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Aligning English Language Courses with Specialized Professions:

Lessons learned from development of an ESP course for Medical Lab Technicians

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Outline

- Needs analysis✔
- Goals and objectives ✔
- Methodology ✔
- Material selection ✔
- Study materials development ✔
- Examples of customized lesson materials and activities ✔
- Assessment (work in progress)

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In one or two words, describe the biggest challenge you face when developing English for Specific Purposes courses

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COURSE CHARACTERISTICS

Name of the course: English language II

Term: spring 2024 (pilot version)

Number of hours: 2 per week

Type of Completion: zk

The TEAM of COURSE DEVELOPERS

Veronika Dvořáčková – Unit 6, chief editor

Tetiana Kibalnikova – Units 3, 4, 9, 10, 12, 13

Katarína Lexová – Units 3, 5, 8, 11, 13

Jana Klapilová – chief graphic designer

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Needs Analysis

– *Different sources:*

a) field guarantor (MUDr. Zdeňka Čermáková, Ph.D.)

b) instructors (MUDr Miroslava Beňovská, doc. MUDr. Milan Dastych, CSc., MBA)

c) students (BLAN 0321)

– *A variety of complementary methods* to gather information for needs analysis (documents analysis, interviews, questionnaires)

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2 lab tours:

1) The University Hospital Brno (January 30, 2023) – MUDr Miroslava Beňovská, doc. MUDr. Milan Dastych, CSc., MBA
2) Masaryk Memorial Cancer Institute (February 7, 2023) – MUDr. Zdeňka Čermáková, Ph.D.

Document analysis:

1) Bachelor's study programmes: Medical Laboratory Technologist (Laboratorní diagnostika ve zdravotnictví), Laboratory Assistant (Zdravotní laborant)
2) CEFR

 - *Are students capable to define their needs effectively?*

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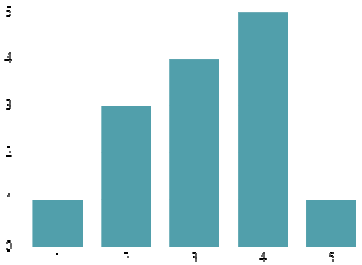
Needs Analysis Questionnaire

BLAN 0312 (14/16 students)

1) How motivated are you to attend the course of English focused on your specialty? (5 stars - very motivated; 1 star - not motivated)

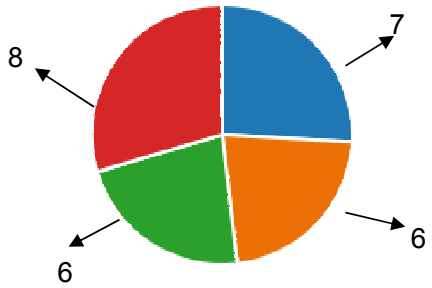
Figure 1



2) What for will you need the knowledge of English for specific purposes (ESP)? You may choose more than 1 option:

- Further education 7
- Work placement in a multinational team 6
- Scientific research 6
- Reading specialized literature for professional development 8
- Other 0

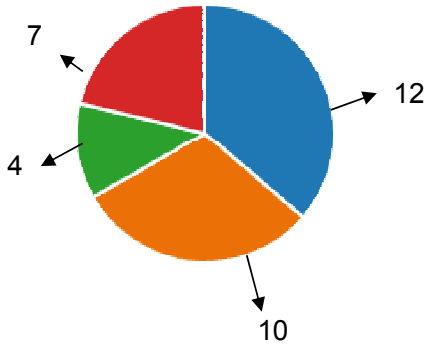
Figure 2



3) What specific language skills would you like to practise in the ESP course? You may choose more than one option

- Speaking 12
- Listening 10
- Reading 4
- Writing 7

Figure 3



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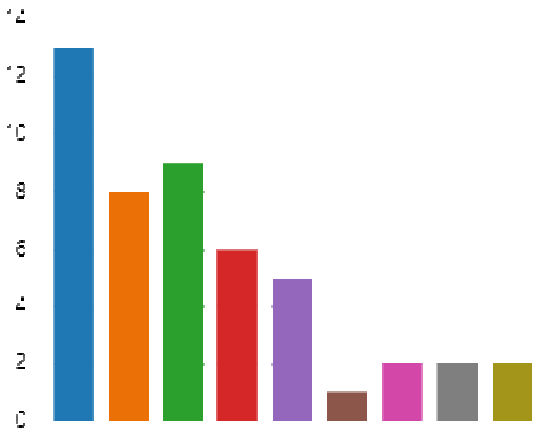
4) Which classroom activities would you prioritize in the ESP course?
You may choose more than one option

- learning specialized vocabulary 13
- reading authentic professional texts 8
- watching authentic videos on professional topics 9
- discussing specialized issues in English 6
- revising grammar and doing exercises 5
- doing problem-solving tasks (e.g. case studies) 1
- role playing professional scenarios 2
- creating posters on professional topics 2
- writing reports on professional topics 2
- other 0

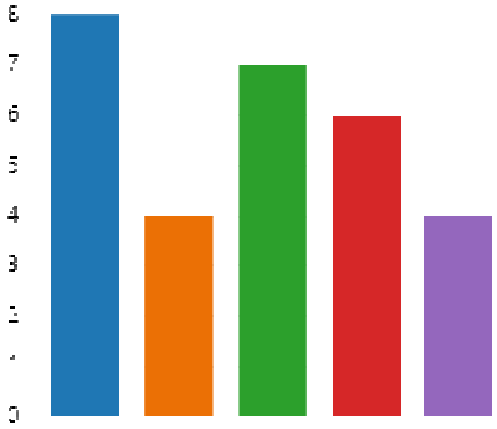
Figure 4



5) Which forms of classroom activities would you prioritise in the ESP course? You may choose more than one option

- pair work 8
- team work 4
- individual work 7
- self-study (assigned home task) 6
- interactive activities (e.g. quizzes, posters…) 4
- other 0

Figure 5



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6) Are there any specific topics or subjects within your field that you would like the English for Specific Purposes course to cover in detail?
Please, list them.

“Microbiology”

“Laboratory”

“Useful vocabulary for lab technicians, for example the methods, instruments etc.”

“All English lessons can be only for our specialization. Not everything for all”

“Special vocabulary”

“Metabolism”……

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New ESP Course Syllabus	Curriculum: *Laboratorní diagnostika ve zdravotnictví, Zdravotní laborant*	CEFR
Unit 3 Medcial Lab Technician Profile		**Reception: -**Can obtain information, ideas and opinions from highly specialised sources within their field.-Can follow the essentials of lectures, talks and reports and other forms of academic/professional presentation which are propositionally and linguistically complex.
Unit 4 Clinical Laboratory and its Automation	Instrument Technology (Year 1)	
Unit 5 Laboratory Safety	First Aid (Year 1), Handling Chemical Substances (Year 1), Hygienic Rules in Laboratories (Year 3)	
Unit 6 Laboratory Biosecurity to the Outside World	First Aid (Year 1), Handling Chemical Substances (Year 1), Public Health Protection (Year 3)	**Production: -**Can give clear, detailed descriptions and presentations on a wide range of subjects related to their field of interest, expanding and supporting ideas with subsidiary points and relevant examples. -Can use appropriate technical terminology when discussing their area of specialisation with other specialists.
Unit 7 Oral Exam Training		
Unit 8 Quality Control, Analytical Errors and their Prevention	Quality Management in Bioanalytical laboratory(Year 3)	
Unit 9 Haematology	Clinical Haematology (Year 2), Immunohaematology and Blood Banking (Year 2)	**Mediation: -** Can interpret and describe reliably (in Language B) detailed information contained in complex diagrams, charts and other visually organised information on topics in their fields of interest. -Can formulate questions and give feedback to encourage people to make connections to previous knowledge and experiences.
Unit 10 Urinary System and Urinalysis	Clinical Biochemistry (Year 2),	
Unit 11 Microbiology	Biochemistry (year 1), Histology (year 1), Molecular and Cellular Biology (Year 1), Techniques of Molecular biology and genetics (Year 1), Medical Microbiology (Year 2, 3)	
Unit 12 Immunology	Clinical Immunology (Year 2, 3)	**Linguistic competence: -**Has a good range of vocabulary for matters connected to their field and most general topics. -Has a good command of simple language structures and some complex grammatical forms, although they tend to use complex structures rigidly with some inaccuracy.
Unit 13 Diagnostic tests	Molecular and Cellular Biology (Year 1), Techniques of Molecular biology and genetics (Year 1) , Clinical Genetics (Year 2), Clinical Biochemistry (Year 2),	

Goals and Objectives of the ESP Course

- to enhance the students' productive (spoken, written), receptive (listening, reading), interactive (spoken, written) and mediative (oral, written) communicative skills at B2 CEFR level
- to develop the students critical thinking through problem-solving activities
- to boost the students' specialized vocabulary to communicate effectively in their job environment
- to foster practical application of language structures and enhance grammar proficiency at B2 CEFR level

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Methodology

Task-based Language Teaching and Content-based Instruction :

- focused on the completion of meaningful tasks
- problem solving
- contextualized language learning
- integration of basic language skills within the context of meaningful tasks

Material Selection

Video:

https://www.ted.com/talks

https://study.com

https://www.labmanager.com/calibration-metrology

https://www.youtube.com/@NPSmedicinewise

Professional articles:

https://www.testing.com/articles/

Medical websites:

https://medlineplus.gov/lab-tests/

https://my.clevelandclinic.org/

https://www.mayoclinic.org/

https://www.healthline.com/health

Chat GPT

Study Materials Development

- A typical unit framework: 4-5 sections organized around a subject-matter topic
- Starter: lead-in discussion session or a set of pictures
- Content: authentic texts, videos, form-focused activities
- Language: specialized target vocabulary and grammar structures
- Task: case studies, role plays, projects (pair / team work)
- Incorporation of scaffolding strategies

- Unit 4

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Customized lesson materials

Unit 4 Clinical Laboratory and its Automation

Specific Objective: to communicate effectively with colleagues regarding laboratory automation, equipment, processes, and technologies.

Lead-in: discussion session about their recent visiting a lab

Activities:
- *watching a video, note taking, relaying*
- *matching definitions*
- *case study*
- *labeling pictures*
- *reading and matching headlines*
- *grammar practice: Passive Voice*
- *gap filling, word formation*

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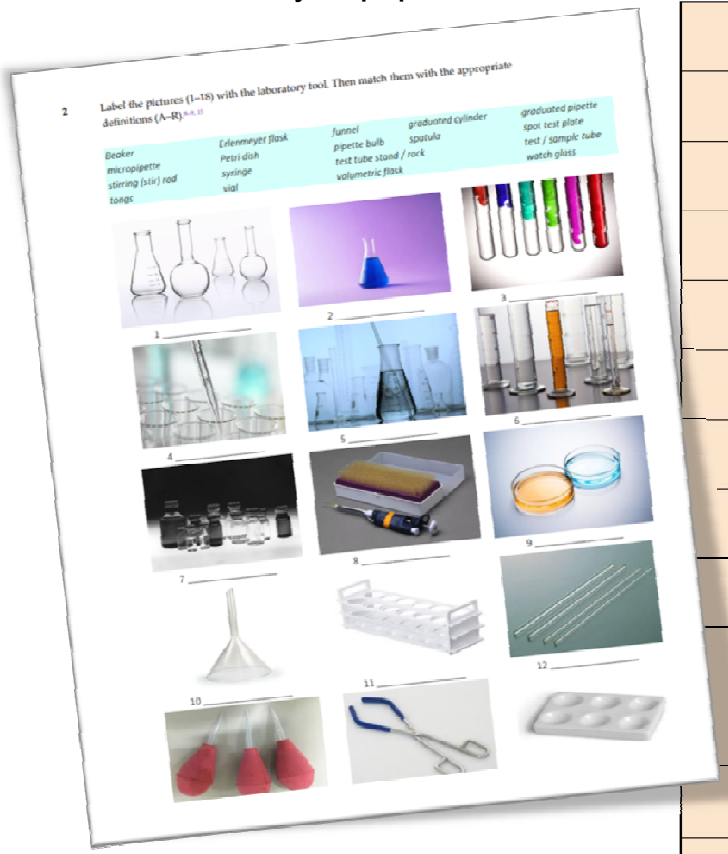
Laboratory Equipment



2 Label the pictures (1–18) with the laboratory tool. Then match them with the appropriate definitions (A–R).

Beaker, micropipette, stirring (stir) rod, tongs, Erlenmeyer flask, Petri dish, syringe, vial, funnel, pipette bulb, test tube stand / rack, graduated cylinder, spatula, volumetric flask, graduated pipette, spot test plate, test / sample tube, watch glass

1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____ 7 _____ 8 _____ 9 _____ 10 _____ 11 _____ 12 _____

	A	a simple reciprocating pump consisting of a plunger (though in modern syringes, it is actually a piston) that fits tightly within a cylindrical tube called a barrel
	B	used to draw a liquid into any type of pipette
	C	a shallow cylindrical dish that has a lid. It is named after its inventor, German bacteriologist.
	D	laboratory instrument used to accurately and precisely transfer volumes of liquid in the microliter range
	E	a simple container for stirring, mixing and heating liquids commonly used in many laboratories. It is generally cylindrical in shape, with a flat bottom.
	F	a small closed or closable glass or plastic vessel or bottle, often used to store medication in the form of liquids, powders, or capsules
	G	a type of laboratory flask with a conical base and cylindrical neck used as reaction vessels, particularly in titrations
	H	a laboratory tool, also called a reaction plate
	I	circular concave piece of glass used as a surface to evaporate a liquid, to hold solids while being weighed, for heating a small amount of substance and as a cover for a beaker
	J	a laboratory instrument calibrated in the factory to release the desired quantity of liquid
	K	used to measure and store solutions with a high degree of accuracy
	L	a piece of laboratory equipment used to mix chemicals and liquids for laboratory purposes
	M	small stainless steel utensils, used for scraping, transferring, or applying powders and paste like chemicals or treatments

3 Automation is key in clinical laboratories. Discuss the following questions with your colleague.

1 What is *lab automation*?
2 What are the main benefits of an automated clinical laboratory?
3 Do you see any limitations of fully automated clinical labs?

1 Lab automation

_____
_____

2 Main benefits

- _____
- _____
- _____

3 Limitations (if any)

- _____
- _____
- _____

subheadings with their respective paragraphs.

A Preventing errors arising from repetitive and laborious tasks or fatigue
B Reducing wasted compounds
C Reducing mistakes in data entry
D Reducing the number of failed tests
E Ensuring results of a reliably high quality

How can automation help prevent human error in laboratory environments?

There are a number of ways that automation can help prevent human error, and ensure patients receive timely and high-quality results.

1 _____
In diagnostic labs, it's crucial that tests are accurate and precise. When tests are regularly incorrect, laboratory quality is impacted. Automation technology does not make mistakes. Automation is as accurate when it conducts the first process, as it does when it conducts its final. It can replicate and reproduce results, processes and instructions far more precisely, and swiftly, than human counterparts.

2 _____
When testing results are inputted manually, human error can lead to incorrect data, the consequences of which are sometimes only discovered when it's far too late to fix. Lab automation software automatically inputs data into reports, reducing the number of errors in manual reporting.

3 _____
When humans make mistakes, expensive compounds and components can be wasted, and that's before the time to clean up, fix and re-perform the process is considered. Full workflow automation can be carefully planned, tested and implemented to ensure valuable compounds aren't unnecessarily wasted.

4 _____
Human error can cause failed tests, whether it's through contamination or incorrectly handling the sample. A high number of failed tests can mean constant re-testing, wasting valuable resources, analyzing failures and finding solutions. Automation can reduce failed test numbers thanks to its ability to repeatedly reproduce results precisely. With early diagnosis critical to patient care, automation can prevent patients experiencing unnecessary delays to their diagnosis.

5 _____
Errors often happen in lab testing, because humans aren't designed to conduct laborious and repetitive tasks, such as

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Grammar Practice: Passive Voice

UNIT 04 CLINICAL LABORATORY AND ITS AUTOMATION

C GRAMMAR POINT – PASSIVE VOICE

The passive voice is often used in scientific writing, including laboratory automation, because it emphasizes the action being performed rather than the person or entity performing it. In laboratory automation, it is often important to focus on the action being taken by the instrument or system rather than the person who is operating it.

Present simple	am/is/are + done	*The lab automation **is made up** of various components.*
Past simple	was/were + done	*Then the tubes **were put** into a refrigerator.*
Future simple	will be + done	*The amount of time to produce the lab results **will be reduced**.*
Present continuous	am/is/are + being done	*The sample **is being centrifuged** now.*
Past continuous	was/were + being done	*The sample **was being put** on the line when suddenly the machine stopped working.*
Present perfect	have/has + been + done	*Error rates in labs **have been reduced** due to automation.*

Paraphrase the following sentences using the passive voice where possible.

1 People drop a lot of different samples off via the hatch in the lab.

2 First of all, the analyzer will read a barcode on the sample tube.

3 After the analyzer has centrifuged the samples, it will take off the lids and the samples will go to another analyzer.

4 The main track took the sample to the analyzer to do the correct test.

5 The lab automation was processing the samples when it suddenly stopped due to a power outage.

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Unit 5 Safety Control

Specific Objective: to acquire and use a range of specialized vocabulary and grammar structures relevant to safety communication.

Lead-in: Which everyday situations pose risks for people and why?

Activities:
- designing a concept map based on a text
- interpreting diagrams (mediation)
- synonym discrimination exercise *(risk vs hazard)*
- *gapfill*
- *video (2)*

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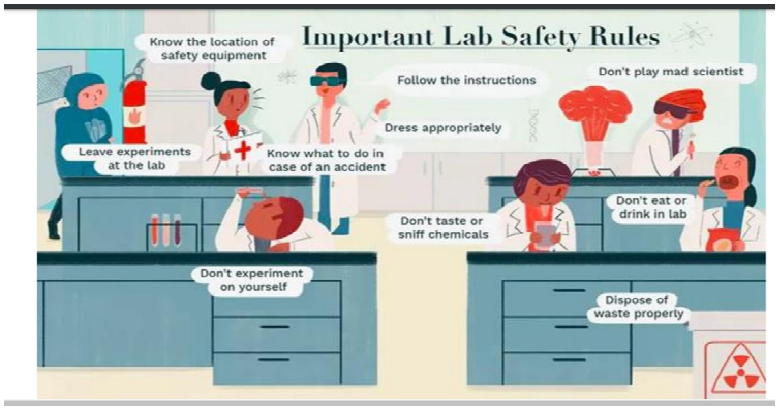
3 Something is not right in this lab. The breaking of lab safety rules is shown in the following picture. The names of the rules have been deleted from the bubbles. Can you formulate the rules?

Key:



Follow-up Reading activity:

The rules formulated in the bubbles are briefly defined in the following text. Match the description with the rule identified in the picture:

1 _____

Whether it's listening to your lab supervisor or following a procedure in a book, it's critical to listen, pay attention, and be familiar with all the steps, from start to finish. Know how to use all of the lab equipment before you begin.

2 _____

In the event something goes wrong, it's important to know where to find the safety equipment and how to use it. The equipment should be periodically checked to make sure it is in working order.

3 _____

Your clothing is one of your best forms of protection against an accident. For any science lab, wear covered shoes, long trousers, and keep your hair up so it can't fall into your experiment. Make sure you wear protective gear, as needed. Basics include a lab coat and safety goggles. You may also need gloves, and other items, depending on the nature of the experiment.

4 _____

Save your snacking for the office, not the lab. Don't store your food or beverages in the same refrigerator that contains experiments, chemicals, or cultures. Main risks are:

- risk of food contamination
- risk of spilling your drink on laboratory specimens and equipment, which could damage your colleagues' work
- risk distracting your laboratory colleagues and disrupting their work focus
- a risk of accidentally poisoning yourself if you mistake your drink for a laboratory-tested liquid

5 _____

Tasting or smelling some chemicals can be dangerous or even deadly. The best way to know what's in a container is to label it, so get in the habit of making a label for glassware before adding the chemical.

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UNIT 05 SAFETY CONTROL

C PERSONAL PROTECTIVE EQUIPMENT (PPE)

Understanding the hazards present in a laboratory environment is crucial to ensuring the safety of individuals working in the space. To reduce these risks, personal protective equipment (PPE) must be utilized. By wearing the appropriate PPE, laboratory workers can protect themselves from exposure to harmful substances and prevent accidents from occurring. Failure to put on proper PPE endangers not just yourself but also your workplace and the people around you.

1 Watch a video extract, which illustrates the necessity to use PPEs in a lab. **Name the PPEs items and describe how they are used.**[5]

Proper use and disposal of PPE is crucial in ensuring laboratory safety. While PPE provides protection against hazardous materials, it must be disposed of appropriately to prevent further contamination and minimize risk.

2 The following sentences describe the steps you need to take to put on sterile gloves and remove contaminated ones. Arrange the sentences in chronological order. There are four sentences related to donning of the gloves and five sentences related to doffing them.[1]

- **A** Adjust the gloves to fit your hands snugly, making sure that each finger is in the correct position.
- **B** Dispose of the gloves in an appropriate container.
- **C** Hold the gloves by the folded cuffs and pull them onto your hands, being careful not to touch anything other than the gloves themselves
- **D** Open the sterile glove package and remove the inner wrap without touching the gloves inside.
- **E** Peel the second glove off over the first glove, turning it inside out as you remove it. The removed gloves should now be contained within the glove you are still wearing.
- **F** Perform hand hygiene with soap and water or an alcohol-based hand sanitizer.
- **G** Slide your ungloved fingers under the cuff of the remaining glove, being careful not to touch the outside of the glove.
- **H** Wash your hands thoroughly with soap and water before you start.
- **I** With one hand, grasp the outside of the glove at the wrist and gently pull it away from your body, turning it inside out as you remove it. Hold the removed glove in your gloved hand.

Putting on sterile gloves: 1 __, 2 __, 3 __, 4__

Removing them: 1 __, 2 __, 3 __, 4__, 5 __

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Grammar Practice: Modals (prohibition, permission, obligation, rules, regulations and prevention)

E GRAMMAR POINT (RULES, REGULATIONS AND PREVENTION)

1 What language would you use to ensure effective communication concerning rules and regulation? Discuss with your colleague.

Medical lab technicians must follow strict rules and regulations to ensure the accuracy and safety of the testing procedures they perform. To effectively communicate, lab technicians may use verbs and modals to express **prohibition, permission, obligation, rules and regulations, and prevention**.

Prohibition	to prohibit /not allow/must not	*Lab technicians **are strictly prohibited from** working with biohazardous materials without the proper protective equipment, such as gloves, goggles, and lab coats.*
Obligation	to be responsible/obligated/to require/to maintain/should/have to	*Lab technicians **are obligated to** report any injuries or incidents that occur in the lab to their supervisor immediately.*
Permission	to permit/can/could/may/may access/to allow/	*With permission from their supervisor, lab technicians **may work** outside of regular business hours to complete urgent testing orders.*
Rules and regulations	must	*Lab technicians **must follow** all established safety rules and regulations when handling, storing, and disposing of biohazardous waste.*
Prevention	prevent/can prevent/can minimize	*Proper maintenance and calibration of lab equipment **can prevent** errors and ensure accurate testing results.*

UNIT 05 SAFETY CONTROL

2 Complete the sentences by selecting a red verb from the box. You may need to change the form of the verb. There is always one verb per line.[1]

1 It is strictly _____ to use cell phones or electronic devices in the lab, as they may interfere with sensitive equipment or contaminate samples.

2 Regular hand-washing and the use of hand sanitizer _____ _____ the spread of infectious diseases in the lab.

3 In the event of a chemical spill or exposure to biohazardous materials, lab personnel _____ _____ established protocols for decontamination.

4 Lab personnel _____ document all testing procedures and results to ensure proper record keeping.

5 Lab technicians are _____ _____ strict following of all established protocols and procedures for handling and disposing of hazardous materials.

6 Unauthorized personnel are _____ _____ to operate any lab equipment or perform any testing procedures.

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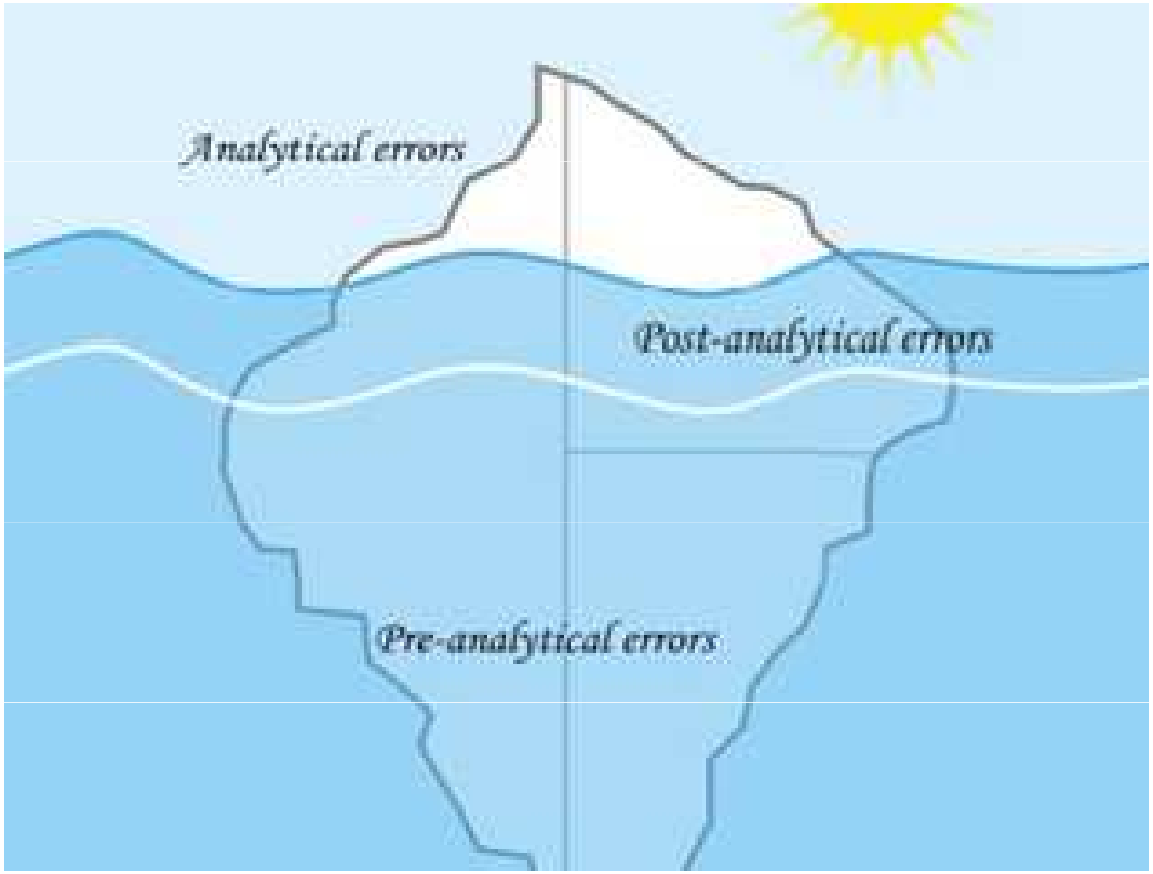
Unit 8 Quality Control, Analytical Errors and their Prevention



Specific Objective: to proficiently implement quality control measures, identify various types of analytical errors and implement preventive measures demonstrating mastery of relevant vocabulary and language structures with an emphasis on language of speculation

Lead-in: discussion session about QC in a medical lab

Activities:

- *matching definitions*
- *sentence completion*
- *interpreting the information in the cartoon and a diagram*
- *complementing a concept map*
- *note taking (listening)*
- *sorting / categorizing terminology*
- *reading and gap filling*
- *sequencing paragraphs in the case report*
- *text relaying (group work)*

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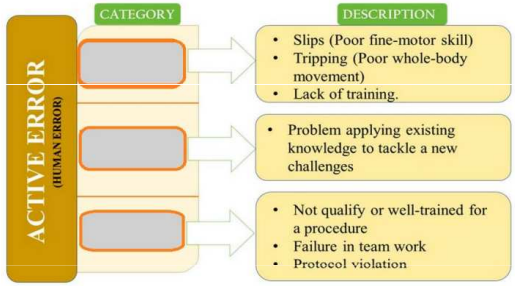
One of the most common pre-analytical errors is caused by mistakes made at the collection of samples. In this video you are going to look at seven most common mistakes made by phlebotomists. Write down the mistakes and their consequences.[16]

MISTAKE	CONSEQUENCES
1	
2	
3	
4	
5	
6	
7	

8 It is essential to acknowledge that the diverse range of analytical errors encountered in laboratories ultimately originates from human errors. By organizing them systematically, we can gain valuable insights into their causes and develop effective preventive strategies to evade them or mitigate their impact. Based on the description, give categories of errors.[17]



2 Read the article about prevention of analytical errors. Put the following words and phrases back into the text.

A. operating procedures
B. prevent errors
C. manual data entry
D. quality assurance program
E. identify potential sources
F. communication channels
G. regular training
H. follow-up actions
I. clear protocols
J. consistent and reproducible
K. transcription errors
L. acted upon

Preventing analytical errors in medical laboratories requires a comprehensive approach that addresses all stages of the testing process. Some effective strategies for preventing analytical errors include:

1 Laboratories should have a robust **quality control** and **1** _____ in place that includes regular monitoring of laboratory processes and procedures, implementing standardized **2** _____, using quality control materials, and participating in external quality assessment schemes.

2 Ensuring that **laboratory staff is adequately trained and educated** on laboratory processes and procedures can help **3** _____. Staff should receive **4** _____ on proper sample collection, handling, and processing, as well as instrument calibration and maintenance, and quality control practices.

Standardization of operating procedures can help prevent errors by ensuring that laboratory processes are **5** _____. This includes establishing **6** _____ for sample collection, handling, and processing, instrument calibration and maintenance, and quality control practices.

Implementation of automation and computerization of laboratory processes can help reduce the risk of errors by minimizing the need for **7** _____ and reducing the potential for **8** _____.

Regular review and auditing of laboratory processes can help **9** _____ of errors and provide opportunities for process improvement.

Effective communication with healthcare providers and patients. Establishing clear **10** _____. with healthcare providers and patients can help ensure that test results are accurately reported and interpreted, critical values are identified and **11** _____ in a timely manner, and

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CASE REPORTS

Read an abstract of a journal article about an analytical error. As you read, put the paragraphs in the chronological order. Unintended transplantation of three organs from an HIV-positive donor: report of the analysis of an adverse event in a regional health care service in Italy.[18]

A The patient's history did not highlight any risky behavior. The available data on previous hospital admissions reported a negative result on HIV testing. During the donation process, the result of the lab test performed for evaluation of organ suitability was mistakenly transcribed from positive to negative. This wrong negative result was then included in the donation record without any cross-check. Therefore, the Regional Transplant Center allocated the liver and both kidneys.

B Transplanted patients were immediately assessed and then treated with antiretroviral medications. A national commission soon performed a systems analysis of the adverse event. Besides the active error committed during the manual transcription for the HIV lab test result, the commission also identified technological factors, such as the lack of integration between the lab machine, the laboratory information system (LIS), and the donor record, as well as organizational factors.

C Recommendations included: automatic transmission of lab test results from the lab machine to the LIS and to the donor record, centralization of lab tests for suitability evaluation of organs and tissues, a training program to develop a proactive quality and safety culture in the regional network of donation and transplantations.

D In February 2007, three organs from a human immunodeficiency virus (HIV)–positive donor were transplanted at two hospitals in the Tuscany Regional Health Care Service, owing to a chain of errors during the donation process. The heart-beating donor was a 41-year-old woman who died as a result of head trauma.

E The patient also donated tissues, and a second laboratory conducted an evaluation of suitability for the tissue banks. During this process, only 5 days after the successful transplantation procedures, the positive HIV result was fed back to the Regional Transplant Center and the previous error discovered.

1 ___, 2 ___, 3 ___, 4 ___, 5___

2 **Your teacher will provide you with four brief stories of diagnostic errors stemming from inaccurate laboratory test outcomes. Choose one story to read and then narrate it to your fellow classmates within your assigned group. Afterwards, discuss the following questions.**[1, 13–14]

What do you think went wrong between the tests being ordered and clinicians/doctors acting upon results?
How were the individuals and families involved affected by these events?

STORY 1

- A couple that had been married for 50 years were healthy except he required blood thinner medication for a treatable heart condition. However, incorrect prothrombin test results led to several increases in his medication. He died shortly after of brain hemorrhage from over-medication.

STORY 2

- Over 100 patients tested positive for prostate cancer when in fact the test results from a prominent institution were wrong and some patients underwent treatment for non-existent tumors. The problem was later determined to be errors by equipment, personnel, and procedures.

STORY 3

- As part of a routine military physical, a soldier was told he was HIV positive. This led to him and his wife separating. Later the soldier found out he was actually HIV negative and the first test had been incorrect.

STORY 4

- A young couple was proud parents of a baby girl until routine tests cast doubt on the father's paternity. The couple split up over this issue but reunited some years later and had another child. Knowing the first child wasn't his, he insisted on a paternity test. They subsequently learned the first child was his and the original test had been compromised.

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Pronunciation Practice

Units of measurement, numbers

Units of measurement

1 Units of measurement

Lab test results usually contain some type of unit of measurement. The units provide a way to report results so that they can be compared. Units of measurement that may be used for lab test results include: %, ‰, milligrams (mg), milligrams per litre (mg/L)/ decilitre (mg/dL)/ litre (mg/L), millilitres (mL), mcU, mcgEq, Millimoles per litre (mmol/L) ect. Look at the table below and practise saying these units.[7, 11]

NAME	ABBREVIATION	PRONUNCIATION
percent	%	/pər'sent/
per mille/pro mille	‰	/pər'mil/
grams per deciliter/litre	g/dL/L	/græm pər desi-li:tər/
milligrams milligrams per litre/decilitre mg/dL	mg mg/L/ (g/dL	/'mɪl.ɪgræm/ /'mɪl.ɪgræmpərdesi-li:tər/
micro unit microgram equivalent	mcU mcgEq	/'maɪkroʊ//'ju:nɪt/ /mɪɪ'græm/ /ɪ'kwɪvalənt/
millimoles per litre= millimolar	mmol/L = mM	/mɪɪ'mool/ /'mɪləmolər/
milliunits per gram/litre	mU/g/L	/mɪlɪ-'ju:nɪts pər græm pər/ /li:tər/
nanograms per deciliter, milliliter/litre	ng/dL/mL/L	/'nænə græm pər desi-/mɪl.ɪ-li:tər/
units per litre	U/L/mL	/'ju:nɪtspərli:tər/

The units of measurement are naturally combined with numbers. Look at the table below and practise saying the numbers.

NUMBER	NUMERAL	PRONUNCIATION
ten	10	/ten/
hundred	100	/'hʌndrəd/
thousand	1000	/'θaʊzənd/
zero point one	0.1	/'zɪroʊ/ /pɔɪnt//wʌn/
zero point zero five **or** zero point o five	0.05	/'zɪroʊ pɔɪnt 'zɪroʊ faɪv/ **or** /'zɪroʊ pɔɪnt oʊ faɪv/
zero point zero five seven	0.057	/'zɪroʊ pɔɪnt 'zɪroʊ faɪv/ /'sevən/**or** /'zɪroʊ pɔɪntoʊ/ /faɪv 'sevən/

Note: hundreds and thousands are usually combined with **and**, e.g.: *two hundred **and** one, three hundred **and** thirty-six, two thousand **and** six, three thousand **and** ninety-five*

Language of speculation

In the exercise involving four short case stories you were asked to speculate both about the (present and past) causes of the analytical errors and their impact on the patients and their relatives.

The following language of speculation may be used.

To refer to present situations	To refer to past situations
It may be ... There could be ... It can´t be true ...	It may have been ... There could have been ... It can´t have been ...

The phrase *it is possible* can be used to speculate both about the present and the past depending on the rest of the sentence.

It is possible he forgot to lock to lab door.
It is possible he is still unaware of the error.

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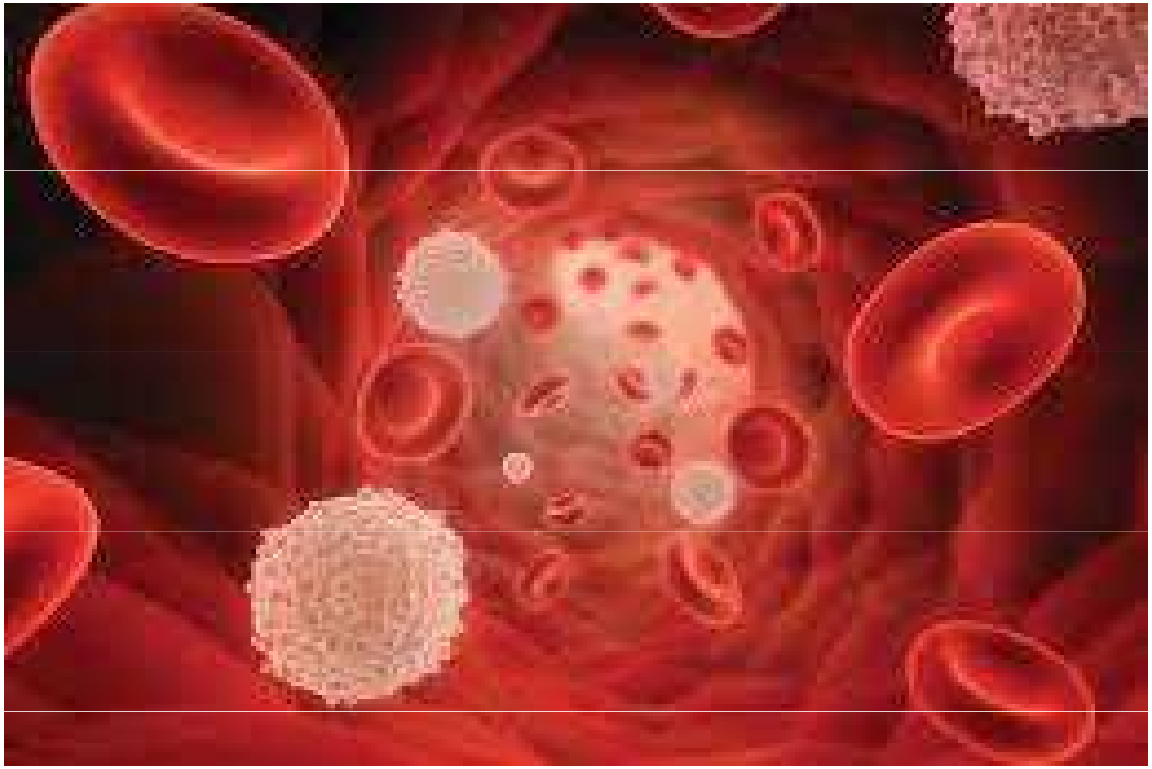
Unit 9 Haematology



Specific objective: to develop proficiency in specialized vocabulary to be able to interpret and communicate information related to blood components, diseases and laboratory techniques.

Lead-in: a Blood quiz "How well do you know what's flowing through your veins?"

Activities:
- *reading the text, filling in the gaps and labeling the diagram*
- *matching definitions*
- *categorizing / sorting terminology*
- *listening, notetaking, completing the grid*
- *case study*
- *scanning*

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Complete blood count

A complete blood count (CBC) is a blood test. It's used to look at overall health and find a wide range of conditions, including anemia, infection and leukemia. A complete blood count test measures the following:

- red blood cells, which carry oxygen
- white blood cells, which fight infection
- hemoglobin, the oxygen-carrying protein in red blood cells
- hematocrit, the amount of red blood cells in the blood
- platelets, which help blood to clot

A complete blood count can show unusual increases or decreases in cell counts. Those changes might point to a medical condition that calls for more testing.

Why it's done

A complete blood count is a common blood test done for many reasons:

- **to look at overall health.** CBC count can be part of a medical exam to check general health and to look for conditions, such as anemia or leukemia.
- **to diagnose a medical condition.** CBC can help find the cause of symptoms such as weakness, fatigue and fever. It also can help find the cause of swelling and pain, bruising, or bleeding.
- **to check on a medical condition.** CBC can help keep an eye on conditions that affect blood cell counts.
- **to check on medical treatment.** CBC may be used to keep an eye on treatment with medicines that affect blood cell counts and radiation.

Results (for adults)

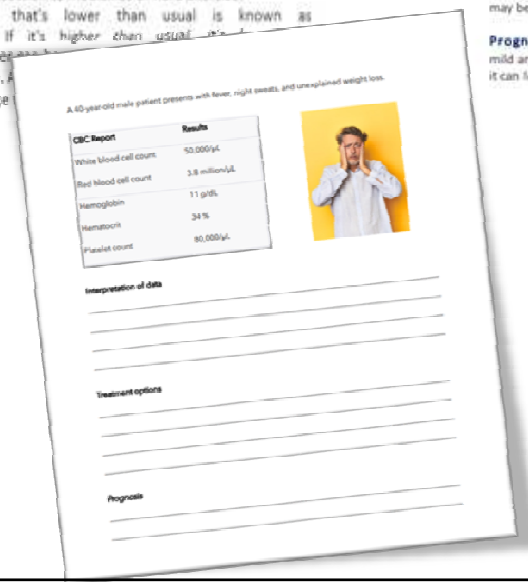
The blood is measured in cells per liter (cells/L) or grams per deciliter (grams/dL).

Red blood cell count	**Male** 4.35 trillion to 5.65 trillion cells/L **Female** 3.92 trillion to 5.13 trillion cells/L
Hemoglobin	**Male** 13.2 to 16.6 grams/dL (132 to 166 grams/L) **Female** 11.6 to 15 grams/dL (116 to 150 grams/L)
Hematocrit	**Male** 38.3 % to 48.6 % **Female** 35.5 % to 44.9 %
White blood cell count	3.4 billion to 9.6 billion cells/L
Platelet count	**Male** 135 billion to 317 billion/L **Female** 157 billion to 371 billion/L

What the results may indicate

Results in the following areas – above or below the typical ranges – might point to a problem.

- The results of **red blood cell count, hemoglobin and hematocrit** are related because they each measure a feature of red blood cells.
  Lower than usual measures in these three areas are a sign of **anemia**. Its causes may include low levels of certain vitamins or iron, blood loss, or another medical condition. People with anemia might feel weak or tired. These symptoms may be due to the anemia itself or the cause of anemia.
  A red blood cell count that's higher than usual is known as **erythrocytosis**. A high red blood cell count or high hemoglobin or hematocrit levels could point to a medical condition such as blood cancer or heart disease.
- **A low white blood cell count** is known as **leukopenia.** An autoimmune disorder that destroys white blood cells, bone marrow problems or cancer might be the cause. Certain medicines also can cause a drop in white blood cell counts.
  A white blood cell count that's higher than usual most commonly is due to an infection or inflammation. Or it could point to an immune system disorder or a bone marrow disease. A high white blood cell count also can be a reaction to medicines or hard exercise.
- **A platelet count** that's lower than usual is known as **thrombocytopenia**. If it's higher than usual, it's known as **thrombocytosis**. Either [illegible] effect from medicine. A [illegible] will likely lead to more



6 Case study. Read the following sample case study paying particular attention to how the interpretation, treatment options, and prognosis sections are built. Afterward, you will receive your own case report, which will contain only basic information in the table, without the name of the condition. Your task will be to identify the disorder in the first section (interpretation of data) and complete the other two sections (treatment options and prognosis).[1]

Sample case study: Anaemia

A 55-year-old female patient presents with fatigue, weakness, and shortness of breath.

CBC Report	Results
White blood cell count	6,000/µL
Red blood cell count	3.5 million/µL
Haemoglobin	8 g/dL
Haematocrit	25 %
Platelet count	120,000/µL

Interpretation of data: Laboratory results show a low haemoglobin level of 8 g/dL, low haematocrit level of 25%, and low red blood cell count of 3.5 million/µL. The platelet count of 120,000/µL is slightly below the normal range (typically between 150,000 and 450,000 cells/µL) but not significantly so.
The patient is likely suffering from anaemia, which is a blood disorder characterized by low levels of red blood cells, haemoglobin, or haematocrit. The low levels of these parameters suggest that the patient's blood is not carrying enough oxygen, leading to the symptoms of fatigue, weakness, and shortness of breath. Further diagnostic tests, such as a peripheral blood smear and iron tests, may be needed to determine the specific type and cause of anaemia.

Treatment options: Treatment for anaemia depends on the underlying cause. In this case, the patient may need to take iron supplements and/or vitamin B12 supplements. If the anaemia is caused by a chronic disease, such as kidney disease or cancer, treating the underlying condition may help to improve the anaemia. In more severe cases, blood transfusions may be necessary.

Prognosis: The prognosis for ana[illegible] and severity of the condition. If the anaemia is mild and treated promptly, the p[illegible] is severe and left untreated, it can lead to serious complicatio[illegible]

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Unit 11 Microbiology

Specific Objective: to employ specialized vocabulary and communication skills to comprehend, analyze, and convey information related to microorganisms, laboratory techniques, and microbial processes.

Lead-in: discussion session about hot topics in microbiology

Activities:
- reading and gap filling
- matching definitions
- listening (watching a video) for gist
- reading for orientation (scanning a website for locating relevant details
- interpreting charts (mediation)
- matching headlines
- grammar practice: noun-forming suffixes
- word formation

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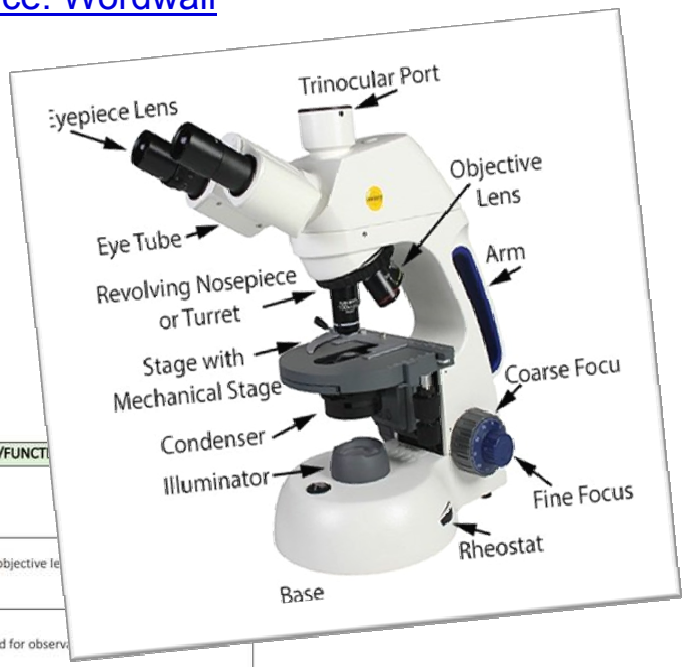
A slideshow

Presented below are a series of images showcasing the key milestones in the history of the microscope, arranged chronologically.
Your task is to figure out the significance of each milestone based on the provided pictures

Vocabulary practice: Wordwall



MICROSCOPE PART		DEFINITION/FUNCTI	
1	eyepiece lens	A	the bottom support of the microscope
2	eye tube	B	This is the part that holds two or more objective le change power.
3	arm	C	the flat plate where the slides are placed for observ
4	base	D	Usually, you will find 3 or 4 of these on a microscope. They almost always consist of 4x, 10x, 40x and 100x powers When coupled with a 10x (most common) eyepiece lens, total magnification is 40x (4x times 10x), 100x, 400x and 1000x.
5	Illuminator	E	connects the eyepiece to the objective lenses
6	stage	F	this is an adjustment that determines how close the objective lens can get to the slide
7	revolving nosepiece or turret	G	the rough (and basic) focus knob on the microscope. You use it to move the objective lenses toward or away from the specimen.

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Grammar Practice: Noun-forming Suffixes

D GRAMMAR POINT

1 Microbiology is not only a scientific field rich in the variety of studied organisms, but also in the use of nouns formed by noun forming suffixes. Look at the examples in the table below:

Noun-forming suffixes

-age	spoilage
-ance/-ence	resistance, prevalence
-y	colonoscopy
-ism	organism
-ist	biologist
-ity/-ty	versatility, diversity, stability, obesity
-ment	treatment, development
-ness	illness
-ry	delivery
-ship	relationship
-sion/-tion	biodegradation, biodeterioration, prevention, infection, colonization, composition, transmission, pollution

UNIT 11 MICROBIOLOGY

Complete the gaps with nouns made from the words in brackets.

1 The _____ between us and our microbiome is so intertwined that one can think of the human body as one superorganism made of human and microbial cells. (RELATE)

2 Our microbiome is also a natural shield against a variety of _____ (ILL)

3 Loss of microbial _____, specifically in our gut microbiome, is associated with the rise in many diseases such as asthma, _____, diabetes and atopic dermatitis. (DIVERSE, OBESE)

4 A faecal sample from a "healthy" individual is transplanted into the gut via enema, nasogastric tube or _____ of a diseased patient. (COLONOSCOPE)

5 Thanks to their _____ can be put to work in many ways: making life-saving drugs, the manufacture of biofuels, cleaning up _____ and processing food and drink. (VERSATILE, POLLUTE)

6 Medical microbiology is the _____ with the _____ and treatment of diseases.

Complete the gaps with the phrases below.

determine the most effective antibiotic	*explore new frontiers*	*follow strict protocols*
grow microorganisms	*help diagnose infectious diseases*	*identify potential pathogens*
play a crucial role	*study the genetic makeup*	*use a variety of techniques*
visualize and study microorganisms		

1 Microbiologists cultivate and _____ in the lab on various types of growth media to study their characteristics, behaviour, and interactions.

2 Lab technicians _____, such as staining, biochemical tests, and molecular methods, to identify microorganisms, including bacteria, viruses, fungi, and parasites.

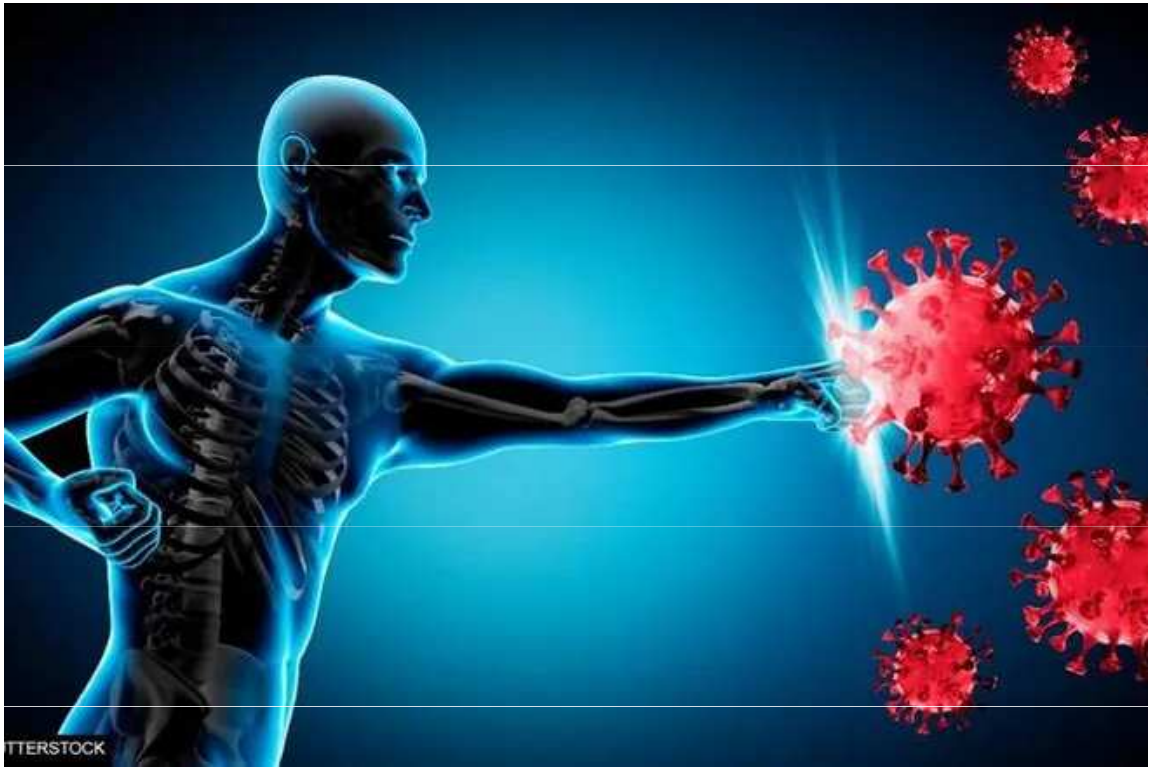
3 Microbiologists perform antibiotic susceptibility testing on isolated bacterial strains to _____ for treating infections caused by those bacteria.

4 Microbiology labs _____ for sterilizing equipment, media, and surfaces to prevent contamination and maintain the integrity of experiments.

5 Microbiologists use different types of microscopes, such as light microscopes and electron microscopes, to _____ at a cellular and subcellular level.

6 Microbiology labs may analyze samples from various environments, such as water, soil, food, and air, to monitor and _____ or beneficial microorganisms.

Unit 12 Immunology



Specific Objective: demonstrate a comprehensive understanding of fundamental immunological concepts, including immune responses, cell-mediated immunity, laboratory techniques commonly used in immunology

Lead-in: discussion session "How can understanding of immunology help lab technicians in diagnosing and treating diseases?"

Activities:
- *listening / watching a video for details*
- *matching definitions*
- *inferring meaning of the target vocabulary*
- *reading for detail*
- *role play*

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Grammar Practice: Direct and Indirect Questions

2 Grammar point. Look at the table and try to recollect the rules of making up questions.

Direct questions require inverted word order	
Yes / No questions	Auxiliary / modal + subject + verb? *Do phlebotomists train a lot to draw the blood? Yes, they do. / No, they don't.*
Wh- questions	Object questions: Question word + auxiliary / modal + subject + verb? *What will a phlebotomist sterilize my inner elbow with?* Subject questions: Who / whose... / what / which... + verb? *What prevents bleeding? (~~What does prevent bleeding?~~)*
Alternative questions	*Did your blood test come positive or negative?*
Question tags	*The lymphatic system helps clear bodily toxins and waste, doesn't it?* *You've studied immunology extensively, haven't you?*

Indirect questions require direct word order as in statements. They are commonly used after: ***I don't kn to know... / I wonder... / Do you know if/that... / Can you tell me...,*** **etc.**	
Yes / No questions	Direct question: *Is an antibody considered a protein?* Indirect question: *Do you know if an antibody is a protein?*
Wh- questions	Direct question: *What do pregnancy tests detect?* Indirect question: *I wonder what pregnancy tests detect.*

3 You will be working in pairs. Your teacher will provide you with a gapped text describing a laboratory technique used in immunology. While the text will be the same for both of you, the missing information in each gap will differ. Utilizing the question word indicated in red at the end of every gap, take turns asking each other for the specific missing information. Make sure to take thorough notes as you gather the information from your partner.[8, 14, 16]

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Role Play

To check for autoimmune diseases, your healthcare provider may do some blood tests, including:

- ✓ antinuclear antibody test (ANA),
- ✓ complete blood count (CBC),
- ✓ erythrocyte sedimentation rate (ESR).

4 The teacher will provide you with a handout on a role play between two junior lab technicians discussing detection of anti-nuclear antibodies (ANAs) and autoimmune diseases. The exchanges in the dialogue have been mixed up, with only the first and last ones staying in their proper places.
Put the rest of the exchange in the correct order and act out the dialogue.

BEGINNING Alex: (Curious) Hey, Lisa! I've been reading about ANA detection methods, and I find it fascinating how these antibodies play a significant role in autoimmune diseases.
U: Lisa: (Engaged) You're absolutely right, Alex! ANAs are essential indicators of malfunctions in the immune system, particularly in autoimmune conditions.
B: Alex: (Nods) But how exactly do ANAs work, and why are they so important in autoimmune diseases?
Q: Lisa: (Explaining) ANAs, or antinuclear antibodies, are a group of autoantibodies that target the body's own nuclear antigens. These nuclear antigens are typically found within our cells' nuclei.
V: Alex: So, in autoimmune diseases, the immune system mistakenly identifies these self-antigens as foreign invaders?
A: Lisa: (Affirming) Yes, exactly! Normally, our immune system's primary role is to defend us against harmful pathogens like bacteria and viruses. But when it malfunctions, it can start attacking healthy cells and tissues, leading to various autoimmune diseases.
F: Alex: (Thoughtful) And ANA detection can help identify these autoimmune diseases, right?
M: Lisa: (Nods) Absolutely! ANA testing is a critical diagnostic tool for autoimmune diseases like systemic lupus erythematosus (SLE), rheumatoid arthritis (RA), and others. By detecting ANAs in a patient's blood, we can get valuable insights into their immune system's activity.
P: Alex: (Intrigued) That's amazing! But how do we actually detect these ANAs in the lab?
C: Lisa: (Explaining) Well, there are different methods available. One of the classic techniques is indirect immunofluorescence assay (IFA). We incubate diluted patient serum on a slide containing cells that express nuclear antigens.
N: Alex: Ah, I remember! If ANAs are present in the serum, they'll bind to the nuclear antigens on the cells.
G: Lisa: (Smiling) You got it! After washing away any unbound antibodies, we add a fluorescent-labeled secondary antibody. If ANAs are present, the secondary antibody will bind to them, and we can visualize the fluorescence under a microscope.
D: Alex: (Excited) IFA seems to provide a lot of information about the type and pattern of ANAs present.
H: Alex: (Curious) And I've heard about another method – the multiplex bead immunoassay (MBIA).
W: Lisa: (Smiling) Yes, MBIA is gaining popularity. It uses microbeads, each coated with different nuclear antigens. Patient serum is incubated with these beads, and if ANAs are present, they'll bind to the respective antigens.
J: Alex: (Interested) So, MBIA allows us to detect multiple ANA specificities simultaneously?
Z: Lisa: (Nods) Exactly! It provides a more comprehensive view of the patient's ANA profile in a single test.
Y: Alex: (Impressed) That sounds powerful! By using these different methods, we can gain deeper insights into autoimmune diseases and provide better care for patients.
END Lisa: (Agrees) Absolutely! ANA detection is an essential tool in diagnosing autoimmune diseases early, allowing for timely intervention and improved patient outcomes.

R: Alex: (Excited) IFA seems t present.
O: Lisa: It does, indeed! But t
X: Alex: (Curious) EIA? How d
E: Lisa: In EIA, we coat a micr ANAs are present, they'll binc
T: Alex: (Thinking) And then v indicates the presence of AN
I: Lisa: (Nods) Exactly! The int present in the patient's serun
L: Alex: (Pondering) So, EIA is
S Lisa: Yes, that's correct. Eac the specific requirements of t

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Limitations of the new ESP course for MLT

- cultural considerations: the new ESP course is not fully relevant for Czech medical laboratory environment
- time constrains
- language complexity

"If the only tool you have is a hammer, you tend to see every problem as a nail" (A.Maslow)

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Resources

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