

DEPARTMENT OF MEDICAL LABORATORY TECHNOLOGY

EXAMINATION REVIEW COMMITTEE (ERC)

Policies and Guidelines



2021

November 2014

FOREWORD

The *Examination Review Committee (ERC)* was organized under the direction of the Dean of the Faculty of Applied Medical Sciences in the First semester, AY 2014-2015.

The ERC is thought of as a *collegial body*. It recognizes the shared responsibility amongst the members of the Faculty and Administration in the Department of Medical Laboratory Technology to do their specific roles in the examination process.

The ERC serves primarily to set the *Policies and Guideline (P & G)* for the standardization of the test questions used in the examinations. The ERC upholds academic freedom and professional responsibility of each of the Faculty member to prepare and formulate his / her own questions in the examination.

The examination questions reflect the objectives of the teaching- learning process. The response of the students should impress the outcome of this process, and indicates if the objectives have been achieved.

Along this line of endeavor, there are programs lined up for enrichment and capability enhancement in our academic roles. These undertaking are in cooperation with the Continuing Education Committee, and Accreditation and Quality Assurance Committee.

The ERC wishes to encourage everyone in the Department of Medical Laboratory Technology Department to adapt, support and sustain the P and G of the ERC.

Should in case in the future time that new members will be tasked to be in the ERC, the novel contributions of the ERC 2014-2015 -Ms. Josephine Milan, Dr. Rod Alfonso, Ms Jazzy Pasia and MLT Supervisors, Dr. Bernard C Silvala and Dr. Eram Husain would be recognized and alluded to.

UNIVERSITY OF TABUK
FACULTY OF APPLIED MEDICAL SCIENCE
DEPARTMENT OF MEDICAL LABORATORY SCIENCE

EXAMINATION REVIEW COMMITTEE (ERC)

E-mail: erc1013@gmail.com

POLICIES AND GUIDELINES AY 2020-2021

***Key terms:** ERC – Examination Review Committee; ERC members- composition of ERC referring to the designated chair and members; P & G – policies and guidelines of the ERC; TOS- table of specifications used in the examination; test questions alternatively, exam questions; course- examples Biochemistry, Hematology; subject – particular topic or subject matter within the unit or chapter.*

I. RATIONALE

The Medical Laboratory Department is committed to quality education. The teaching-learning process is indeed an essential component of quality education. One way of measuring this process effectively is evaluation of tests and examinations. Thus, the Examination Review Committee (ERC) is established to set guidelines to standardize the examination procedure. This will also monitor the quality of student assessment process through the use of appropriate evaluative tools that must be suitable for the intended learning outcomes. Moreover, this endeavor is designed in response for the program to be consistent with the National Qualifications Framework to demonstrate quality teaching and program effectiveness.

The ERC is a *collegial body*. The examination procedure is not only the work of the ERC, but that the entire Faculty and Coordinators have their counterpart in the committee functions. Just as well with the Dean, Department Head and Supervisors, the Council, and Year level advisers to render administrative supervision of the examination. Everyone is involved, and is expected to do his/ her counterpart roles in order to make the ERC function effective. The success of the ERC is measured by the attainment of the objectives of the teaching-learning process.

II. COMPOSITION:

Chair: Dr. Marian M. Eusoya

Members: Dr. Ma. Geraldine La Madrid, Mr. Regie Deslate, Dr. Mohamad Fahadullah, Dr. Eram Husain, Dr. Reema Almoitare, Dr. Khloud Almasoudi

Consultant: Dr. Bernard Silvala, Dr. Ruqaiyah Bedaiwi

The above-named composition is applicable within the AY2020-2021.

The term of office of the ERC depends on the designation of the Department Head approved by the Council.

III. TASKS

A. ERC MAIN TASKS

The main task of the ERC is to **qualify and validate the examination** questions, in terms of:

1. agreement vis-à-vis the table of specifications (TOS)

2. conformity to the approved (by the MLT Department) guidelines of the exams, particularly referring to the types of questions, number of items, total marks, cognitive processes of learning (in reference to the TOS), and level of difficulty.
3. structure and construction of the test questions.

(Please see attached sample of TOS)

ERC SPECIFIC TASKS

1. The evaluation of the examination questions in the different courses offered in the current semester is distributed accordingly among the ERC members.
2. The ERC evaluation function will be unbiased. This means, the course handled by the ERC member will be checked by another member.
3. The ERC will review and approve the examination questions if these are found compliant within the established guidelines. Thereafter, the examination questionnaires will be forwarded for final approval by the Supervisor who will endorse the exam for printing.

Please refer to the attached flowchart.

4. The ERC prepares the policies and guidelines (P & G) to be followed in the construction of test questions for the Mid Term and Final examinations.

B. FACULTY and COORDINATORS COUNTERPART TASKS

The counterpart tasks of the Faculty members and Course coordinators consist the following:

1. The Faculty member handling the course will prepare the test questions within the coverage of the CSTF reflected on the table of specifications (TOS).
2. The questions will be initially categorized according to the cognitive processes of learning, such as:
 - Remembering [*Rem*] or knowledge (simple recall)
 - Understanding [*Und*] or comprehension
 - Applying [*Ap*] or application
 - Analyzing [*An*] or analysis
 - Evaluating [*Eval*] or judgment
 - Creating [*Crea*] or synthesis
3. The questions will be initially categorized according to the level of difficulty, such as:
 - Easy (Eas)
 - Moderate (Mod)
 - Difficult (Dif)
4. The faculty member should construct the test questions in correct grammar and structure.
5. The faculty members both in the male and female divisions should coordinate to come up with a unified test questions for the exams. The Faculty Coordinator facilitates this task.

6. The unified examination questions are submitted in soft copy to the ERC (use ERC email address) within the specified period for review and evaluation.

a) The course coordinator in the female division shall take charge of forwarding the unified exam questions to the ERC for the Mid term examination; and the male course coordinator for the Final exams. This coordination is recommended to avoid being remiss about the submission.

7. The Faculty member will print the questionnaires in accordance to the printing guidelines issued by the Department Head.

8. The Faculty assumes responsibility in ensuring the security and confidentiality of the exams (no leakage of questions, no loss of exam papers).

C. DEPARTMENT SUPERVISOR'S (MALE AND FEMALE) TASKS

1. The Department Supervisors will receive the reviewed and approved exam questions from the ERC in soft copy.

2. The Supervisors will approve (stamp) and affix signature to the original copy of the exam questionnaire if its entirety is found meritorious as per Departmental guidelines. Thereafter, the Supervisors will forward the approved questionnaires to the Faculty coordinator for printing .

3. The Supervisors will ensure the availability of printing requirements of exam questions as well as the conditions to ensure the integrity of the examination proceedings.

D. DEPARTMENT SUPERVISOR AND YEAR LEVEL ADVISERS' TASKS

1. To prepare the examination schedule in all year levels, both Theory and Practical.
2. To disseminate the information on the schedule of exams early enough once it is approved. This will be the basis for setting the deadline of submission of exam questions for ERC review.
3. To supervise the conduct of the examination.

E. DEAN, DEPT HEAD, AND COUNCIL FOR MEDICAL TECHNOLOGY'S TASKS

1. To approve the policies and guidelines of the ERC and other policies related thereto, for implementation.
2. To approve the schedules of examinations.
3. To render supervision overall the ERC and its co-participants' functions.

IV. GENERAL GUIDELINES ON THE EXAMINATION QUESTIONS:

A. TABLE OF SPECIFICATIONS (TOS)

1. The TOS is prepared / adapted from the CSTF (Syllabus) of the Course.
2. The learning objectives (at the heading) and the topics within the chapter or unit (on the left side below) should be reflected in the TOS, vis-à-vis the different categories of cognitive learning (on the main matrix).

Please see attached format of TOS.

3. The cognitive processes of learning consist of the following:
 - Remembering [*Rem*] or knowledge (simple recall)

- Understanding [*Und*] or comprehension)
- Applying [*Ap*] or application
- Analyzing [*An*] or analysis
- Evaluating [*Eval*] or judgment
- Creating [*Crea*] or synthesis

The learning objectives in the TOS will be the guide when these cognitive processes are utilized in formulating the questions. Having these in mind, the questions will be diversified, avoiding too many simple recall (too easy exam) or too many analytical (difficult exam).

4. The type and number of the question is classified under each level of cognitive learning (column), specifying its location within the different types of the exam questionnaire.

Example : MCQ #7 under Remembering.

Please see attached format of sample questionnaire.

Note: The bulk of reviewing / qualifying the exam questions rests on the agreement of the questions within the objectives of the Unit/ topics in the unit vis-à-vis the cognitive processes of learning.

B. TYPES OF QUESTIONS in the MIDTERM and FINAL EXAMS

1. The *types of questions* and their *item number distribution* in the Midterm and Final exams are as follows:

TYPES OF QUESTIONS	MIDTERM EXAM	FINAL EXAM
I. Multiple Choice	20- 25	30-35
II. Others: Matching type, True or False, Identification or Fill-in-the Blanks, Enumeration (list down items)	15-20	25-30
III. Essay/ Short notes, Case study, Problem solving with calculations, Illustration	3-5	3-5
TOTAL ITEMS	45- 50	60-70

2. The number of items should be within these ranges of questions given. No less or more than the prescribed numbers of the questions will be formulated.

3. The multiple choice questions (MCQ) can include those of simple recall, understanding, or application of concepts and analysis . The level of difficulty asked in MCQ can range from easy to difficult.

4. The other types of questions in category II can include questions similar to MCQ covering the different levels of cognitive learning and levels of difficulty.

5. The essay questions should invite critical thinking, rationalization, or synthesis or creating concepts, or evaluating such concepts.

C. CATEGORIZING THE QUESTIONS According to LEVELS OF DIFFICULTY

1. The 3 levels of difficulty of the questions, and the distribution of items within each level are as follows:

LEVEL OF DIFFICULTY	% DISTRIBUTION OF ITEMS
1. Easy	35 %
2. Moderate	50%
3. Difficult	15 %
TOTAL	100%

Rationale: *A well-prepared examination consists these three levels of difficulty, to provide a clear separation of the bright students from the average ones; or differentiating those students who prepared themselves well for the exams, from those who did not. The examination cannot be too easy nor too difficult for the students, that is why there is greater bulk for the moderate type of questions. Even if there is subjectivity in initially classifying a question as easy or difficult, still there is merit in taking this guideline in making the test questions.*

This is further supported by the statement “ that the six major categories of cognitive processes starting from the simplest to the most complex can be thought of as degrees of difficulty . That is, the first ones must normally be mastered before the next one can take place.

(Source: <http://www.nwlink.com/~donclark/hrd/bloom.html>)

2. To determine specific number of items based on percent (%) distribution, the following is a guide:

Example: You need to prepare a **total of 25 MCQ** for the Midterms:

Easy – 35% of 25 = $0.35 \times 25 = 8.75$, so, this means you can prepare 8-9 questions in MCQ that are easy.

Moderate – 50 % of 25 = $0.5 \times 25 = 12.5 = 12-13$ questions

Difficult- 15% of 25= $0.15 \times 25 = 3.75 = 3- 4$ questions

Another example: You need to prepare a total of 50 questions for the Mid Terms.

Easy – 35% of 50 = $0.35 \times 50 = 17.5 = 17-18$ questions which can be distributed among MCQs, true or false or matching type, fill-in-the blanks, etc.

Moderate – 50% of 50 = $0.5 \times 50 = 25$ questions

Difficult – 15% of 50 = $0.15 \times 50 = 7.5 = 7-8$ questions

3. The questions categorized according to the level of difficulty are based on the levels of cognitive process , such as:

- Easy (Eas) – covers *Remembering* or *knowledge (simple recall of previously learned information)*.
- Moderate (Mod) – covers *Understanding*, and *Applying* levels of learning
- Difficult (Dif) – covers *Analysis*, *Evaluating* and *Creating* levels of learning

4. The **level of difficulty of each question** is carried, and reflected in the TOS table.

D. COVERAGE OF TOPICS WITHIN THE PERIODICAL EXAM

The CSTF of the course serves as the basis for the coverage of topics to be included in the periodical examination. It is recommended that all the chapters are covered evenly, meaning

questions are formulated representing the major topics within the chapters. Of course, the relevance of the subject matter is also given consideration in formulating the questions.

E. DETERMINING NUMBER OF QUESTIONS UNDER WHAT TOPIC IN THE CHAPTER.

The Faculty members and Coordinator responsible for the course have the option to determine how many questions can be asked under a topic / subject matter depending on relevance and coverage.

F. TEST QUESTION CONSTRUCTION AND FORMULATION

The ERC recognizes the *academic freedom* and *professional responsibility* of every Faculty member to formulate his/ her own questions in the exams. The manner in which the questions are asked depends upon how the lessons were presented during class discussion. Thus, as much as possible, the ERC will try *not* to change the idea of the question during editing. If editing would be necessary, it would only be on the structure or construction of the question. Suggestions are also given how to improve the questions for the better.

The Faculty member should take adequate time to prepare the questions in the exam; the exam is not done overnight prior to the submission date. Plenty of time is needed to review the objectives of the lessons, preparing the TOS, and judiciously formulating and asking the right questions.

General Guidelines:

1. The questions are formulated, guided by the learning objectives specified in the unit/ topics. Refer to the CSTF of the course.
2. The subject (object) being asked about in the question must be definite and clearly described. (This means, is it a substance, a chemical reagent, an event, a phenomenon, a principle, a color, a structure, a particle, a part of the body, a part of the cell, a process, a test method, etc. that is being asked about in the question?).
3. The questions are stated in a definite manner (not as an open-ended question). Otherwise, the student will be guessing what is being asked. Moreover, the student might have a different perspective from the Faculty member about what is needed in the question.
4. The questions are constructed with correct grammar, and stated in a sentence with a complete thought.
5. Questions are stated simply, using simple or common words to drive what is desired in the question. Flowery, complex words should be avoided, unless these are technical terms related to the subject matter.
6. The reading level is appropriate to the understanding of the students. (Consider the English proficiency of the students).
7. Acronyms (examples AST, DNA, CM, CSF) are avoided in stating the question, rather that, the complete words are used and enclose the letters in parenthesis if these are needed to be used quite often in the exam.

8. It is better to express the questions in a positive mood; avoid double negatives because these are confusing.

9. As much as possible, the questions should be formulated freshly per every exam. The recycling of questions given in the past examination is discouraged. However, if a question is deemed important and needs to be asked again, a slight modification should be introduced.

10. **Questions are not lifted / copied verbatim** from the book / presentations or examination reviewers (This practice is called **plagiarism** and a violation of intellectual property rights or breach of copy rights of the owner of the questions or the books). Hence, the questions should be constructed by the **own idea** of the faculty member.

11. A question that is already asked in a previous type (example in MCQ) is not repeated in another type, or elsewhere in the questions (example, in fill in the blanks) .

12. The total points in each type of questions are indicated (enclose in parenthesis).
(See examples below).

13. Directions in the test should be given clearly.
(See the examples below)

Examples:

I. Multiple Choice. (25 points)

Direction: Select the BEST answer from the choices given.

II. Identification. (10 points)

Direction: Name or identify the cell parts being described.

III. True or False. (10 points)

Direction: Write the word TRUE if the statement is correct, or FALSE if it is wrong.

***Note:** True or False questions can be MODIFIED to enhance thinking process, rather than guessing only as true or false.*

The following **tips** are quick references only while the questions are being formulated. The techniques and details of constructing test questions are discussed in a seminar-workshop on Test Construction.

Brief Guidelines in writing Multiple Choice Questions (MCQ):

1. The stem of the question can be in the interrogative form or incomplete statement form, provided, the subject being asked is clearly stated.

2. Ensure that the stem asks a clear question and contain only one main idea.

3. The options or choices should be homogenous, meaning the choices are related to one another. The answer and distracters are all related to the stem of the question. Avoid an unrelated distracter because this becomes obviously not the answer.

4. Only one option / choice should be correct or clearly the best.

5. The choices or options are stated nearly equal in length. A very long statement gives the clue it might be the answer.

6. The number of choices in the MCQ ideally is 4, however 5 choices may be given (A, B, C, D) if so desired. More than 5 choices will only confuse the student.
7. Letter choices/ answers should be given in capital letters (**A, B, C, D**). This is to avoid vagueness / ambiguity with small letters which may appear as “a” or “c”, “b” or “d” when the student writes down the answer.
8. Avoid using “*none of these*” as a choice in MCQ. Because logically, a question with no answer should not be asked. A “none of these” should not be the chosen answer, either.
9. The “ *all of these* or *all of the above*” choice may be given as a last choice (**D**), although this may be used sparingly. When it is used, do not make it always the correct answer.
10. If terms like *never, not, except, least likely or most likely* are used in the stem of the question, these words should be emphasized by italics, capital letters, or bold letters, or underlined. Negative statements should be used sparingly.
11. The options are arranged logically from a content standpoint.
Example, chronological order when numerals are used (such as in values, counts, etc.)
12. To emphasize the stem of the question apart from the choices or options, this may be made darker , or written in bold letters.

Brief Guidelines in Writing True or False Test:

1. True and False questions often invite some form of understanding and analysis of certain concepts. So, the question must be not be formulated like a simple guessing game. It suggested that a modified true or false instead, can be done.
2. Each statement is clearly a true or clearly a false. It can not contain components in the questions that are partly true, and partly false.
3. Exact quantitative (two, three, four) term is better than qualitative (some, few, many).
4. Give a definite instruction to write the words TRUE or FALSE, rather than “T” or “F”, or “/” (check mark) or “x” (wrong mark).
5. Avoid long or complex sentences.
6. Include more false than true statements in any given test and vary the number of false statements from test to test.
7. Avoid the answers coming in a pattern.
Example: True, False, True, False; or True, True, False, False. Or all True or all False.
8. Avoid using specific determiners which usually gives a clue to the answer
Examples: False: all, always, never, every, none, only
True: generally, sometimes, usually, maybe, often

Brief guidelines in writing **Matching Type / Headings**

1. Matching type requires 2 (or more) columns where the items find their match in the choices in column II , (and in additional columns, as the case may be).
2. Headings have choices of 4 to 5 which may consist a set of principles, or body parts or system parts, and the items find their match from the headings above. This is suitable so that grouping of items can be done, rather than the items and choices given in a smorgasbord (mix up).
3. Directions clearly indicate the basis of matching. Indicate also if choices can be used more than once or not.
4. The list of responses should be relatively short
5. Position of matches should be varied. Avoid using patterns.
6. The choices of each matching set should be on one / or the same page of the questionnaire. This means, the choices are not cut and the continuation is in the next page
7. There are more choices / responses than the premises in a single set; not an exact number of choices match with the number of items.
8. The premises are homogeneous as well as the responses and are grouped as one item
9. Capital letters (**A, B, C, D, E** etc.) of the choices are used.

Brief guideline in writing **Fill in the Blanks or Identification.**

1. The question can be in interrogative form (what is ...), or a sentence statement which asks for something in the blank.
2. The question asks for something that is definite.
Example: Molisch test consists of ___ and ___. (This is a vague question).
What are the reagents used in the Molisch test ? ___. ___. (this is more clear).
Or: The chemical reagents used in the Molisch test are ____, ____.
3. The question does not start with a blank. The premise of the question should be given clearly first.
4. Sentences are short to moderately long.
5. Provide enough space to write on the answers.

Guide questions in Writing **Enumeration:**

Enumeration question entails quantitative knowledge of the subject matter. Thus, the question would ask for 3 or more answers.

1. The question asks for definite required answers.
2. This type can be used to ask for a sequence of steps or arranging concepts in correct order. The premise should be made clear.
3. The answers in the enumeration type should not appear elsewhere in the questionnaire, such as in the multiple choices.

Guidelines in Writing Essay Questions

Essay questions invite critical thinking, analysis, ability to judge or evaluate, rationalize, synthesize concepts in a cohesive manner, or apply the principles; these measure the higher cognitive process.

1. The Restricted Response essay question is recommended, because it is more specific, easier to score, and has improved reliability and validity.

2. The essay should not describe a case where it might be too long to read (time constraint), or complicated to be understood by the students. In a case study, break down the questions more simply.

3. Critical words to use: compare, contrast, analyze, evaluate, etc.

The terms of differentiation or discussion must be indicated.

Example: Using a table/ Venn Diagram, compare and contrast mitosis and meiosis in terms of the following:

- a. type of cell where the process occurs
- b. number of cell divisions
- c. number of chromosomes in parent cell and daughter cells.

4. Flow diagram/ flow chart can be used to ask for a process or a series of steps, or a cycle.

5. The number of essay items asked to be answered must be specified;

Example: “Answer the following essay questions”, rather than instructing “answer 3 out of 5 questions”. This ensures the same level of (uniform) evaluation of the students’ capability.

G. ASSIGNING THE POINTS ON THE QUESTIONS, AND EXAM SCORES CONGRUENT WITH THE MARKS.

1. Ideally, the assigned points in the questions consists of :

- a. Objective type = 0.5 to 1 point per item answer or question
- b. Essay type (depending on the question and level of difficulty) = 2 to 5 points per question

2. The total points per type of question in the examination should be reflected enclosed in parenthesis beside the type of test.

- Examples: Test I. MCQ (25 points)
 Test II. True or False (10 points)
 Test III. Essay.
 Q. 1 (2 points)
 Q. 2..... (3 points)

3. Based on the approved Grading System, the equivalent points in the types of questions is easy to match with the required marks.

Example:

Required Marks for Theory in Mid term exam = 20 marks

Total **items** in the Mid Term exam = 50.

Total **points** in the exams = 65

Computation:

Equivalent Mark for Theory in Mid Term = raw score of the student divided by total points of exam, then multiply by 20.

Example: Raw score of student is 58 .

So, $[58 / 65 = 0.892] \times 20 = 17.84$ **marks**.

4. Assigning marks per question rather than points is difficult (and cumbersome), considering that the total marks in the Midterm is 20, while 40 marks for the Finals exams. This means, per objective item would fetch 0.2 or 0.25 mark; essay question would fetch for 1 mark. Thus, the chance for the answer to merit a fraction of a mark for consideration purposes due to inadequate answer would be discounted.

H. EXAMINATION FORMAT:

1. The format or layout of the exam questionnaire adapted by the Department should be uniform, as much as possible.

Please see attached sample of exam.

Note: A column or space on the left of the questions is used as area where to indicate the cognitive levels and levels of difficulty. These are used for the purpose of ERC review only. Before printing the approved questionnaire, these classifications should be deleted. Alternatively, the space can be used by the students to write down their tentative answers, or final answers if so desired.

2. The overall picture of the exam questionnaire should be “light and free”, meaning, it is not congested, or cramped. This affects the mental disposition of the examinee.

3. It is ideal to leave a single space between questions/ numbers.

4. A separate answer sheet may be prepared for the students to write on their answers; or a space for the answers may be provided within the questionnaire itself.

A table for the MCQ gives convenience in checking the answers, however, this can be inconvenient for the student to be turning the pages to and fro while writing down the final answers on the table; moreover, there is always the risk for transcription errors to occur.

5. To acknowledge the authorship of the faculty member who prepared the questions, his / her name / initials can be placed in the footer, or can be written on the bottom part of the last page, such as:

Prepared by: _____ and _____ (being unified) .

6. The phrase “end of exam” is indicated after the last question, on the last page of the questionnaire.
7. Paging of the questionnaire is made, preferably stating the specific page over the total number of pages. Example: “ page 1 of 5”.
8. The official cover page of the University of Tabuk for the examination question will be adapted.

V. ERC REVIEW PROCESS:

1. A flowchart is implemented in the review process.

Please see attached Flowchart.

2. The period of submission, review, returning of approved exam questionnaire and printing is stringently followed.

- a) The period of submission is given by a directive or memorandum by the Dept. Head.
- b) The review period is 8 to 16 working hours after initial sending.
- c) If the questionnaire is returned to the Coordinator for improvement or corrections, the return submission is within 8 working hours.
- d) Reviewed examination papers are relayed to the Supervisors within 16 to 32 working hours after submission by the Course coordinator for review.

3. The exam questions with accompanying TOS are submitted in soft copy to the ERC by either the male or females course coordinator, provided that the counterpart is copy- furnished.

Note: ERC email address : erc2014@gmail.com

4. The ERC review of the exam questionnaire will consider the following:

- a) the questions reflect the learning objectives of the subject matter, in reference to the TOS.
- b) the questions are classified with the categories of cognitive learning and levels of difficulty. (In the questionnaire, these classifications are reflected in a column beside the questions.)
- c) the questions are in varied types (MCQ, matching types, essay, etc...)
- d) the number of questions comply with the directives of the Department
- e) the questions are stated in correct grammar and structure.
- f) the exam questionnaire is in the right format.

5. Editing the question, if necessary, will involve the least possible modification, to ensure that the *real idea* of the question will not be changed. The concerned Faculty member / Course coordinator should feel free to communicate with the ERC (through email) if they feel their concept (in the question) has been changed.

6. A vague question will be referred back to the Course coordinator for reconstruction / correction immediately within the review period. Thereafter, the corrected questionnaire is sent back to the ERC to resume its review of the paper. This process still involves the soft copy of the exam.

7. Reviewed exam questionnaire will be sent in soft copy to the Supervisors within 24 to 32 working hours of the review period.

8. The Supervisor prints a copy of the reviewed questionnaire, affix signature and stamp the approval. Then, the hard copy is given to the Course coordinator for printing in accordance to the printing directive of the Department.

8. Late submission of exam questions (beyond the submission period) is discouraged. In such case, the matter is referred to the Supervisor and Department Head . Unreviewed exam questions will not be endorsed by the Supervisors for printing.

9. In case no questionnaire is submitted, the matter is reported to the Supervisor and Dept. Head.

10. Decking for review of the exam questions will follow the “first come, first serve” basis.

VI. SECURITY OF TEST QUESTIONS and EXAM PAPERS

The integrity and confidentiality of the examination is crucial, and thus it is everybody’s concern.

1. The security of the test questions must be ensured primarily by the ERC during the review period, as well as the Faculty members and Course coordinators during their preparation and printing before the examination, as well as the Supervisors for its endorsement prior to printing.

2. Everyone is enjoined to be vigilant for leakages of test questions during the preparation of examination questions and examination period itself.

3. Examination papers of students are under the utmost care of the Faculty concerned.

VII. CONDUCT OF THE EXAM PROCESS

1. The conduct of the exam will follow the schedules approved by the Dean and Department Head.

2. The Department Supervisors shall supervise the proceedings of the examination as the usual .

VIII. POST EXAMINATION EVALUATION

The post examination review is a means to derive a feedback about the nature of the examination, examination process, the level of difficulty, and this consists a relevant performance indicator of the teaching- learning process.

1. Determine the MEAN of the scores / marks of the students. This will reflect the overall performance of the class in regard to the examination.

2. Determine how many students passed the exams based on the approved minimum passing level of **60%**.

3. Determine how many students got scores in ranges of 5 points in the scores, such as in the example below:

Total points 100.

>95 How many students got these scores...

90-94

85-89

75-79

70-74

65-69

60-64
55-69
50-54
45-49
40-44
35- 39
30-34
Below 30

Example in terms of marks in ranges of 2- 3.

(Example for **Mid term: 20 marks**)

19-20..... How many students got these marks.

16- 18

13-15

10-12

7-9

4-6

1-3

Such data will give an impression if the exam is too easy or too difficult.

4. The examination is reviewed and rationalized in the class. The scores / marks are given to each of the student in a manner that upholds confidentiality and respect.

5. Take note how soon the corrected test papers are shown, discussed and rationalized in class after the exam (number of days after the examination date). This applies following the directive of the Department Head or Supervisors.

6. The checking and scoring of the test papers must be accurate.

7. Post examination evaluation also consists of item analysis and determining discrimination index of the examination. Orientation on these processes is in the program of the ERC.

Post examination review report is submitted to the Supervisors, QA committee (as part of the Course File) and the ERC. These reports will be utilized as basis for Continuing Faculty Development seminars and workshops. It will form part of the Course Report.

X. ATTACHMENTS

1. Sample TOS in the correct format and inclusions.

2. Sample examination questions.

3. ERC flow chart

4. Department Orders or Memoranda in regard to the examination.

Example: new grading system

POLICIES AND GUIDELINES FOR PRACTICAL / LABORATORY EXAMINATIONS

The laboratory exercises of MLT subjects are designed to promote the engagement and interest of students in developing a range of skills, competencies, knowledge, and conceptual understanding relevant to the practice of Medical Technology profession. A well designed and critically planned practical examination is essential not only to assess the knowledge and skills the learners gained during laboratory sessions but also the terminal competencies of the course. A carefully planned practical exam may also test student's ability to integrate lecture content with the laboratory exercises. Therefore, reviewing the practical exam becomes a necessary step to ensure that questions/activities address the knowledge, skills and competencies the teacher would like to assess.

A. TABLE OF SPECIFICATIONS (TOS)

1. The TOS is prepared / adapted from the CSTF (Syllabus) of the Course.
2. Practical Examination should largely gauge the skill developed by the students at different levels of psychomotor domain, hence, examination should contain activities that would measure what the students can do rather than what they know.
3. The learning objectives (at the heading) and the topics/ laboratory exercises covered within the term should be reflected in the TOS vis-à-vis the different categories of knowledge and psychomotor learning processes. The distribution of questions across the categories depends on the nature of the course, hence, not all learning processes will be filled. Refer to the example below.

TOPIC: The Microscope, Specimen Handling, Macroscopic and Microscopic Examination of Stool, Wet Mount and Concentration Techniques									
OBJECTIVES: At the end of the midterm, the student is able to: <ol style="list-style-type: none"> 1. Recognize the parts and function of microscope. 2. Demonstrate the proper handling and processing of stool sample. 3. Describe the macroscopic appearance of stool as to color, consistency, presence of undigested food, blood, odor, and others. 4. Perform NSS and iodine wet mount and other concentration techniques. 									
TOPICS	KNOWLEDGE and CATEGORIES OF PSYCHOMOTOR DOMAIN								TOTAL
	Remembering / Knowledge (Cognitive)	Perception	Set	Guided Response	Mechanism	Complex Response	Adaptation	Origination	
1. Microscope	Stn 1								1
2. Handling and Processing Stool Sample		Stn 2							2
3. Macroscopic Examination of Stool		Stn 3							1
4. Wet Mount Microscopy using NSS and Lugol's			Stn 4				Stn 9		2
5. Microscopic Examination of Stool				Stn 5		Stn 8			2
6. Concentration Techniques					Stn 6	Stn 7		Stn 10	3
TOTAL:	1	2	1	1	1	2	1	1	10

4. The cognitive process remembering/knowledge is included to evaluate the ability of students to integrate some theory concepts. Moreover, certain skills require knowledge. The psychomotor processes of learning consist of the following:

Learning Process	Definition	Illustrative Verbs
Perception	The ability to use sensory cues to guide motor activity. This ranges from sensory stimulation, through cue selection, to translation.	chooses, describes, detects, differentiates, distinguishes, identifies, isolates, relates, selects, separates
Set	Readiness to act. It includes mental, physical, and emotional sets. These three sets are dispositions that predetermine a person's response to different situations (sometimes called mindsets).	begins, displays, explains, moves, proceeds, reacts, responds, snows, starts, volunteers
Guided response	The early stages in learning a complex skill that includes imitation and trial and error. Adequacy of performance is achieved by practicing.	assembles, builds, calibrates, constructs, dismantles, displays, dissects, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches
Mechanism	This is the intermediate stage in learning a complex skill. Learned responses have become habitual and the movements can be performed with some confidence and proficiency.	assembles, builds, calibrates, constructs, dismantles, displays, dissects, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches
Complex or overt response	The skillful performance of motor acts that involve complex movement patterns. Proficiency is indicated by a quick, accurate, and highly coordinated performance, requiring a minimum of energy. This category includes performing without hesitation, and automatic performance. For example, players often utter sounds of satisfaction or expletives as soon as they hit a tennis ball or throw a football, because they can tell by the feel of the act what the result will produce.	assembles, builds, calibrates, constructs, dismantles, displays, dissects, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches
Adaptation	Skills are well developed and the individual can modify movement patterns to fit special requirements.	adapts, alters, changes, rearranges, reorganizes, revises, varies
Origination	Creating new movement patterns to fit a particular situation or specific problem. Learning outcomes emphasize creativity based upon highly developed skills.	arranges, combines, composes, constructs, creates, designs, originates

5. The learning objectives in the TOS will be the guide when knowledge and these psychomotor processes are utilized in formulating the questions. Having these in mind, the questions will be diversified, avoiding too many simple recall (too easy exam) or too many analytical (difficult exam).
6. The type and number of questions is classified under which level of psychomotor learning (column) the question falls, specifying its location within the different stations.
Example: Station 1, Remembering.

±)

PARASITOLOGY PRACTICAL EXAMINATION	
Knowledge	Station 1. Identify the labelled parts of the microscope and give its corresponding function. a) _____ b) _____ c) _____
Perception	Station 2. a) The stool sample is to be transported to Jeddah for further confirmatory testing. Select which of the following stool fixatives is ideal for both concentration and permanent staining. b) If the stool sample contains cystic stage of an amoeba species, how should the fixative be prepared?
Perception	Station 3. a) Describe the macroscopic appearance of the stool sample as to: a.1 color: _____ a.2 consistency: _____ a.3 form: _____ a.4 presence of undigested materials: _____ b) Decide whether the stool specimen should be accepted or rejected. Why? _____
Set	Station 4. Given the materials on the working table, prepare a fecal smear using NSS and Lugol's iodine.
Guided Response	Station 5. Examine the smear that you prepared and report your result on the provided result form.
Mechanism	Station 6. Given the reagents on the table, choose the reagents and demonstrate Zinc sulfate floatation technique.

Note: *The bulk of reviewing / qualifying the exam questions rests on the agreement of the questions within the objectives stated in the CSTF vis-à-vis the psychomotor processes of learning.*

B. TYPES OF QUESTIONS in the MIDTERM and FINAL EXAMS

- The *types of questions* and their *item number distribution* in the Midterm and Final exams are as follows:

TYPES OF QUESTIONS	MIDTERM EXAM	FINAL EXAM
I. Identification (Knowledge) 20%	3 - 4	5 - 6
II. Demonstration / Performance (Psychomotor) 80%	12 - 16	20 - 24
TOTAL ITEMS	15 - 20	25 - 30

- The course coordinator should incorporate performance part with general and specific checklist to measure the learnt skill. For the general checklist, point deduction shall be employed if not followed by the student. Meanwhile, specific checklist should be customized to the skill being measured, but, it is recommended that pre-analytical, analytical, and post-analytical phases should be incorporated

in the checklist.. (please see Appendix A and B respectively).

3. The number of questions should be within these ranges of items. No less or more than the prescribed number of questions will be formulated. Sub-questions are included in counting the number of items.
4. Power point presentation in measuring learnt skill is not allowed. Course coordinators should find alternative resources in case materials needed are not available.
5. While time allotted for each question is arbitrary to the course coordinators, consider that the whole practical exam should be done in 2 hours, therefore, time should be considered in drafting the exam.

VI. ERC REVIEW PROCESS:

1. A flowchart is implemented in the review process. Please see Figure 1.
2. The period of submission, review, returning of approved exam questionnaire and printing is strictly followed.
 - a) The period of submission is given by a directive or memorandum by the Dept. Head.
 - b) The review period is 8 to 16 working hours after initial sending.
 - c) If the questionnaire is returned to the Practical Coordinator for improvement or corrections, the return submission is within 16 working hours.
 - d) Reviewed examination papers are relayed to the Supervisors within 16 to 32 working hours after submission by the Course coordinator for review.
3. The practical exam questions with accompanying TOS are submitted in soft copy to the ERC by either the male or female practical course coordinator, provided that the counterpart is copy-furnished. Below is the proposed submission responsibility:

TERM	THEORY	PRACTICAL
MidTerm	Female	Male
Final	Male	Female

4. Coordinators handling different courses should submit their exams separately for easy tracking and acknowledgement by the assigned ERC reviewer.
5. Files should be sent as WORD document and not PDF. The filename should include the Course code, the course, whether theory or practical exam, the grading period, and if it's TOS or the test questions.

Example: MLT 301ClinChem_MidTerm_theory_TOS

Revisions: REV_1MLT 301ClinChem_MidTerm_theory_TOS

In case of revisions, place the code REV_1 for first revision and so forth. This is for ERC to check if coordinators made changes based on ERC suggestions.

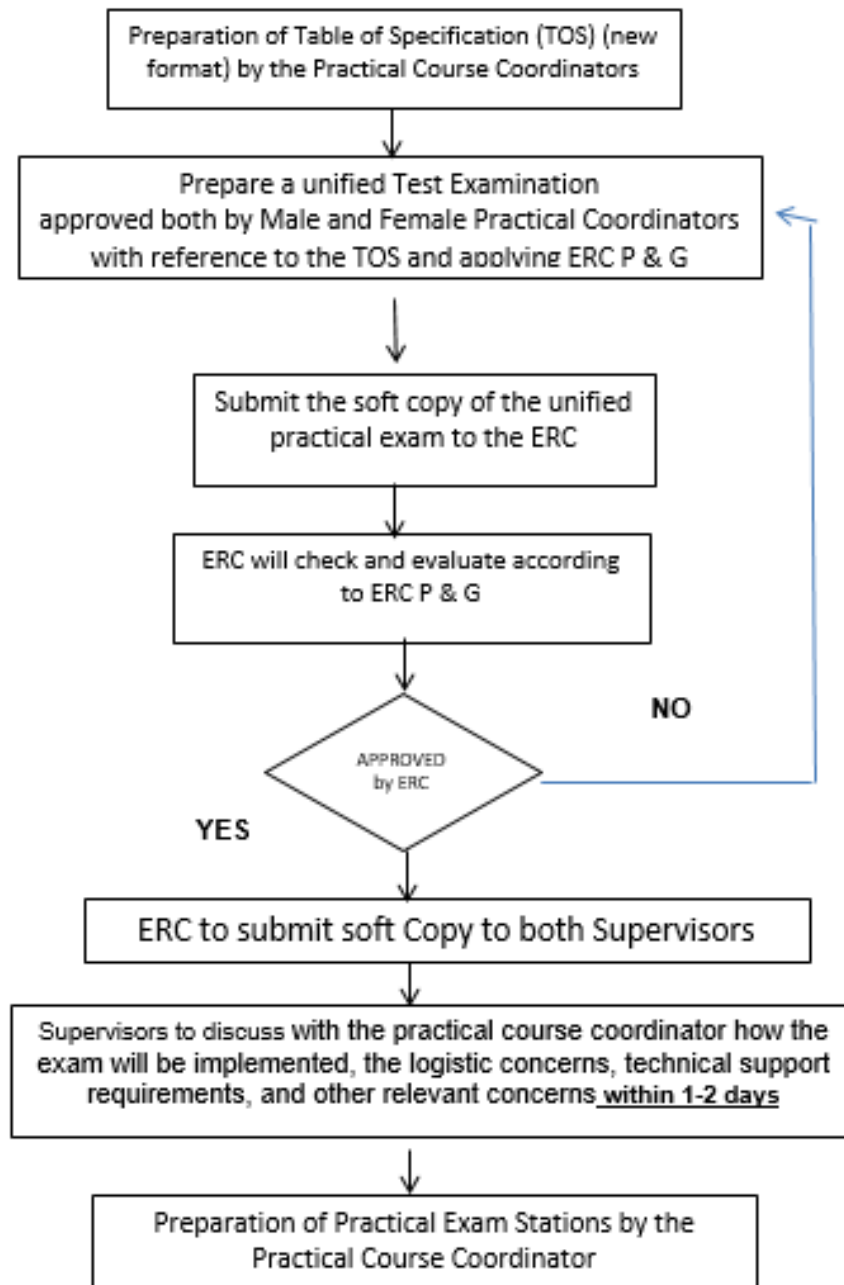


Figure 1. Flow Chart of Practical Exam Review

6. The ERC review of the exam questionnaire will consider the following:
 - a. the questions reflect the learning objectives of the subject matter, in reference to the TOS,
 - b. the questions are classified with the categories of psychomotor learning)
 - c. the number of questions comply with the directives of the Department,
 - d. the questions are stated in correct grammar and structure, and
 - e. the exam questionnaire is in the right format.

7. Editing the question, if necessary, will involve the least possible modification, to ensure that the *real idea* of the question will not be changed. The concerned Practical Course coordinator should feel free to communicate with the ERC (through email) if they feel their concept (in the question) has been changed.

8. A vague question will be referred back to the Practical Course coordinator for reconstruction / correction immediately within the review period. Thereafter, the corrected questionnaire is sent back to the ERC to resume its review of the paper. This process still involves the soft copy of the exam.
9. Reviewed exam questionnaire will be sent in soft copy to the Supervisors within 24 to 32 working hours of the review period.
10. The Supervisor will then discuss with the practical course coordinator how the exam will be implemented, the logistic concerns, technical support requirements, and other relevant concerns.
11. The supervisor prints a copy of the approved questionnaire, affix signature and stamp the approval, only then can the practical course coordinator prepare the stations.
12. Late submission of exam questions (beyond the submission period) is discouraged. In such case, the matter is referred to the Supervisor and Department Head . Unreviewed practical exam questions will not be endorsed to the Supervisors for printing.
13. In case no questionnaire is submitted, the matter is reported to the Supervisor and Dept. Head.
14. Decking for review of the exam questions will follow the “first come, first serve” basis.

Appendix A

General Checklist

For non-compliance of the PPE procedure, 0.2 points will be deducted the student's mark.

General Evaluation

	S 0.2	US 0	Comments
A. Safety Precautions			
1. Personal Protective Equipment (lab coat, gloves, mask, shoes)			
2. Hair tied.			
3. Cleaned the working area.			
4. Disposed used materials appropriately.			
B. Work Rules/Discipline			
1. Work without supervision			
2. Work without disturbing/talking with other students			
3. Work without wasting reagent/materials			
4. Finish work on time			
5. Clean-up the working area after the test			

**Appendix B
Specific Checklist**

URINE ANALYSIS CHECKLIST

	Yes	No
1. WORK RULES /DISCIPLINE (0.5 point each)		
1.1. Work without supervision		
1.2. Work without disturbing/talking with other students		
1.3. Work without wasting reagent/materials		
1.4. Finish work on time		
1.5. Clean-up the working area after the test		
2. PRE-ANALYTICAL (3 points)	Satisfactory	Unsatisfactory
2.1. Collect specimen properly		
2.2. Collect appropriate volume of specimen for the test		
2.3. Label the specimen properly		
3. ANALYTICAL		
3.1. Macroscopic (4 points)		
3.1.1. Describe the color of urine correctly (1 point)		
3.1.2. Describe the transparency of urine correctly (1 point)		
3.1.3. Read the specific gravity correctly (using the urinometer) – 2 points		
3.2. Chemical (long method) 4 points		
3.2.1. Perform protein test using the Heat and HAc test procedure.		
3.2.2. Read the protein result correctly		
3.2.3. Perform sugar test using the Benedict's method procedure.		
3.2.4. Read the sugar test correctly		
3.3. Microscopic (5 points)		
3.3.1. Centrifuge the urine using the correct speed		
3.3.2. Centrifuge the urine following the correct time		
3.3.3. Decant/separate the sediment		
3.3.4. Drop urine sample on the slide		
3.3.5. Cover urine sample with a cover glass/slip appropriately for microscopic examination		

4. POST-ANALYTICAL (4 points)		
4.1. Report macroscopic examinations on the result form correctly		
4.2. Report chemical examinations on the result form correctly		
4.3. Interpret results correctly		
4.3.1. Macroscopic		
4.3.2. Chemical		

Approved Revised Clinical Rotation Tutorial Examination modification

	Type of Question	No. of questions/items	Point/s Earned	Total Points
Midterm				
1	Multiple Choice	40	1 point	40 points
2	Essay	3-5	Assignment of point is variable depending on teacher's discretion	10 points
				Grand Total 50 points
Finals				
	Multiple Choice	50	1 point	50 points
	Essay	3-5	Assignment of point is variable depending on teacher's discretion	10 points
				Grand Total 60 points

Additional guidelines are as follows.

1. Seventy (70) % of the MCQ questions shall be case-based and 30% non-case based; and
2. Essay shall contain higher level questions and no definition of terms.

Approved by the Department Council, 2019

UNIVERSITY OF TABUK
FACULTY OF APPLIED MEDICAL SCIENCE
DEPARTMENT OF MEDICAL LABORATORY TECHNOLOGY

**TABLE OF SPECIFICATION
BLOOD BANKING (MLT 309) – FINAL EXAMINATION**

TOPIC: BLOOD TRANSFUSION PRACTICE, BLOOD COMPONENT PREPARATION AND THERAPY

OBJECTIVES:

At the end of the unit, the student is able to:

1. Indicate the different purposes of transfusion procedures.
2. Describe particular considerations in the preparation of specific blood components.
3. Describe the storage conditions, shelf-life, QC requirements and indications for use of the blood components and plasma products.
4. Validate the use of a component transfusion given a patient case.

TOPICS	CATEGORIES OF COGNITIVE PROCESS (DOMAINS OF LEARNING)						TOTAL
	Remembering / Knowledge	Understanding/ Comprehension	Applying/ Application	Analyzing/ Analysis	Evaluating/ Judgment	Creating/ Synthesis	
1. Indications of blood transfusion	-	MCQ #25					1
2. Methods of blood transfusion	-	T/F #2	MCQ #1				2
3. Preparation of blood components and blood products.	MCQ#7	MCQ #10, 21	T/F #5				4
4. Special treatment of blood components for special cases	Ident. # 3	MCQ#12					2
5. Blood component therapy (Uses of blood components)	MT/ Headings #1,2,3			MCQ 15	MCQ #18	Essay #1	5
TOTAL:	5	5	2	1	1	1	15

Notes:

Required number of items in this chapter/ unit = 15. This is based on the relevance of and coverage of the topics in the Finals period.

Levels of difficulty:

Easy = 35% → $0.35 \times 15 = 5$ items/ questions.

Moderate = 50% → $0.5 \times 15 = 7.5 = 8$ questions

Difficult = 15% → $0.15 \times 15 = 2$ questions

Sample TOS –Table of Specification

UNIVERSITY OF TABUK
FACULTY OF APPLIED MEDICAL SCIENCES
DEPARTMENT OF MEDICAL LABORATORY TECHNOLOGY

TABLE OF SPECIFICATION
URINALYSIS & OBF Clinical Rotation (MLT 409) – MID TERM EXAMINATION NOV 2017

LEARNING OBJECTIVES:

1. Understand the overview of Urinalysis & OBF section in the laboratory
2. Discuss the mechanism of Specimen collection.
- 2) Describe the standard method for urine collection for both males and females
- 4) Describe standard method for Sterile body fluid collection.
- 5) describe the standard safety guideline during dealing with Urine and other body fluid
- 6) Understand specimen acceptability criteria.
- 7) Describe Urine Color, Odor and turbidity

COURSE LEARNING OUTCOMES (CLO):

- 1.
- 2.
- 3.

TOPICS	Objective	CLO Course Learning Outcome	CATEGORIES OF COGNITIVE PROCESS (DOMAINS OF LEARNING)						TOTAL
			Remembering/ Knowledge	Understanding / Comprehension	Applying/ Application	Analyzing/ Analysis	Evaluating Judgment	Creating / Synthesis	
Overview of Urinalysis & OBF Laboratory	#1, #2	#2	MCQ#6	MCQ#7	MCQ#10				3
Laboratory Safety	#3,#4		MCQ#1	TF #2, 3 CLO #2					3
Physical Exam	#6,#7		MCQ#13	MCQ#8, 9,11, 12, 14 TF #1					7
Chemical Examination of Urine	#6		MCQ #3, 4,5, 19 TF #8	MCQ#20 TF #3, 5, 6, 7	TF #9, 10				12
Microscopic, Crystals			MCQ#15, 18 MT # 1,2,3,4,5	MCQ # 2, 16, 17					10
Correlation study on Urine Analysis		#4 #5		Test IV, #1, Q2 #2, Q2, Q3 CLO #4	Test IV, #1, Q3 #2, Q4 #3, Q1, Q4, Q5 CLO#5	Test IV, #1 Q1, #2, Q2 #3, Q2, Q3			12
TOTAL:			15	20	8	4	0	0	47

UNIVERSITY OF TABUK
FACULTY OF APPLIED MEDICAL SCIENCES
DEPARTMENT OF MEDICAL LABORATORY TECHNOLOGY

FINALS EXAM

BLOOD BANKING (MLT 309) –THEORY

GENERAL INSTRUCTIONS:

- Read and understand the questions properly before answering.
- Answer accordingly based on the instructions of the test.
- Write your answers clearly. Avoid erasures especially on letter answers. Keep your paper clean.
- Place the answers on the space provided for. (or answer sheet)

I. MULTIPLE CHOICE : (35 POINTS) (including all other questions). Instruction: Select the BEST answer from the choices given.	
App, Mod	1. In an extreme emergency situation requiring blood transfusion, what blood unit is most appropriate to use ? A. Type AB, Rh (+) whole blood B. Type AB, Rh (-) whole blood C. Type O, Rh (+) red cell concentrate D. Type O, Rh(-) red cell concentrate

Rem, Easy	7. The amount of platelets in a random platelet concentrate is: A. 5.5×10^{10} B. 7.5×10^{10} C. 3×10^{11} D. 5×10^{11}
	...
Und, Mod	10. Which of the following conditions in preparing fresh frozen plasma (FFP) is NOT correct ? A. It is prepared and frozen within 12 hours from a freshly collected whole blood. B. Whole blood is collected for FFP preparation is collected with CPD or CPDA-1 C. It is separated from red cells by heavy spin centrifugation. D. It is has a shelf life of 1 year at minus 18 °C.
	...
Und, Mod	12. To prevent graft-versus-host reaction in an immunocompromised patient, a blood component unit is required to be: A. irradiated B. deglycerolized C. washed with sterile NSS D. leukocyte-reduced
	...
An, Mod	15. Which of the following components would the MLT prepare to treat a patient with hypofibrinogenemia, who is known to be deficient as well with other coagulation factors. A. Fresh frozen plasma B. Cryoprecipitate C. Plasma frozen within 24 hours

	D. Recovered plasma
	...
Eval, Dif	<p>18. A patient suffered massive bleeding due to an accident. The physician ordered initially 8 units of whole blood for transfusion. After a day, he also ordered , FFP and platelets. Rationalize the relevance of blood and blood components required for the transfusion. Which of these are correct ?</p> <ol style="list-style-type: none"> 1. Whole blood units are used to replace massive loss of blood immediately. 2.FFP is required to increase coagulation factors. 3. The platelets are give to enhance hemostasis. 4. FFP are used to expand blood volume. <p>CHOICES:</p> <ol style="list-style-type: none"> A. 1 and 3 B. 2 and 4 C. 1, 2, and 3 D. 1, 2, 3 and 4
	...
Und, Mod	<p>21. Quality control for a unit of red cell concentrate requires a hematocrit of__ to provide the benefit of transfusion.</p> <ol style="list-style-type: none"> A. 30 - 40% B. 50 – 60% C. 70 - 80% D. 85 – 90%
	...
Und, Mod	<p>25. Which of the following are the reasons for blood transfusion ?</p> <ol style="list-style-type: none"> 1. To replace blood loss. 2. To increase the oxygen- carrying capacity of red blood cells. 3. To replace deficient coagulation proteins. 4. To remove toxic components in the blood such as bilirubin or immune complexes. <p>CHOICES:</p> <ol style="list-style-type: none"> A. 1 and 2 B. 3 and 4 C. 1, 2 and 3 D. 1, 2, 3 and 4
	...
II. IDENTIFICATION (5 POINTS) (including all other questions).	
Instruction: Name or identify the thing that is being described.	
	1...
Rem, Eas	3. What is the cryoprotective agent that is used to prepare frozen red cells ?
	...
III. TRUE OR FALSE, MODIFIED (10 POINTS) (including all other questions).	
Instruction: Indicate whether the statement if True or False. For every false statement, pick out the word(s) that make it false.	
	1...
Und, Mod.	2. Autologous blood involves only blood typing and no crossmatch prior to transfusion.
	...
App, Mod	5. A platelet concentrate is stored under constant agitation at 2-8 °C.
	...
IV. MATCHING TYPE: (10 POINTS) (including all other points)	
Instruction: Find the match of the numbered items described below to the appropriate principle given in the headings. Write the letters properly.	

Rem, Easy (3)	<p>Find the match of the blood component to the indications given in the headings.</p> <p>A. Volume expansion B. Treatment of anemia C. Bleeding due to Thrombocytopenia D. Hemophilia A E. Coagulation factors deficiency such as in DIC</p> <p>1. Cryoprecipitate 2. Red cell concentrate 3. Fresh frozen plasma</p>
V. ESSAY. Instruction: Answer the following accordingly.	
Creat, Diff.	1. Given a unit of whole blood, illustrate by means of flow diagram the preparation of red cell concentrate, platelet concentrate, fresh frozen plasma, and cryoprecipitate units. Indicate correct centrifugation process (heavy spin or light spin) as these are is used. (8 POINTS)

Note:

1. The column on the left before the question is used to indicate the cognitive levels and level of difficulty. These are used for the purpose of ERC review only. Before printing of the approved questionnaire, these classifications should be deleted. Alternatively, the space can be used by the students to write down their tentative answers/ or final answers , if so desired.

2. Answer sheets separately prepared may be used, however , if so desired by the Faculty.