL EXAMINATION

Section 1 — BACTERIOLOGY (100%)

- A.** Given a culture medium supporting a growth of *Staphylococcus albus*, and another with a growth of *Escherichia coli*: (40%) Grade.....%
1. Make suitable smears of each and make a Gram's stain of each.
  2. Discuss the reasons for each of the steps of the Gram's stain and point out at least three important sources of error which must be avoided.
- B.** Using properly prepared smears of each: (60%) Grade.....%
1. Identify as far as possible the following:
 

a. <i>Corynebacterium diphtheriae</i>	c. <i>Neisseria gonorrhoeae</i>
b. <i>Mycobacterium tuberculosis</i>	d. <i>Clostridium welchii</i>
  2. Describe further steps in identification of each of the organisms. Total Grade.....%

Section 2 — HEMATOLOGY (100%)

- A.** 1. Perform a leukocyte count. (50%) Grade.....%
2. Point out five important sources of error and describe methods of avoiding these errors.
- B.** 1. Prepare a blood smear and stain it satisfactorily. (50%) Grade.....%
2. Using this stained smear identify four different forms of leukocytes. Total Grade.....%

Section 3 — SEROLOGY (100%)

- A.** 1. Demonstrate in detail one of the following tests: (70%) Grade.....%
- |                           |                 |
|---------------------------|-----------------|
| a. Kolmer Wassermann test | d. Mazzini test |
| b. Kahn test              | e. Hinton test  |
| c. Kline test             | f. Eagle test   |
2. Discuss the purpose of each of the technical procedures and the various materials used.
- B.** 1. Demonstrate a method for the titration of hemagglutinins. (30%) Grade.....%
2. Discuss the use of this procedure in laboratory practice. Total Grade.....%

Section 4 — BIOCHEMISTRY (100%)

- A.** 1. Prepare a Folin-Wu blood filtrate. (40%) Grade.....%
2. Point out four sources of possible error and methods of avoiding.
- B.** 1. Using the above filtrate perform a blood glucose determination. (60%) Grade.....%
2. Point out four important sources of error and methods of avoiding them. Total Grade.....%

Section 5 — CLINICAL MICROSCOPY AND HISTOLOGIC TECHNIC (100%)

- A.** Using a tissue specimen mounted in a paraffin block: (60%) Grade.....%
1. Cut and mount a section on a microscope slide.
  2. Describe five possible reasons for defective sections and methods for avoiding these defects.
- B.** 1. Identify five different structures in a urine sediment. (40%) Grade.....%
2. Perform a test for indican in the urine. Total Grade.....%

REGISTRY OF MEDICAL TECHNOLOGISTS  
AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS  
BALL MEMORIAL HOSPITAL  
MUNCIE, INDIANA

Name of Applicant \_\_\_\_\_  
Name of Examiner \_\_\_\_\_, M.D.

WRITTEN EXAMINATION

(Maximum time for written examination, 3 hours. Answer ten questions *only*.)

1. Describe in detail the performance of a fractional gastric analysis.
2. List all the apparatus and other materials used in the conduct of TWO of the following procedures:
  1. Determination of blood group
  2. Kolmer complement fixation test for syphilis
  3. Blood carbon dioxide combining power
3. List in the order of their importance what you consider the TWO MOST IMPORTANT factors of error in each of the following procedures:
  1. Basal metabolic rate determination
  2. Determination of blood group
  3. Blood sedimentation rate measurement
  4. Phenolsulphonphthalein renal function test
  5. Thrombocyte enumeration
4. Describe a suitable method for the detection of INTRA-blood-group incompatibility (i. e. incompatibility when donor and patient are of the same group).
5. State the normal values for the following: (Choose TEN of the twelve)
  1. Cerebrospinal fluid glucose
  2. Blood hemoglobin (in grams)
  3. Cerebrospinal fluid chlorides (as NaCl)
  4. Urine urobilinogen
  5. Blood clotting time (test tube method)
  6. Erythrocyte sedimentation rate (name method used)
  7. Blood plasma chlorides (as NoCl)
  8. Blood serum bilirubin
  9. Blood serum protein
  10. Blood uric acid
  11. Blood cholesterol
  12. Semen spermatozoa count
6. State chief points of differentiation between:
  1. Blood serum and blood plasma
  2. Taenia solium and Taenia saginata
  3. Bence-Jones protein and albumin in the urine
  4. A megaloblast and a large lymphocyte in a fixed blood smear stained with Wright's stain
  5. Endamoeba histolytica and Endamoeba coli
7. Make a drawing at least an inch in greatest diameter of each of the following: Choose FIVE of the six.
  1. Ascaris lumbricoides (unfertilized ovum)
  2. Trichinella spiralis (cyst)
  3. Trichomonas vaginalis
  4. Necator americanus (ovum)
  5. Enterobius vermicularis (ovum)
  6. Diphyllbothrium latum (proglottis)
8. Describe in general terms the principles involved in the conduct of each of the following procedures: (Choose TWO of the three)
 

**Example:** Carbon dioxide estimation in blood plasma:  
Principle: The carbon dioxide content of blood plasma is determined by adding to the plasma a strong acid and creating a partial vacuum to liberate the carbon dioxide gas, which is then measured in cubic centimeters at normal atmospheric pressure. This is recorded in cubic centimeters per 100 cc of blood plasma.

  1. Bromsulphthalein liver function test
  2. Total plasma proteins
  3. Erythrocyte fragility test
9. Define the following terms: (Choose TEN of the twelve)
  1. Specific gravity
  2. Macrogametocyte
  3. Thrombocytopenia
  4. Ketosis
  5. Diazo reaction
  6. Erythroblastemia
  7. Glycolysis
  8. Heterophile antibody
  9. Isohemagglutinin
  10. Isotonic
  11. Rh factor
  12. Agglutininogen
10. Describe in detail a method for the determination of blood prothrombin time.
11. Given:
  - A. 1.27 liters of 95 per cent ethyl alcohol: What percentage solution would result if enough water were added to make two liters?
  - B. 379 cubic centimeters of a 3.5 per cent solution of sodium chloride in water: How many liters of water will it be necessary to add to obtain an isotonic solution?

REGISTRY OF MEDICAL TECHNOLOGISTS  
AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS  
BALL MEMORIAL HOSPITAL  
MUNCIE, INDIANA

Name of Applicant \_\_\_\_\_  
Name of Examiner \_\_\_\_\_, M.D.

PRACTICAL EXAMINATION

Section 1 — BACTERIOLOGY (100%)

- A. Given a specimen of feces: (50%) Grade.....%
  - 1. Demonstrate the initial steps in making suitable cultures for the identification of possible pathogenic bacteria.
  - 2. Describe subsequent procedures which may be used in the further identification of the resultant cultures.
- B. Using properly prepared stained smears of each: (50%) Grade.....%
  - 1. Identify as far as possible the following:
    - a. Escherichia coli
    - c. Diplococcus pneumoniae
    - b. Corynebacterium diphtheriae
    - d. Neisseria catarrhalis
  - 2. Describe further steps in their identification. Total Grade.....%

Section 2 — HEMATOLOGY (100%)

- A.
  - 1. Perform an erythrocyte count drawing the blood to the 0.7 graduation on the pipette, and showing all calculations. (60%) Grade.....%
  - 2. Describe three important sources of error in the performance of an erythrocyte count and methods of avoiding them.
- B.
  - 1. Make a blood smear and stain it. (40%) Grade.....%
  - 2. Using this stained smear, point out four important requirements in making a suitable smear. Total Grade.....%

Section 3 — SEROLOGY (100%)

- A.
  - 1. Demonstrate in detail one of the following tests: (60%) Grade.....%
    - a. Mazzini
    - c. Kolmer Wasserman
    - e. Eagle
    - b. Kline
    - d. Hinton
    - f. Kahn
  - 2. Describe four important sources of error in the conduct of the test.
- B.
  - 1. Cross-match the blood from two individuals. (40%) Grade.....%
  - 2. Point out the most important sources of error in this procedure. Total Grade.....%

Section 4 — BIOCHEMISTRY (100%)

- A. Given a specimen of cerebrospinal fluid: (50%) Grade.....%
  - 1. Perform a quantitative estimation for glucose.
  - 2. Point out four important sources of error in the performance of this estimation and methods of avoiding each.
- B. Given three specimens of urine collected at 20, 60 and 120 minutes after the dye injection in a phenolsulphonephthalein renal function test, and a statement of the appearance time: (50%) Grade.....%
  - 1. Make the necessary examinations and write out a report of the result of your examination.
  - 2. Use the colorimeter with the standard cup set at 5, and show all calculations. Total Grade.....%

Section 5 — CLINICAL MICROSCOPY AND HISTOLOGIC TECHNIC (100%)

- A. Using a tissue specimen mounted in a paraffin block: (70%) Grade.....%
  - 1. Cut and mount a section on a slide.
  - 2. Point out five possible reasons for defective sections and describe methods of avoiding each defect.
- B. Given a specimen of urine: (30%) Grade.....%
  - 1. Identify five different structures in the centrifuged sediment.
  - 2. Test the specimen for the presence of bile. Total Grade.....%

REGISTRY OF MEDICAL TECHNOLOGISTS  
 AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS  
 BALL MEMORIAL HOSPITAL  
 MUNCIE, INDIANA

Name of Applicant Mrs. Jean Zierke Johnston  
 Name of Examiner G. T. Evans, M.D.

WRITTEN EXAMINATION

(Maximum time for written examination, 3 hours. Answer TEN questions *only*.)

- I. State the normal values for the following: (10 of the 12)
- |  |  |
|--|--|
| 1. Urine pH                            | 7. Blood thrombocytes                    |
| 2. Cerebrospinal fluid protein         | 8. Blood cell volume percent             |
| 3. Blood plasma chlorides              | 9. Blood CO <sub>2</sub> combining power |
| 4. Urine urea                          | 10. Blood potassium                      |
| 5. Total acid in fasting gastric juice | 11. Spermatozoa per cc. of semen         |
| 6. Blood clot retraction time          | 12. Blood non-protein nitrogen           |
- II. Define: (10 of the 12)
- |                  |                     |
|------------------|---------------------|
| 1. Megakaryocyte | 7. Granulocytopenia |
| 2. Erythroblast  | 8. Bacteriolytic    |
| 3. Mycelium      | 9. Molecular weight |
| 4. Protozoan     | 10. Acidosis        |
| 5. Spore         | 11. Scolex          |
| 6. Buffer        | 12. Merozoite       |
- III. Differentiate: (5 of 7)
- |                               |   |
|-------------------------------|---|
| 1. Yeast and mold             | 5. Antigen and antibody   |
| 2. Megaloblast and normoblast | 6. Entamoeba histolytica and Entamoeba coli (encysted forms)                                  |
| 3. Acid and base              | 7. Thrombocyte and Plasmodium malariae (as seen in a blood smear stained with Wright's stain) |
| 4. Parasite and saprophyte    |   |
- IV. A. Express the following values:
- |                                    |  |
|------------------------------------|--|
| 1. 0.6252 liters as milliliters    | 4. 927.612 cubic centimeters as liters |
| 2. 0.00126 grams as micrograms     | 5. 527.23 micra as centimeters         |
| 3. 423.417 micrograms as kilograms |  |
- B. If blood is drawn to the 0.6 mark and the diluting fluid to the 11 mark in a leukocyte diluting pipette, and the average number of leukocytes in one square millimeter of the counting chamber is 23, what is the total leukocyte count per cubic millimeter of whole blood? (Show all calculations)
- V. Describe the principle involved in the conduct of the following procedures: (2 of the 3)
- Bromsulfalein test of liver function
  - Determination of the Rh factor
  - Estimation of carbon dioxide combining power of blood.
- VI. A. Name 2 reagents used in the fixation of tissue for histologic examination, and 3 reagents which may be used for dehydration of tissue.
- B. List the materials necessary for the preparation of a frozen tissue section.
- VII. In the course of the examination of what material are the following most likely to be encountered: (10 of the 12)
- |                                   |                                 |
|-----------------------------------|---------------------------------|
| 1. Negri bodies                   | 7. Necator americanus (larvae)  |
| 2. Trichomonas hominis            | 8. Trichinella spiralis (cysts) |
| 3. Leishman-Donovan bodies        | 9. Ascaris lumbricoides (adult) |
| 4. Leptospira icterohaemorrhagiae | 10. Torula histolytica          |
| 5. Plasmodium falciparum          | 11. Epidermophyton cruris       |
| 6. Actinomyces bovis              | 12. Coccidioides immitis        |
- VIII. A. Name two bacteria which are facultative anaerobes and two which are obligatory anaerobes.
- B. Describe in detail a convenient method for the culture of anaerobic bacteria.
- IX. List all the necessary material used in the conduct of the following: (2 of the 3)
- A complement fixation test for syphilis. (Name the method used)
  - A fractional gastric analysis
  - A blood cholesterol determination
- X. List the two **most important** sources of error in each of the following procedures: (5 of the 7)
- |                                   |                                 |
|-----------------------------------|---------------------------------|
| 1. Preparation of a blood smear   | 4. Reticulocyte count           |
| 2. Blood sedimentation test       | 5. Qualitative urine sugar test |
| 3. Qualitative urine albumin test | 6. Standard Kahn test           |
|                                   | 7. Basal metabolism test        |
- XI. Describe in detail the conduct of a phenolsulphonephthalein test of renal function.

REGISTRY OF MEDICAL TECHNOLOGISTS  
 AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS  
 BALL MEMORIAL HOSPITAL  
 MUNCIE, INDIANA

Name of Applicant -----

Name of Examiner -----, M.D.

## WRITTEN EXAMINATION

(Maximum time for written examination, 3 hours. Answer TEN questions *only*.)

- I. Describe in detail the examination of a specimen of cerebrospinal fluid for the presence of the bacillus of tuberculosis.
- II. Define: (10 of the 12)
- |                    |                       |
|--------------------|-----------------------|
| 1. In vitro        | 7. Normocyte          |
| 2. Normal solution | 8. Macrophage         |
| 3. Isotope         | 9. Ketonuria          |
| 4. Hemopoietic     | 10. Antigen           |
| 5. Nematode        | 11. Anticomplementary |
| 6. Gametocyte      | 12. Precipitin        |
- III. State the normal values of the following: (10 of the 12)
- |  |                                      |
|--|--------------------------------------|
| 1. Free acidity of fasting gastric juice                     | 6. Bleeding time (State method used) |
| 2. Erythrocyte sedimentation rate of men (State method used) | 7. Urine urea                        |
| 3. Fasting blood glucose                                     | 8. Blood nonprotein nitrogen         |
| 4. Blood plasma chlorides (as NaCl)                          | 9. Blood cholesterol                 |
| 5. Cerebrospinal fluid glucose                               | 10. Erythrocyte diameter             |
|  | 11. Blood serum globulin             |
|  | 12. Blood calcium                    |
- IV. Describe in detail the examination of a specimen of feces for the presence of pathogenic bacteria.
- V. A. State the scientific name for each of the following: (5 of the 7)
- |                           |                      |
|---------------------------|----------------------|
| 1. Diphtheria bacillus    | 5. Tubercle bacillus |
| 2. Tetanus bacillus       | 6. Gonococcus        |
| 3. Pertussis bacillus     | 7. Typhoid bacillus  |
| 4. Paratyphoid B bacillus |                      |
- B. Name a suitable culture medium for the growth of each.
- VI. Differentiate: (5 of the 7)
- Rouleaux formation and agglutination of erythrocytes
  - Plasmodium vivax and Plasmodium malariae as found in a blood smear
  - The proglottis of Taenia saginata and Taenia solium
  - Bacteriostatic and bactericidal
  - Bacterium and protozoan
  - Milliequivalent and millimol
  - Hypha and mycelium
- VII. List the apparatus, reagents, and other materials used in the conduct of the following tests: (2 of the 3)
- Fractional gastric analysis
  - Permanent frozen tissue section
  - Kolmer complement fixation test
- VIII. A. State what you consider the MOST IMPORTANT source of error in each of the following laboratory procedures: (5 of the 7)
- |  |  |
|--|--|
| 1. Basal metabolism estimation                 | 5. Aschheim-Zondeck Test (Friedman modification) |
| 2. Phenolsulphonphthalein renal function test  | 6. Glucose tolerance test                        |
| 3. Icterus index estimation                    | 7. Erythrocyte sedimentation rate                |
| 4. Quantitative estimation of albumin in urine |  |
- B. State the means of avoiding each of these sources of error.
- IX. Outline in proper order the various steps in the conduct of the following: (2 of the 3)
- Standard Kahn blood test
  - Erythrocyte fragility estimation
  - Quantitative cerebrospinal fluid protein estimation
- X. Describe in general terms the principles involved in the conduct of the following procedures: (2 of the 3)
- Heterophile antibody reaction
  - Blood typing
  - Urine glucose determination
- XI. A. Express the following values:
- |                                      |   |
|--------------------------------------|---|
| 1. 6752.34 grams as kilograms        | 4. 27 drams as ounces                   |
| 2. 25.75 cubic centimeters as liters | 5. 117° Fahrenheit as degree centigrade |
| 3. 0.0138 kilograms as micrograms    |   |
- B. If 0.3 cubic centimeters of N/20 NaOH is required to adjust the pH of 10 cubic centimeters of culture medium to pH 3.2, how much N/1 NaOH will be required to adjust the pH of 5000 cubic centimeters of the same culture medium to the same pH?
- XII. A. State what you consider the FIVE MOST IMPORTANT rules of ethics which must be observed by the medical technologist in the practice of the profession.
- B. State one reason which renders each of these rules of ethics desirable.

WRITE ON ONE SIDE ONLY

WRITTEN EXAMINATION

(Maximum time for written examination, 3 hours. Answer TEN questions *only*.)

- I. Define: (10 of the 11)
- |                   |                       |
|-------------------|-----------------------|
| 1. Microcyte      | 7. Isoagglutinin      |
| 2. Amorphous      | 8. Aleukemic leukemia |
| 3. Leukocytosis   | 9. Alkalosis          |
| 4. Trophozoite    | 10. Symbiosis         |
| 5. Bacteriostatic | 11. Rh factor         |
| 6. Hemolysin      |                       |
- II. A. Name a parasite that may be found:
- |              |              |
|--------------|--------------|
| 1. In urine  | 4. In blood  |
| 2. In feces  | 5. In muscle |
| 3. In sputum |              |
- B. Give a possible source of infestation in each case.
- III. Give the gram stain reaction and a suitable culture method for each: (5 of the 6)
- |                         |                           |
|-------------------------|---------------------------|
| 1. Actinomyces bovis    | 4. Staphylococcus albus   |
| 2. Shigella dysenteriae | 5. Clostridium welchii    |
| 3. Brucella mellitensis | 6. Neisseria meningitidis |
- IV. Differentiate: (5 of the 6)
- |  |   |
|--|---|
| 1. Endotoxin from exotoxin                         | 4. Molecular weight from atomic weight          |
| 2. Combined from total acidity in gastric contents | 5. Megaloblast from a large lymphocyte          |
| 3. Bence Jones Protein from albumin in urine       | 6. Trichomonas hominis from Chilomastix mesnili |
- V. Describe methods of avoiding each of the following sources of error: (2 of the 3)
1. Leakage of oxygen during the conduct of a basal metabolic test.
  2. Death of the rabbit after injection of urine in a Freidman test.
  3. Hemolysis of blood drawn by needle and syringe.
- VI. Describe in detail the examination of a sample of water for the presence of pathogenic bacteria.
- VII. State the normal values of the following: (10 of the 11)
- |   |                                      |
|---|--------------------------------------|
| 1. Hematocrit                             | 7. pH of urine                       |
| 2. Blood amylase (name method used)       | 8. Blood serum sodium                |
| 3. Blood clotting time (name method used) | 9. Urobilinogen in urine             |
| 4. Blood serum protein                    | 10. Cerebrospinal fluid protein      |
| 5. Hemoglobin (in women)                  | 11. Lymphocytes in blood (in adults) |
| 6. Reticulocyte count (in adults)         |                                      |
- VIII. Make a detailed outline of a suitable requisition form to be sent to the laboratory when a test is required.
- IX. Express the following: (5 of the 6)
- |  |                                   |
|--|-----------------------------------|
| 1. 1.23 kilograms as ounces            | 4. 2.763 centimeters as microns   |
| 2. 37° Centigrade as degree Fahrenheit | 5. 32.45 micrograms as milligrams |
| 3. 124.52 grams as kilograms           | 6. 2.3 meters as inches           |
- X. Make a complete list of all apparatus and reagents used in the conduct of: (2 of the 3)
1. Determination of blood non-protein nitrogen
  2. Erythrocyte fragility test
  3. Fractional gastric analysis
- XI. Describe in general terms the principles involved in the conduct of: (2 of the 3)
- EXAMPLE: Carbon dioxide estimation in blood plasma:
- Principle: The carbon dioxide content of blood plasma is determined by adding to the plasma a strong acid and creating a partial vacuum to liberate the carbon dioxide gas, which is then measured in cubic centimeters at normal atmospheric pressure. This is recorded in cubic centimeters per 100 cc. of blood plasma.
1. Kolmer modification of the Wasserman test
  2. Phenolsulphonaphthalein test for renal function
  3. Glucose tolerance test

REGISTRY OF MEDICAL TECHNOLOGISTS  
 AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS  
 BALL MEMORIAL HOSPITAL  
 MUNCIE, INDIANA

Name of Applicant Miss Olga Leschisin  
 Name of Examiner G. T. Evans, M.D.

REGISTRY EXAMINATION — SECTION I  
 (Maximum time for this paper, 2 hours. Answer TEN questions only.)

1. Define: (5 of the 7)
  1. Histoplasmosis
  2. Serology
  3. Virus
  4. Trematode
  5. Hypertonic solution
  6. Anticomplementary
  7. Merozoite
  
2. Differentiate: (5 of the 7)
  1. Endamoeba coli and Endamoeba histolytica
  2. Borrelia vincentii and Treponema pallidum
  3. Blood plasma and blood serum
  4. Agglutination and precipitation
  5. Solution and suspension
  6. Lymphocyte and lymphoblast
  7. Eberthella typhosa and Escherichia coli
  
3. Describe in outline form the conduct of the Friedman test.
  
4. State the normal values of the following: (5 of the 7)
  1. Erythrocyte sedimentation rate in men (State method used)
  2. Basal metabolic rate in adults
  3. Plasma carbon dioxide combining power in children
  4. Plasma cholesterol esters
  5. Plasma fibrinogen
  6. Serum bilirubin
  7. Blood pH
  
5. Describe in general terms the principles involved in the conduct of: (2 of the 3)
 

Example: Carbon dioxide estimation in blood plasma:

Principle: The carbon dioxide content of blood plasma is determined by adding to the plasma a strong acid and creating a partial vacuum to liberate the carbon dioxide gas, which is then measured in cubic centimeters at normal atmospheric pressure. This is recorded in cubic centimeters per 100cc. of blood plasma.

  1. Quantitative determination of urobilinogen in the urine
  2. Measurement of the prothrombin time
  3. One dose, oral, 100 gram glucose tolerance test (state method used)
  
- 6: Make a complete list of all reagents, apparatus and other materials used in the conduct of the following tests: (2 of the 3)
  1. Blood sugar determination
  2. Routine urinalysis
  3. Bromsulphalein liver function test
  
7. Describe the preparation of a vaccine from a sample of pus.
  
8. Name five parasites that may be found in the stool and make a drawing of each.
  
9. If blood is drawn to the 0.4 mark in the leukocyte diluting pipette, and the average number of leukocytes in one square millimeter of the counting chamber is 17, what is the total leukocyte count per cubic millimeter of whole blood? (Show all calculations)
  
10. List the MOST IMPORTANT source of error in each of the following tests and give a method for avoiding each: (5 of the 6)
  1. Bleeding time measurement
  2. Icterus index
  3. Platelet count
  4. Cerebrospinal fluid glucose determination
  5. Erythrocyte fragility test
  6. Urine specific gravity measurement
  
11. Describe the examination of a specimen of semen and indicate the approximate findings in a normal case.

MASTER COPY

October, 1946

REGISTRY OF MEDICAL TECHNOLOGISTS  
AMERICAN SOCIETY OF CLINICAL PATHOLOGISTS

Name of Applicant

Miss Joyce Elizabeth Lounberg

BALL MEMORIAL HOSPITAL  
MUNCIE, INDIANA

Name of Examiner

G. T. Evans, M.D.

REGISTRY EXAMINATION — SECTION I

(Maximum time for this paper, 2 hours. Answer TEN questions only.)

1. Define: (5 of the 7)
  1. Histoplasmosis
  2. Serology
  3. Virus
  4. Trematode
  5. Hypertonic solution
  6. Anticomplementary
  7. Merozoite
  
2. Differentiate: (5 of the 7)
  1. Endamoeba coli and Endamoeba histolytica
  2. Borrelia vincentii and Treponema pallidum
  3. Blood plasma and blood serum
  4. Agglutination and precipitation
  5. Solution and suspension
  6. Lymphocyte and lymphoblast
  7. Eberthella typhosa and Escherichia coli
  
3. Describe in outline form the conduct of the Friedman test.
  
4. State the normal values of the following: (5 of the 7)
  1. Erythrocyte sedimentation rate in men (State method used)
  2. Basal metabolic rate in adults
  3. Plasma carbon dioxide combining power in children
  4. Plasma cholesterol esters
  5. Plasma fibrinogen
  6. Serum bilirubin
  7. Blood pH
  
5. Describe in general terms the principles involved in the conduct of: (2 of the 3)
 

Example: Carbon dioxide estimation in blood plasma:

Principle: The carbon dioxide content of blood plasma is determined by adding to the plasma a strong acid and creating a partial vacuum to liberate the carbon dioxide gas, which is then measured in cubic centimeters at normal atmospheric pressure. This is recorded in cubic centimeters per 100cc. of blood plasma.

  1. Quantitative determination of urobilinogen in the urine
  2. Measurement of the prothrombin time
  3. One dose, oral, 100 gram glucose tolerance test (state method used)
  
- 6: Make a complete list of all reagents, apparatus and other materials used in the conduct of the following tests: (2 of the 3)
  1. Blood sugar determination
  2. Routine urinalysis
  3. Bromsulphalein liver function test
  
7. Describe the preparation of a vaccine from a sample of pus.
  
8. Name five parasites that may be found in the stool and make a drawing of each.
  
9. If blood is drawn to the 0.4 mark in the leukocyte diluting pipette, and the average number of leukocytes in one square millimeter of the counting chamber is 17, what is the total leukocyte count per cubic millimeter of whole blood? (Show all calculations)
  
10. List the MOST IMPORTANT source of error in each of the following tests and give a method for avoiding each: (5 of the 6)
  1. Bleeding time measurement
  2. Icterus index
  3. Platelet count
  4. Cerebrospinal fluid glucose determination
  5. Erythrocyte fragility test
  6. Urine specific gravity measurement
  
11. Describe the examination of a specimen of semen and indicate the approximate findings in a normal case.