NIHS RESIDENCY TRAINING PROGRAM

Adult Haematology

Final Written Examination

Examination Format:

National Institute for Health Specialties NIHS (Emirate Board) final specialty written examination shall consist of one paper with 80-120 Single Best Answer MCQs. Up to 10 % unscored items can be added for pretesting purposes.

Passing Score:

The pass mark in the Final Written Examination will be determined according to the scientific standards and based on reliable practices in assessment.

Suggested References:

TEXT BOOKS:

- Hematology, 7th Edition, Basic Principles and Practice by Ronald Hoffman
- Wintrobe's Clinical Hematology Thirteenth Edition by John P. Greer
- Williams Hematology, 9th Edition by Kenneth Kaushansky
- ASH –SAP American Society of Hematology Self-Assessment Program, 6th edition
- Dacie and Lewis Practical Haematology, 12th Edition, by Barbara Bain, Imelda Bates, Mike Laffan
- Bone Marrow Pathology by Kathryn Foucar
- *WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues, WHO Classification of Tumours, Revised 4th Edition. Edited by Swerdlow SH, Campo E, Harris NL, Jaffe ES, Pileri SA, Stein H, Thiele J, 2017.

JOURNALS:

- Blood
- Blood Review
- British Journal of Hematology
- Hemophilia
- Journal of Thrombosis and Hemostasis
- Hematology: ASH Education Program Book
- New England Journal of Medicine
- Bone Marrow Transplantation
- Biology of Blood and Marrow Transplantation
- Journal of Clinical Oncology
- Leukemia & Lymphoma
- Leukemia
- The Lancet
- Lancet Oncology

On-Line RESOURCES: Uptodate.com
ASH Image Bank

Note:

This list is intended for use as a study aid only. NIHS does not intend the list to imply endorsement of these specific references, nor are the exam questions necessarily taken solely from these sources.

Blueprint Outlines:

No.	Sections	Percentage
1	Hematopoietic System	18%
2	Bleeding disorders	11%
3	Thrombosis	10%
4	Transfusion Medicine	7%
5	Myeloproliferative disorders and Leukemia	15%
6	Lymphoproliferative disorders	14%
7	Plasma Cell Neoplasm	10%
8	Pharmacology & complications of hematopoietic neoplasms	5%
9	Hematopoietic Cell Transplantation (HCT) & CAR-T cell therapy	10%
Total		**100%**

Notes:

- Blueprint distributions of the examination may differ up to +/-5% in each category.
- Percentages and content are subject to change at any time. See the website for the most up-to-date information.
- Research, Ethics, Professionalism, and Patient Safety are incorporated within various domains.

Main topics to be assessed under each major discipline are as follows:

✞ **Hematopoietic System 18%**

1. **Normal Hematopoiesis**
2. **RBC**

Red blood cell production disorders
Nutritional deficiencies
Anemia of chronic disease
Red cell aplasia and hypoplasia
Sideroblastic anemia
Red blood cell destruction disorders
Thalassemias
Alpha thalassemia
Beta thalassemia
Hemoglobin E disorders
Sickle cell disorders
Sickle cell trait
Sickle cell anemia (hemoglobin SS disease)
Hemoglobin SC disease and C hemoglobinopathy
Sickle cell-β_0 and sickle cell-β_+-thalassemias
Non-sickle hemoglobinopathies
Autoimmune hemolytic anemias (AIHA)
Warm antibody-mediated autoimmune hemolytic anemia
Cold antibody-mediated autoimmune hemolytic anemia
Drug-induced hemolysis
Metabolic enzyme deficiency hemolytic anemias
Paroxysmal nocturnal hemoglobinuria
Red blood cell membrane disorders
Microangiopathic hemolytic anemias (other than TTP, HUS, or DIC)
Non-autoimmune, acquired hemolytic anemias
Erythrocytosis
Porphyrias
Hemochromatosis

3. **WBC**

Granulocyte dysfunction disorders
Granulocytopenia
Lymphocytopenia and lymphocyte dysfunction syndromes
Leukocytosis
Eosinophilia

4. **BM failure**

Aplastic anemia

Inherited aplastic anemia
Acquired aplastic anemia
Pancytopenia

✞ **Bleeding disorders 11%**

1- Platelet and megakaryocyte disorders

Inherited disorders of platelet function
Acquired disorders of platelet function
Drug-induced disorders
Non-drug-induced disorders
Thrombocytopenia
Inherited thrombocytopenia
Acquired thrombocytopenia
Immune thrombocytopenic purpura (ITP)
Drug-induced thrombocytopenia
Thrombotic thrombocytopenic purpura (TTP)
Hemolytic uremic syndrome (HUS)
Thrombocytopenia secondary to liver disease and splenic disorders
Thrombocytosis

2- Hemostasis

Molecular basis of coagulation and hemostatic agents
Normal hemostasis
Laboratory evaluation
Hemostatic drugs

3- Inherited bleeding disorders (non-platelet)

Von Willebrand disease
Types 1, 2A, 2M, 2N, and 3
Type 2B
Modifiers of von Willebrand factor levels
Hemophilias A and B
Hemophilia A
Hemophilia B
Factor XI deficiency
Factor deficiencies other than factor XI
Inherited vascular abnormalities

4- Acquired bleeding disorders (non-platelet)

Factor inhibitors
Disseminated intravascular coagulation (DIC)
Acquired vascular abnormalities
Secondary acquired factor deficiencies

✞ **Thrombosis 10%**

1- Molecular basis of natural anticoagulants, fibrinolytic

Pathway and anticoagulant therapy
Normal anticoagulant and fibrinolytic mechanisms
Laboratory evaluation
Anticoagulant drugs

2- Thrombotic disorders

Inherited thrombotic disorders
Factor V Leiden and prothrombin G20210A
Deficiencies of natural anticoagulants
(Antithrombin, proteins C and S)
Disorders involving cysteine and homocysteine metabolism

3- Acquired thrombotic disorders

Heparin-induced thrombocytopenia (HIT)
Anti-phospholipid antibody syndrome (APS)
Cancer-related thrombotic disorders

4- Thromboembolism at unusual sites

5- Thrombosis management (non-disease-specific) 6- Complications of thrombotic disorders

✞ **Transfusion medicine 7%**

1- Clinical indications for the use of blood products

Red blood cell preparations
Platelet preparations
Granulocyte preparations
Fresh frozen plasma
Cryoprecipitate

2- Risks associated with blood products

Risks associated with administration
Allergic reactions
Nonanaphylactic allergic reactions
IgA deficiency
Anaphylactic reactions
Graft-versus-host disease
Electrolyte disturbances

Infectious organisms
Alloimmunizations
Transfusion reactions
Hemolytic reactions
Febrile reactions
Transfusion-related acute lung injury (TRALI)
Transfusion-related circulatory overload (TACO)
Post-transfusion purpura and other risks associated with dministration

Risks associated with therapeutic apheresis procedures

✞ **Myeloproliferative disorders and Leukemia 15%**

1- Myeloproliferative neoplasms

Chronic myeloid leukemia
Polycythemia vera and secondary erythrocytosis
Primary myelofibrosis
Essential thrombocythemia
Mastocytosis
Chronic neutrophilic leukemia

2- Acute myeloid leukemias (AML)

Acute promyelocytic leukemia
AML with recurrent genetic abnormalities
Therapy-related myeloid neoplasms
Myeloid sarcoma
AML with myelodysplasia-related changes
AML not otherwise specified

3- Myelodysplastic syndromes (MDS) and chronic myelomonocytic leukemia

Myelodysplastic syndromes
Chronic myelomonocytic leukemia

4- Myeloid and lymphoid neoplasms with eosinophilia and abnormalities of PDGFRA, PDGFRB, or FGFR1

✞ **Lymphoproliferative disorders 14%**

1- B-cell neoplasms

B-cell acute lymphoblastic leukemia/lymphoma (B-ALL)
Lymphoplasmacytic lymphoma
Chronic lymphoid leukemias
Chronic lymphocytic leukemia/small lymphocytic lymphoma
Monoclonal B-cell lymphocytosis

Hairy cell leukemia
B-cell prolymphocytic leukemia
Non-Hodgkin lymphomas, B-cell
Diffuse large B-cell lymphoma
Follicular lymphoma
Mantle cell lymphoma
Marginal zone B-cell and mucosa-associated lymphoid tissue (MALT) lymphomas
Burkitt and Burkitt-like lymphomas
Primary central nervous system lymphoma
General lymphoma issues (not specific to lymphoma type)

2- Immunodeficiency-associated lymphoproliferative disorders

Post-transplantation lymphoproliferative disorders
Lymphomas associated with HIV infection or primary immune disorders
Lymphoproliferative disorders associated with iatrogenic immunodeficiency

3- T-cell and NK-cell neoplasms

T-cell acute lymphoblastic leukemia/lymphoma (T-ALL)
Cutaneous T-cell lymphoma (mycosis fungoides and Sezary syndrome)
T-cell lymphomas
Adult T-cell leukemia/lymphoma
Large granular lymphocyte leukemia

4- Hodgkin lymphoma

Classical Hodgkin lymphoma
Nodular lymphocyte-predominant Hodgkin lymphoma

5- Histiocytic and dendritic cell neoplasms

✞ Plasma cell neoplasms 10%

1- Multiple myeloma
2- Plasmacytomas
3- Amyloidosis
4- Castleman disease
5- Monoclonal gammopathy of undetermined significance (MGUS)

✞ Pharmacology & complications of hematopoietic neoplasms 5%

1- Complications of hematologic malignancies

Hemophagocytic syndrome
Tumor lysis syndrome
Spinal cord compression
Paraneoplastic disorders

2- Pharmacology

Toxicities and complications, including cytopenic complications
Drug dosing and dose modifications

✞ **Hematopoietic Cell Transplantation (HCT) and CAR-T Cell Therapy 10%**

1- Stem cell biology and engraftment

Biology of hematopoiesis and hematopoietic cell transplantation
Tumor immunology
Biologic and immunologic relationship between donor and host

2- Hematopoietic cell transplantation in the management of hematologic diseases

Autologous transplantation
Syngeneic transplantation
Allogeneic transplantation
Reduced-intensity allogeneic transplantation
Haplo-identical transplantation
Cord blood transplantation

3- Conditioning regimens

Components
Toxicities

4- Collecting and handling cells for transplantation

Bone marrow
Peripheral blood
Mobilization
Donor complications of cell collection

5- Prophylaxis and supportive care

Preventing infectious disease
Pharmacologic prevention
Environmental prevention
Immunosuppressive therapy for graft-versus-host disease (GVHD)
Graft-versus-host disease
T-cell depletion

Complications of immunosuppressive therapy
Transfusion and blood product issues related to transplantation

6- Complications after hematopoietic cell transplantation

Marrow engraftment failure
Graft-versus-host disease, clinical
Acute
Chronic
Opportunistic infections
Hepatic sinusoidal obstruction syndrome
Management of relapse
Late effects

7- Biology of CAR-T cell therapy, indications and complications

Example Questions

EXAMPLES OF K2 QUESTIONS
Question 1

A 22-year-old man with sickle cell disease came with acute onset of dizziness, palpitation for one day. Examination reveals pallor and tachycardia. No organomegaly, CNS and other clinical exam is unremarkable. A transfusion of PRBC was ordered in the Emergency Department (see lab results).

Test	Result	Normal Value
Hb	5.5	130-170 g/L
WBC	7.5	4.5-10.5 x 10^9/L
Platelets	250	150-400 x 10^9/L
Reticulocytes	1	0.2-1.2 %

Which of the following is the most likely cause?

A. Acute hemolytic crises
B. Iron deficiency anemia
C. Acute sequestration crises
D. Aplastic crises from Parvovirus B19

EXAMPLES OF K1
Question 2

Elevated serum ferritin, serum iron and percentage transferrin saturation are most consistent with which of the following diagnoses?

A. IDA
B. Lead poisoning
C. Hemochromatosis
D. Anemia of chronic inflammation