

Module 8:

Laboratory Testing

Key Message ...

My lab provides prompt, accurate, and validated test results.

Desired Outcome

- **All laboratory tests are performed promptly and accurately.**
- **Test results are validated and recorded before release.**

Laboratory Information

- Accurate, reliable test results
- The right test on the right patient at the right time
- Information used to diagnose, monitor and treat patients
- Confidence in the provided information is essential for patient care and proper laboratory utilization



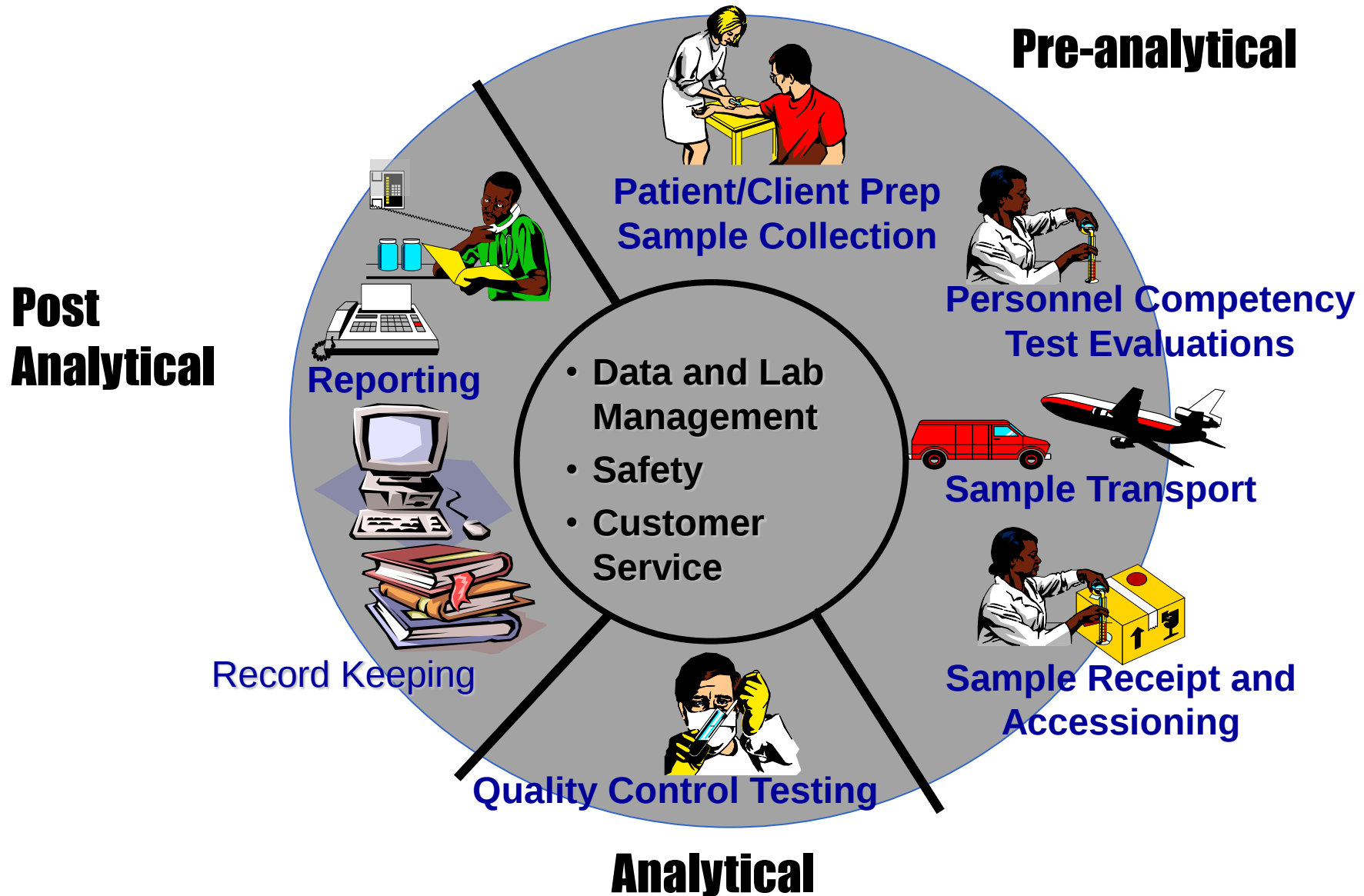
Tasks

- 8.1 - Monitor testing to ensure SOPs are followed and tests are performed and reported properly and promptly
- 8.4 - Validate assigned tests and specific abnormal results

Your providers must have confidence in your information.

Validation of Test Results

The Workflow Cycle



Activity: Validation of Tests Results

Purpose

To identify potential sources of errors or problems throughout the total testing process and create a checklist to verify before patient results are released.

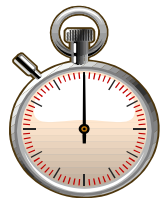
What will you need?

- Paper to list potential errors or problems
- Flipchart paper and marker to write your checklist

What will you do?

Divide into two teams

- Select a team captain
- Brainstorm with your team to come up with as many errors or problems that can invalidate the results
- Create a validation checklist for each of the 3 phases (pre-analytical, analytical, and post analytical)



20 minutes

Tasks

- 8.2 - Cross-check test reports against test request to ensure completion of all tests
- 8.3 - Review test records and findings promptly to ensure accuracy and timely release of test results

Activity: Is the Test Report Ready to be Released?

Purpose

To identify errors and omissions in a lab report so that only complete, accurate, legible, and clinically valid test results are reported

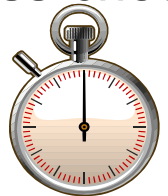
What will you need?

- Worksheet 1: Laboratory Report
- Worksheet 2: Report for Review

What will you do?

Work individually to:

- Complete the 'Patient Information' section on Worksheet 1
- Review the Worksheet 1 and circle all the omissions or errors committed by the laboratory staff members.
- Document on Worksheet 2 that you performed the cross-check review



10 minutes

Laboratory Report

Cape Clinic Laboratory

Report Date/Time: 5-10-2009 1500

Lab #: 38

Drawn by: LS

Collected Date/Time: 3-10-09 0815

Hematology					Additional In-House Testing				
☒ CBC		Tech initials: LS			Tech initials: Am		Normal Values		
Results	WBC	4.2 - 10.0	4.2 - 9.8	x10 ⁹ /L	☐ CRP	POS	NEG	N/A	
15.3	RBC	4.35 - 5.8	3.69 - 5.13	x10 ¹² /L	☐ CRP	POS	NEG	NEG	
3.98	HGB	13.7 - 16.7	11.7 - 14.3	g/dL	☐ Monia Rapid	POS	NEG	NEG	
11.0	ICT	10.5 - 49.7	34.1 - 44.3	g/L	☐ TRDR	WEAK REACTIVE	REACTIVE	NON REACTIVE	
32.0	MCV	78.7 - 82.0	81.5 - 86.7	fL	☐ TRDR	WEAK REACTIVE	REACTIVE	NON REACTIVE	
68.9	MCH	26.1 - 33.3	26.5 - 34.1	pg	☐ Saline Prep	Source:			
22.6	MCHC	32.2 - 35.0	31.9 - 35.2	g/dL	☐ Gram Stain				
31.0	RDW	11.5 - 14.4		%					
1.60	PLT	140 - 440		x10 ⁹ /L					
122									
☒ Differential					☒ Tech initials: Am				
Tech initials:					Normal Values				
Neutrophils					45 - 65%				
Lymphocytes					20 - 40%				
Monocytes					2 - 10%				
Eosinophils					1 - 6%				
Basophils					0 - 2%				
Other:									
RBC Morphology					Normal Morphology				
Anisocytosis					Morphology Terms				
Microcytosis					1 - Slight				
Macrocytosis					2 - Moderate				
Hypochromia					3 - Marked				
Polychromasia									
Chemistry					Tech initials:				
☐ Basic ☐ Comprehensive ☐ LFT ☐ Lipid					10-20				
Result					Normal (M/F)				
GLUC					70 - 100 mg/dL				
UREA					7 - 20 mg/dL				
Na					136 - 145 mmol/L				
K					3.5 - 5.3 mmol/L				
Cl					98 - 110 mmol/L				
CREAT					0.6 - 1.2 mg/dL				
TUBC ACID					20 - 30 mmol/L				
T-PROT					64 - 83 g/L				
ALBUMIN					3.5 - 5.2 g/dL				
T-BIL					0.2 - 1.2 mg/dL				
T-CGT					0.55 - 0.80 mmol/L				
Additional Test Requests									
CCMS Urinalysis					Tech initials: Am				
Color					N/A				
Appearance					N/A				
Urobilinogen					0.6 mmol/L				
Glucose					Negative (mmol/L)				
Ketones					Negative (mmol/L)				
Specific Gravity					1.005 - 1.030				
Blood					Negative				
pH					5.0 - 8.0				
Protein					Negative (g/L)				
Nitrite					Negative				
Leukocytes					Negative				
Microscopic					Tech initials:				
WBCs/HF					Crystals:				
RBCs/HF					Epithelial cells				
LPL					LPL				
Hematuria					Leukocytes / Yeast / Parasite				
Mucus									
Quality Assurance					Date Requested: 03-10-09				
QA Review:					Ordering Doctor: Smith				
Date: / /					Comments:				
Doctor Signature:									
Patient Information					Name (Surname, first):				
DOB: / /					Age: /				
Patient No:					Diagnosis:				
Patient Contact Information:									

Errors Noted

Cape Clinic Laboratory

Report Date/Time: 5-10-2009

Lab #: 38

Drawn by: LS

Collected Date/Time: 3-10-09 0815

Hematology				Additional In-House Testing			
☒ CBC		Tech Initials: LS		Tech Initials: Am		Normal Values	
Results		Adult Normal Values		Urine Pregnancy		POS	
WBC	15.3	4.3 - 10.6	3.4 - 9.8	CRP		POS	
RBC	3.98	4.35 - 5.6	3.65 - 5.13	Micro in Rapid		POS	
HGB	11.0	13.7 - 16.7	11.7 - 14.5	IRPK		W-A: REACTIVE	
HCT	37.0	43.5 - 49.7	34.1 - 44.4	KOH		REACTIVE	
MCV	68.9	79.2 - 92.0	81.7 - 95.7	Schick Prep		Source:	
MCH	22.6	26.1 - 34.3	26.5 - 32.5	Gram Stain			
MCHC	31.0	33.3 - 35.0	31.9 - 35.3				
RDW	16.0	11.5 - 14.4					
PLT	122	140 - 440					
☒ Differential		Tech Initials: LS		CCMS Urinalysis		Tech Initials: Am	
Neutrophils		45 - 65%		Color		N/A	
Band's (Neutrophils)		1 - 12%		Appearance		N/A	
Lymphocytes		20 - 40%		Urobilinogen		<1.0 umol/L	
Atypical Lymphocytes		0 - 2%		Glucose		Negative (mmol/L)	
Monocytes		4 - 10%		Bilirubin		Negative (mmol/L)	
Eosinophils		1 - 5%		Ketones		Negative (mmol/L)	
Basophils		0 - 2%		Specific Gravity		1.005 - 1.030	
Other				Blood		Negative	
RBC Morphology		Normal Morphology		pH		7.35 - 7.45	
Anisocytosis		Morphology Terms		Protein		Negative (g/L)	
Microcytosis		1 = Slight		Nitrite		Negative	
Macrocytosis		2 = Moderate		Leukocytes		Negative	
Hypochromia		3 = Marked		☒ Microscopic		Tech Initials: LS	
Polychromasia				WBC/HPF		Crystals	
				RBC/HPF		Casts	
				Erythrocytes		Casts	
				Erythrocytes		Casts	
				Bacteria		Trichomonas / Yeast / Parasite	
				Mucus			
Chemistry				Quality Assurance			
Basic		Comprehensive		Basic		Comprehensive	
Result		Normal (M/F)		Result		Normal (M/F)	
GLUC		4.0 - 5.8 mmol/L (fasting)		30.1		4.4 - 6.3 mmol/L	
UREA		2.5 - 6.4 mmol/L		AST		8 - 17 U/L	
Na		136 - 145 mmol/L		ALT		10 - 40 U/L	
K		3.5 - 5.3 mmol/L		CK		58 - 171 U/L	
Ca		9.8 - 11.0 mmol/L		LDH		240 - 460 U/L	
CREAT		62 - 115 µmol/L		AMY		27 - 102 U/L	
URIC ACID		208 - 430 µmol/L		CALCIUM		2.15 - 2.50 mmol/L	
PT-PROT		94 - 83 g/L		PHOS		0.87 - 1.45 mmol/L	
ALBUMIN		35 - 52 g/L		CHOL		3.6 - 5.7 mmol/L	
T-BILI		5.1 - 20.8 µmol/L		KID		0.2 - 0.26 mmol/L	
D-BILI		0.0 - 3.4 µmol/L		HDL-C		0.78 - 1.94 mmol/L	
TG		0.55 - 3.8 mmol/L		TRIG		0.85 - 3.8 mmol/L	
						0.71 - 3.44 mmol/L	
Additional Test Requests				Patient Information			
				Information completed by participant			
				Name (surname first)			
				DOB: / / Age: [] Male [] Female			
				Patient No. Diagnosis			
				Patient Contact Information			

Suggested Report Example

platelet count verified by peripheral smear critical plt called to Dr. Smith 9/122 3-10-09 25

Cape Clinic Laboratory Report Date/Time: 3-10-09 1500 Lab #: 38 Drawn by: JS Collected Date/Time: 3-10-09 0815

Hematology					Additional In-House Testing				
☒ CBC		Tech initials: JS			Tech initials: Am		Normal Values		
Results		Adult Normal Values			N Urine Pregnancy		PCNS		NEG
15.3	WBC	9.33 - 10.0	7.54 - 9.8	x10 ⁹ /ul	☐ CRP	PCNS	NEG	NEG	
3.96	RBC	4.35 - 5.6	3.69 - 5.13	x10 ⁶ /ul	☐ Malaria Rapid	PCNS	NEG	NEG	
11.0	HGB	11.7 - 16.7	11.7 - 14.5	g/dl	☐ RPR	WEAK REACTIVE	REACTIVE	NON REACTIVE	
33.0	HCT	40.5 - 48.7	44.1 - 44.3	%	☐ KOU	Source			
68.9	MCV	79.7 - 92.0	81.5 - 96.7	f	☐ Saline Prep				
22.6	MCH	26.1 - 33.3	26.3 - 33.3	pg	☐ Gram Stain				
31.0	MCHC	32.2 - 35.0	31.9 - 35.3	g/dl					
16.0	RDW	11.6 - 14.4		%					
22	PLT	130 - 440		x10 ³ /ul					
☒ Differential		Tech initials: GW			Tech initials: Am		Normal Values		
85	Neutrophils	45 - 65%			yellow	Color	N/A		
10	Bands (Neutrophils)	1 - 12%			hazy	Appearance	N/A		
5	Lymphocytes	20 - 40%			16	Urobilinogen	<15 umol/L		
	Atypical Lymphocytes	0 - 2%			negative	Glucose	Negative (mmol/L)		
	Monocytes	4 - 10%			negative	Bilirubin	Negative (mmol/L)		
	Eosinophils	1 - 6%			negative	Ketones	Negative (mmol/L)		
	Basophils	0 - 2%			1.025	Specific Gravity	1.005 - 1.030		
	Other				moderate	Blood	Negative		
RBC Morphology		[] Normal Morphology			6.5	pH	7.35 - 7.45		
+1	Anisocytosis	Morphology Terms 1 = Slight 2 = Moderate 3 = Marked			1.0	Protein	Negative (g/L)		
+2	Microcytosis				negative	Ketone	Negative		
	Macrocytosis				moderate	Leukocytes	Negative		
+1	Hypochromia								
	Poikilocytosis				☒ Microscopic		Tech initials: GW		
Chemistry					5-10	WBCs/HPF	Crystals		
[] Basic	[] Comprehensive	[] LFT	[] Lipid	Tech initials: RZ	10-20	RBCs/HPF	Casts		
Result	Normal (M/F)	Result	Normal (M/F)			EPI-metals	Casts		
[] GLUC	3.9 - 5.8 mmol/L - fasting	☒ ALT	6.41 - 31 U/L			EPI-squamous cells	Infections / Yeast / Parasite		
☒ URIC 14.9	3.5 - 6.4 mmol/L	[] AST	6.47 - 31 U/L		5-10 moderate	Bacteria			
[] Na	136 - 145 mmol/L	[] ALT	31 - 178 U/L			Mucus			
[] K	3.5 - 5.3 mmol/L	[] CK	35 - 171 U/L		Quality Assurance				
[] CO	98 - 110 mmol/L	[] LDH	25 - 145 U/L		Date Requested: 3-10-09	Ordering Doctor: Smith			
☒ CR-AT 418	67 - 115 / 55 - 97 umol/L	[] AMY	27 - 100 U/L		☒ Reactive	[] Stat	[] Waiting	☒ Testing	
[] URIC-ACID	306 - 430 / 355 - 360 umol/L	☒ CALCIUM 2.30	3.15 - 3.50 mmol/L		QA Review:				
[] PT-PRPT	64 - 83 g/L	☒ PHOS 1.05	0.87 - 1.45 mmol/L		Date	Comments			
[] ALBUMIN	35 - 51 g/L	[] CDP	9.6 - 15.7 mmol/L		Doctor Signature: _____				
☒ T-BILI 6.0	3.1 - 20.5 umol/L	[] TRIG	0.2 - 2.6 mmol/L		Patient Information				
☒ D-BILI 0.5	0.0 - 3.4 umol/L	[] HDL-C	0.78 - 1.54 / 0.85 - 2.58 mmol/L		Information completed by participant				
[] GGT	0.55 - 1.38 U/L	[] calc	0.71 - 5.44 / 1.48 - 5.89 mmol/L		DOB: / / Age: [] Male [] Female				
Additional Test Requests					Patient No. _____ Diagnosis _____				
					Patient Contact Information _____				

Activity: Workstation Set-up

Purpose

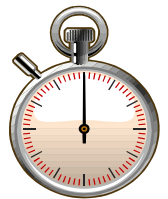
To create and organize an efficient and productive workstation using elements developed from each module.

What will you do?

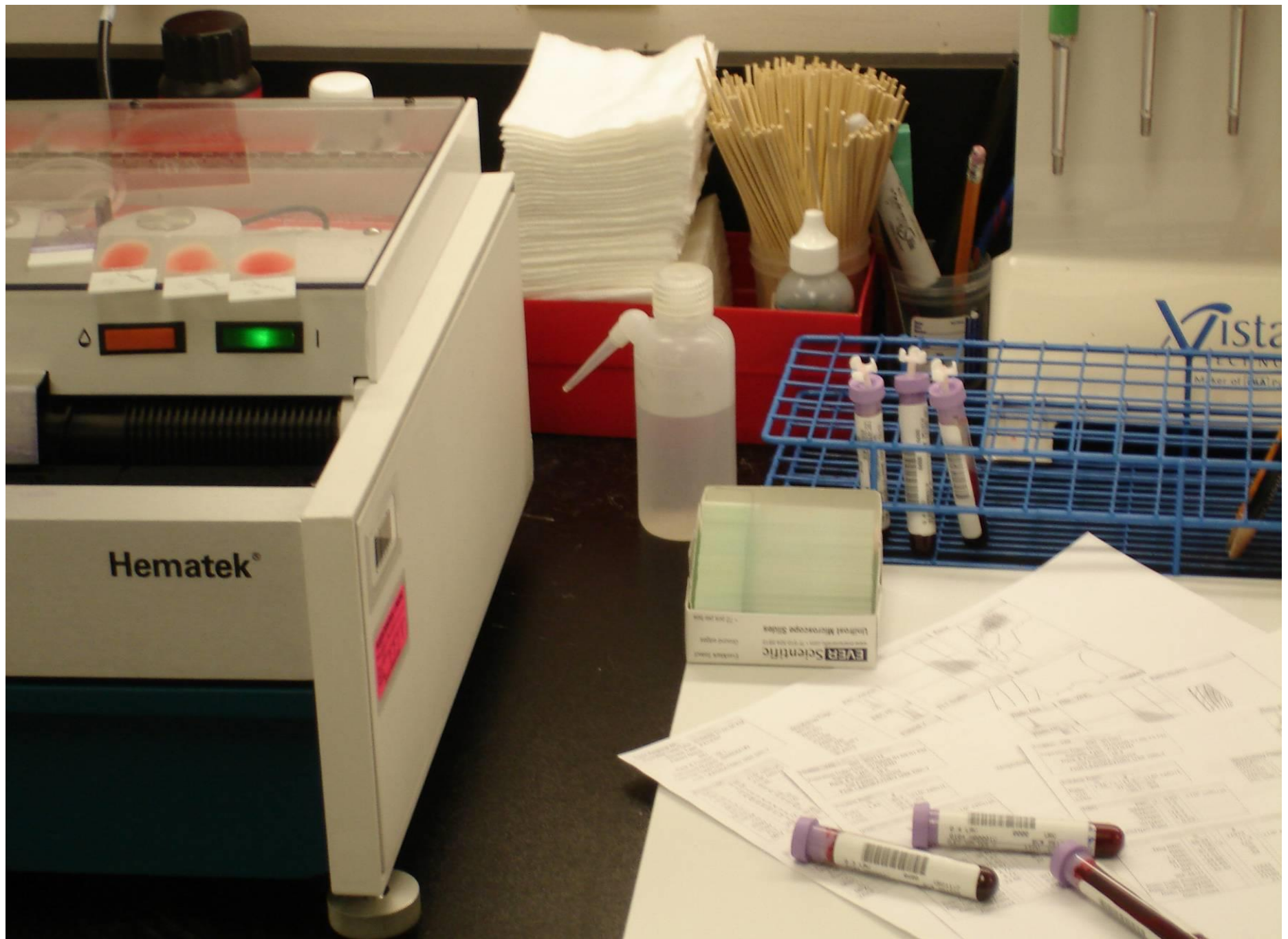
- Participate in the classroom's discussion
- Integrate key concepts from earlier activities

What will you need?

Laboratory Accreditation
Preparedness Checklist



15 minutes

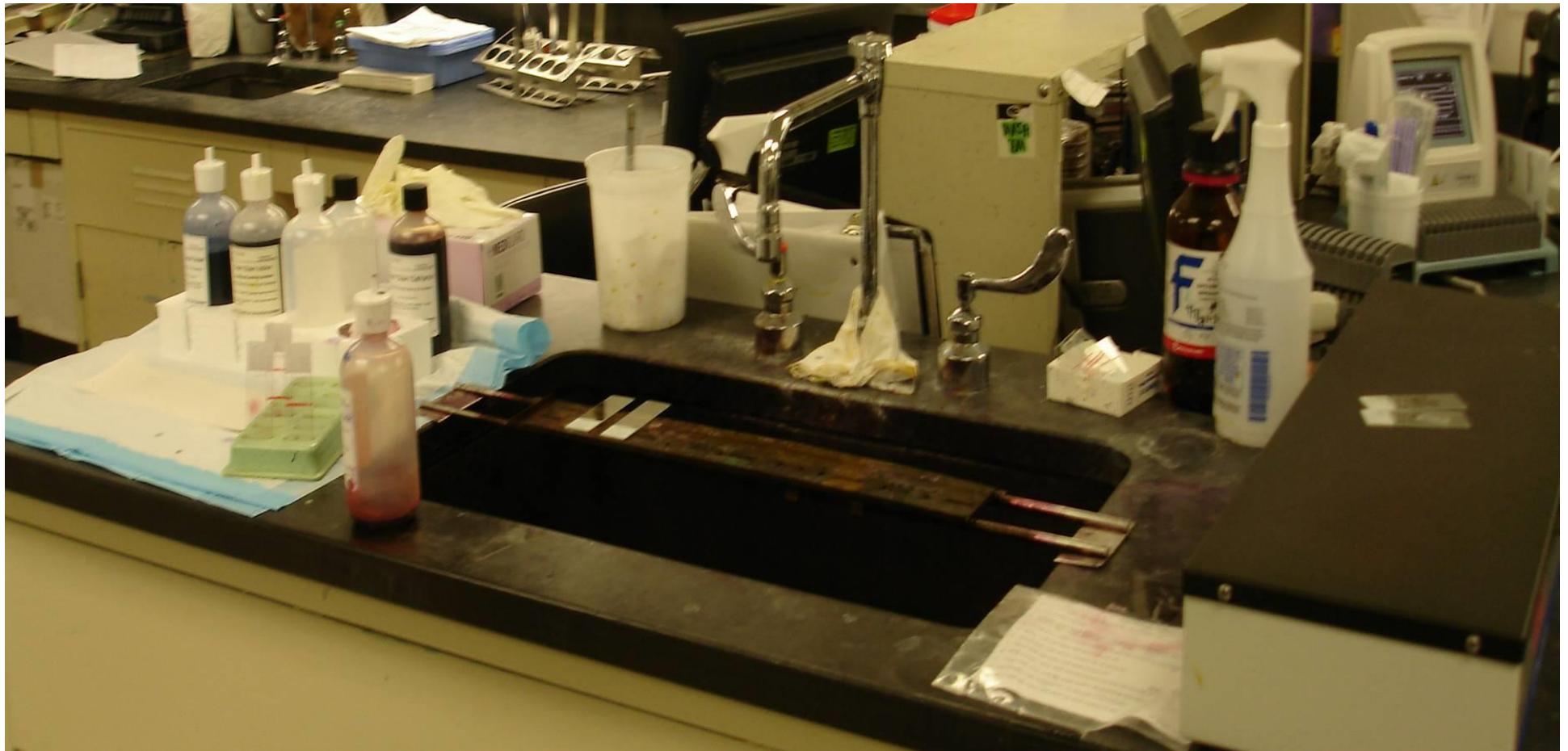
















Activity: What Would You Do?

Purpose

To integrate the module's lessons and apply them to the case scenario.

What will you need?

Handout: Case Study Scenarios

What will you do?

Divide into groups of 4-5

- Select a spokesperson for your group
- Formulate specific action steps to address the scenario from the Handout.
- The group's spokesperson presents the proposed steps during the 2 minute class report.



5 minutes

What Would You Do?

You cross-check results and notice several errors committed by the same staff member. Throughout the day, you notice this staff member preoccupied and distracted with personal phone calls. You feel this distraction is affecting the quality of his work.

How will you handle this situation?

What Would You Do?

You receive a call from the nurse who indicates that another urine pregnancy test was overlooked. From the occurrence log, you discover that your laboratory easily overlooks urine pregnancy tests when a routine urinalysis is ordered on the same specimen.

How will you address this problem?

Tasks

- Monitor testing to ensure SOPs are followed and tests are performed and reported properly and promptly
- Validate assigned tests and specific abnormal results
- Cross-check test reports against test request to ensure completion of all tests
- Review test records and findings promptly to ensure accuracy and timely release of test results