Physiology of the Blood and Lymphoreticular System

Lab (2) – Medical and Dental Students – 2026/2027

• CBC Reports – Practice

Dr. Abdullah Al-Jaouni

CBC Report (1)

PATIENT NAME	MRN / DOB	AGE / GENDER	ORDERING PHYSICIAN
DOE, JANE M.	#9834120 / 04-12-1994	32 YRS / Female	Dr. A. Vance, MD

CLINICAL PRESENTATION (TEACHING VIGNETTE)

32-year-old female presenting with a 4-month history of progressive fatigue, exertional dyspnea, accompanied by new-onset paresthesias in her feet and difficuity with balance. She reports a history of gastric bypass surgery 5 years prior.

COMPLETE BLOOD COUNT (CBC) WITH RETICULOCYTE COUNT

TEST PARAMETER	RESULT	FLAG	UNITS	REFERENCE
Erythrocyte Indices & Red Cell Panel				
Red Blood Cell Count (RBC)	**2.20**		$x10^{12}/L$	3.80 - 5.10
Hemoglobin (Hgb)	**8.8**		g/dL	12.0 - 15.5
Hematocrit (Hct / PCV)	**27.5**		%	36.0 - 46.0
Mean Corpuscular Volume (MCV)	**125.0**		fL	80.0 - 100.0
Mean Corpuscular Hgb (MCH)	**40.0**		pg	27.0 - 33.0
MCH Concentration (MCHC)	**32.0**		g/dL	32.0 - 36.0
Red Cell Distribution Width (RDW)	**22.0**		%	11.5 - 14.5
Reticulocyte Evaluation (Bone Marrow Response)				
Reticulocyte Percentage	**0.6**		%	0.5 - 2.0
Absolute Reticulocyte Count	**13.2**		$x10^{9}/L$	
Leukocyte & Platelet Panel				
White Blood Cell Count (WBC)	**4.2**		$x10^{3}/\mu L$	4.5 - 11.0
Platelet Count (Plt)	**110**		$x10^{3}/\mu L$	150 - 450

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CBC Report (2)

PATIENT NAME	MRN / DOB	AGE / GENDER	ORDERING PHYSICIAN
SMITH, WILLIAM A.	#7712345 / 07-20-2001	25 YRS / Male	Dr. B. Carter, MD

CLINICAL PRESENTATION (TEACHING VIGNETTE)

25-year-old male presenting with intermittent fatigue, mild jaundice, and right upper quadrant abdominal fullness. He notes a family history of "gallstones at a young age" and splenectomy in his father. Physical examination reveals splenomegaly and mild scleral icterus.

COMPLETE BLOOD COUNT (CBC) WITH RETICULOCYTE COUNT

TEST PARAMETER	RESULT	FLAG	UNITS	REFERENCE
Erythrocyte Indices & Red Cell Panel				
Red Blood Cell Count (RBC)	**3.50**		$x10^{12}/L$	3.80 - 5.10
Hemoglobin (Hgb)	**9.5**		g/dL	12.0 - 15.5
Hematocrit (Hct / PCV)	**25.3**		%	36.0 - 46.0
Mean Corpuscular Volume (MCV)	**82.4**		fL	80.0 - 100.0
Mean Corpuscular Hgb (MCH)	**27.1**		pg	27.0 - 33.0
MCH Concentration (MCHC)	**37.5**		g/dL	32.0 - 36.0
Red Cell Distribution Width (RDW)	**18.0**		%	11.5 - 14.5
Reticulocyte Evaluation (Bone Marrow Response)				
Reticulocyte Percentage	**8.0**		%	0.5 - 2.0
Absolute Reticulocyte Count	**280.0**		$x10^{9}/L$	
Leukocyte & Platelet Panel				
White Blood Cell Count (WBC)	**6.80**		$x10^{3}/\mu L$	4.5 - 11.0
Platelet Count (Plt)	**220**		$x10^{3}/\mu L$	150 - 450

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CBC Report (3)

PATIENT NAME	MRN / DOB	AGE / GENDER	ORDERING PHYSICIAN
PETROVA, MARIA N.	**#9034120 / 02-14-2008**	**18 YRS / Female**	**Dr. B. Carter, MD**

CLINICAL PRESENTATION (TEACHING VIGNETTE)

18-year-old female of Bulgarian descent presenting for a routine pre-college physical. She reports life-long mild fatigue and has been previously told she has mild "anemia", without significantly increased family history. Physical examination is unremarkable, with no palpable splenomegaly or jaundice.

COMPLETE BLOOD COUNT (CBC) WITH RETICULOCYTE COUNT

TEST PARAMETER	RESULT	FLAG	UNITS	REFERENCE
Erythrocyte Indices & Red Cell Panel				
Red Blood Cell Count (RBC)	**5.50**		$x10^{12}/L$	3.80 - 5.10
Hemoglobin (Hgb)	**10.5**		g/dL	12.0 - 15.5
Hematocrit (Hct / PCV)	**31.0**		%	36.0 - 46.0
Mean Corpuscular Volume (MCV)	**58.0**		fL	80.0 - 100.0
Mean Corpuscular Hgb (MCH)	**19.1**		pg	27.0 - 33.0
MCH Concentration (MCHC)	**33.9**		g/dL	32.0 - 36.0
Red Cell Distribution Width (RDW)	**13.8**		%	11.5 - 14.5
Reticulocyte Evaluation (Bone Marrow Response)				
Reticulocyte Percentage	**2.5**		%	0.5 - 2.0
Absolute Reticulocyte Count	**137.5**		$x10^9/L$	
Leukocyte & Platelet Panel				
White Blood Cell Count (WBC)	**7.20**		$x10^3/\mu L$	4.5 - 11.0
Platelet Count (Plt)	**250**		$x10^3/\mu L$	150 - 450

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CBC Report (4)

PATIENT NAME	MRN / DOB	AGE / GENDER	ORDERING PHYSICIAN
DAVIS, HAROLD J.	#8123456 / 11-15-1955	68 YRS / Male	Dr. K. Patel, MD

CLINICAL PRESENTATION (TEACHING VIGNETTE)

68-year-old male recently diagnosed with Acute Myeloid Leukemia (AML) with confirmed >85% bone marrow replacement by leukemic blasts. He presents with profound fatigue, severe back pain, and significant spontaneous bruising and mucosal bleeding over the past 3 weeks. Previous CBCs had been stable until 2 months ago. Physical examination reveals pallor, extensive petechiae, and a palpable splenomegaly of 10cm. Treatment is currently pending cytogenetics.

COMPLETE BLOOD COUNT (CBC) WITH RETICULOCYTE COUNT

TEST PARAMETER	RESULT	FLAG	UNITS	REFERENCE
Erythrocyte Indices & Red Cell Panel				
Red Blood Cell Count (RBC)	**2.10**		$x10^{12}/L$	3.80 - 5.10
Hemoglobin (Hgb)	**6.5**		g/dL	12.0 - 15.5
Hematocrit (Hct / PCV)	**20.0**		%	36.0 - 46.0
Mean Corpuscular Volume (MCV)	**90.0**		fL	80.0 - 100.0
Mean Corpuscular Hgb (MCH)	**29.3**		pg	27.0 - 33.0
MCH Concentration (MCHC)	**32.5**		g/dL	32.0 - 36.0
Red Cell Distribution Width (RDW)	**18.5**	**H**	%	11.5 - 14.5
Reticulocyte Evaluation (Bone Marrow Response)				
Reticulocyte Percentage	**0.2**		%	0.5 - 2.0
Absolute Reticulocyte Count	**4.2**		$x10^9/L$	
Leukocyte & Platelet Panel				
White Blood Cell Count (WBC)	**2.10**		$x10^3/\mu L$	4.5 - 11.0
Platelet Count (Plt)	**15**		$x10^3/\mu L$	150 - 450

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CBC Report (5):

PATIENT NAME	MRN / DOB	AGE / GENDER	ORDERING PHYSICIAN
DOE, JANE M.	#9834120 / 04-12-1994	32 YRS / Female	Dr. A. Vance, MD

CLINICAL PRESENTATION (TEACHING VIGNETTE)

32-year-old female presenting with a 4-month history of progressive fatigue, exertional dyspnea, and heavy menorrhagia (7–8 days).Presented for a scheduled laboratory follow-up.

COMPLETE BLOOD COUNT (CBC) WITH RETICULOCYTE COUNT

TEST PARAMETER	RESULT	FLAG	UNITS	REFERENCE
Erythrocyte Indices & Red Cell Panel				
Red Blood Cell Count (RBC)	**3.80**		$x10^{12}/L$	3.80 - 5.10
Hemoglobin (Hgb)	**10.1**		g/dL	12.0 - 15.5
Hematocrit (Hct / PCV)	**32.5**		%	36.0 - 46.0
Mean Corpuscular Volume (MCV)	**72.0**		fL	80.0 - 100.0
Mean Corpuscular Hgb (MCH)	**21.0**		pg	27.0 - 33.0
MCH Concentration (MCHC)	**29.5**		g/dL	32.0 - 36.0
Red Cell Distribution Width (RDW)	**17.8**		%	11.5 - 14.5
Reticulocyte Evaluation (Bone Marrow Response)				
Reticulocyte Percentage	**4.5**		%	0.5 - 2
Absolute Reticulocyte Count	**171**		$x10^9/L$	
Leukocyte & Platelet Panel				
White Blood Cell Count (WBC)	**6.4**		$x10^3/\mu L$	4.5 - 11.0
Platelet Count (Plt)	**460**		$x10^3/\mu L$	150 - 450

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ANSWER SHEET:

Dear student, please note that learning the proper approach to anemia in a CBC report is only the first step that must be followed by further studies that you will learn later.

CBC Report (1): Hb (low; anemia) → MCV (low; microcytic) → Retic. (normal/low; no reticulocytosis) = most probably **Vitamin B12 Deficiency**. However, further testing is needed to confirm your diagnosis.

CBC Report (2): Hb (low; anemia) → MCV (normal; normocytic) → Retic. (high; reticulocytosis) = Hemolytic anemia. Note that the MCHC is high, which further supports your diagnosis as **Hereditary Spherocytosis**. However, further testing is needed to confirm your diagnosis.

CBC Report (3): Hb (low; anemia) → MCV (low; microcytic) → Retic. (slightly high; element of reticulocytosis) = most probably **Thalassemia**. Note that the RBC Count is high which further supports your diagnosis of Thalassemia minor. However, further testing is needed to confirm your diagnosis.

CBC Report (4): Hb (low; anemia) → MCV (normal; normocytic) → Retic. (low; reticulocytopenia) = most probably **Bone Marrow Infiltration**. Note that WBCs and PLT are low which further supports your diagnosis. However, further testing is needed to confirm your diagnosis.

CBC Report (5): Hb (low; anemia) → MCV (low; microcytic) → Retic. (high; reticulocytosis) = most probably **Iron Deficiency Anemia on Iron Supplementation**. Note that the RDW and the clinical vignette support your diagnosis and the reticulocytosis is the bone marrow response following treatment.