Haematology SAQ Questions

Questions were made by students on behalf of The Peer Teaching Society. We hope there are no mistakes but are not liable for any false or misleading information.

1. A 60-year-old man presents to his GP with blood in his stools. He has also been experiencing fatigue and reports unintentional weight loss of a stone over the past month. The GP requests some blood tests, obtaining the following results:

   Hb 120 g/L (130-180)
   WCC 14.9 $x10^9$/L (3.6-11.0)
   MCV 69 fL (80-100)
   Ferritin 18 ng/mL (25-350)

   What is the diagnosis and the underlying clinical cause of these blood results? (2 marks)

2. Name 3 signs or symptoms of immune thrombocytopenia purpura. (3 marks)

3. A pregnant mother is attending antenatal clinic, she is originally from Ghana and is a known sickle cell trait carrier. Her husband is also a carrier. She is concerned about the risks to her unborn baby.

   What is the chance of their child having sickle cell anaemia? (1 mark)

4. Name 3 signs you might see on examination of a patients' face, skin, and nails that are associated with iron deficiency anaemia. (3 marks)

5. What signs would you expect to see in a patient when diagnosing malaria? (3 marks)

6. Which species of protozoa can cause relapses of malaria? (2 marks)

7. What are the criteria needed to characterise multiple myeloma? (3 marks)

8. Which chromosomal abnormalities are associated with multiple myeloma? (1 mark)

9. You see a 50-year-old male in A&E who has presented with breathlessness, bone pain and a severe infection. His temperature is 39.1, his heart rate is 110 and his blood pressure is 130/85. He tells you this is the 3rd severe infection he has had in 6 months and thinks they are causing him to lose weight. On examination, you note hepatosplenomegaly and see some gum hypertrophy.

    a) What is the most likely diagnosis for this man? (1 mark)

    b) What would you expect to see on a bone marrow biopsy? (1 mark)

    c) What 2 things are associated with this cancer? (2 marks)

    d) Give 3 treatments this man is likely to receive (3 marks)

10. You are a medical student on placement where you see a patient with diagnosed chronic lymphoblastic leukaemia. You have the opportunity to speak with him and examine him.

    a) What age would you expect this man to be? (1 mark)

    b) What would you expect to find on examination? (2 marks)

    c) What would you expect to see on a blood film? (1 mark)

    d) What treatment would this man be receiving? (2 marks)

    e) What is a complication of CLL that you should be aware of? (1 mark)

11. You see a 17-year-old male with fever and night sweats. He admits to sometimes drinking with his friends and tells you that over the last 2 months he gets painful lumps in his neck and armpits when he drinks. He has no significant family history, does not smoke or take any recreational drugs.

    a) What investigations would you want to order before making a diagnosis and what signs would you expect to see reported in the results? (6 marks)

    b) What is the most likely diagnosis for this patient? (1 mark)

    c) What would you be the treatment plan for this patient? (3 marks)

12. A 35-year-old male presents with increased urinary frequency, pain on urination and mild back pain. He is pyrexic, tachycardic and tachypnoeic. You send a urine sample which returns positive for a UTI. You explain the diagnosis to the man, and tell him that he will need antibiotics to get rid of the infection. At this point, he tells you that he has G6PD deficiency.

    a) What is the function of G6PD? (2 marks)

    b) What are 3 of the common symptoms of G6PD deficiency? (3 marks)

    c) What would you see on a blood film for this man? (2 marks)

    d) What antibiotic is now contraindicated for his UTI? (1 mark)

13. An 80-year-old man recently had a fall which resulted in a fracture neck of femur. He successfully underwent a total hip replacement and is currently being warded in the NGH. During the ward rounds, being a good F1 doctor, you assess and examine him. It is noted that he has a swell in his left calf only. It appears slightly pale and it is painful when you squeeze it.

    a) What is the most likely diagnosis? (1 mark)

    b) Pain and pallor are 2 out of the 6 symptoms for acute limb ischaemia. What are the 4 other symptoms? (4 marks) (HINT 6 P's)

    c) Name 1 possible complication. (1 mark)

    d) What is the first line investigation? (1 mark)

    e) What is the name of the Scoring system used in making a diagnosis? (1 mark)

    f) List 4 factors in the scoring system. (4 marks)

14. 75yo M patient presented with severe SOB, hypotension, fever and increased RR. He has a history of an untreated UTI caused by E. Coli. His vital signs are as below. SIRS Criteria is met.

- Temp 38.5
- HR 160bpm
- BP 80/60mmHg
- RR 26/min
- O2 Sats 88%

On physical examination, there was tachypnoea. Chest auscultation was positive for bilateral wet crackles. The patient is coughing up pink frothy sputum.

He began to bleed from his mouth, nose, ears and eyes. The patient is presenting with UTI that has led to a septic shock and eventually into Acute Respiratory Distress Syndrome.

You took some bloods as part of SEPSIS 6, and the results are shown below.

- Platelet Count: Low
- Prothrombin Time: Elevated
- APTT: Elevated
- Bleeding Time: Elevated
- Fibrin Degradation Products: High D-Dimer: Elevated
- Fibrinogen levels: Low Coagulation Factor Levels: Low

a) What haematological condition does this patient have? (1 mark)

b) Explain its pathophysiology (3 marks)

c) What does a sepsis 6 involve? (6 marks) (HINT – Give 3, take 3)

d) Which antibiotic is to be prescribed for the complicated UTI caused by E. coli? (1 mark)

15. 35yo M patient presents with blurred vision, headaches and SOB. He has been feeling increasingly tired and has lost weight over the past few months. He has a history of TIAs and angina.

    On examination, there is tenderness in the Left Upper Quadrant. It is noted that he has gum bleeding.

    ECG was normal. Abdominal X Ray showed splenomegaly. Blood Results are seen below:

- RBC: Elevated
- Haematocrit: Elevated
- Haemoglobin Count: Elevated

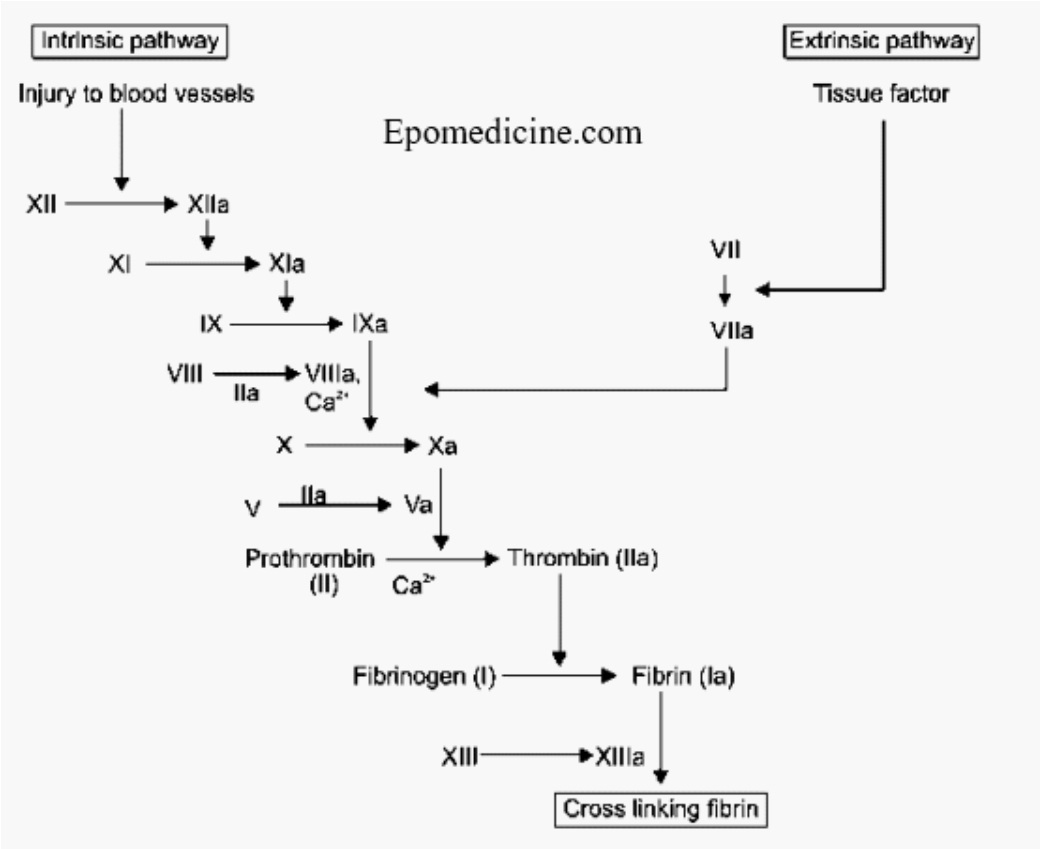
a) What other investigations would you carry out that affects RBC production? (1 mark)

A genetic test was carried out which indicated a JAK-2 mutation

b) What is the diagnosis? (1 mark)

c) What are some potential differential diagnoses? (2 marks)

16. Below is the coagulation cascade



a) Fill in the table below. (4 marks)

Disease	Inheritance	Deficiency
Haemophilia A	X linked recessive	Factor VIII
Haemophilia B		
Haemophilia C		

b) Define the terms below. (7 marks)

- Platelet count
- Bleeding time
- Partial thromboplastin time (PT)
- Activated partial thromboplastin time (ATT)
- Thrombin time (TT)
- Fibrin degradation products
- D-dimer

c) For each of the above terms state whether they increase, decrease or remain the same for patients with haemophilia. (7 marks)

d) Name 3 symptoms a patient with haemophilia would present with (3 marks)

e) What is the treatment for haemophilia? (1 mark)

Total Marks (100)

Haematology SAQ Answers

Question	Answers
1.	Iron deficiency anaemia caused by colorectal cancer Extra Info Causes – GI bleeding (inc. cancer), menorrhagia, hookworm, poor diet, veggie/vegan, increased demand (growth, pregnancy), malabsorption and coeliac disease Blood results – low Hb (anaemia), low WCC (cancer), low MCV (microcytic anaemia), low ferritin (confirms iron deficiency anaemia although this could be raised in malignancy) Other results not mentioned in question – low serum iron (total iron binding capacity rises compared to normal) low transferrin, low transferrin. Blood film (microcytic hypochromic RBCs, poikilocytosis (variation in RBC shape) and anisocytosis (variation in RBC size)
2.	Easy bruising, epistaxis, menorrhagia, purpura (purple spots on the skin caused by bleeding underneath the skin), gum bleeding Splenomegaly and major haemorrhage are rare causes Extra info Epidemiology: • Primary ITP in children (acute) ○ Occurs most commonly in the 2-6 year age group ○ Acute onset with muco-cutaneous bleeding ○ May be a history of recent viral infection including chicken pox and measles ○ May also follow immunisation ○ Although bleeding may be severe, life-threatening haemorrhage is rare ○ Sudden self-limiting purpura • Secondary ITP in adults (chronic) ○ Characteristically seen in women ○ May be associated with other autoimmune disorders such as SLE, thyroid disease and autoimmune haemolytic anaemia ○ Also seen in patients with chronic lymphocytic leukaemia and solid tumours ○ May be a history of HIV or Hep C Investigations and diagnosis: • Bone marrow examination shows thrombocytopenia with increased or normal megakaryocytes in the marrow • Platelet autoantibodies - present in 60-70%, not needed for diagnosis Management: • First line ○ Corticosteroids e.g. Prednisolone ○ IV immunoglobulin e.g. IV IgG - raises platelet count more rapidly than steroids • Second line ○ Splenectomy ○ If splenectomy fails then immunosuppression e.g. Oral/IV azathioprine
3.	1 in 4 // 25% Sickle cell anaemia is an autosomal recessive condition. Both parents are carriers, therefore there is a 25% chance that their child will be affected (homozygous recessive), 50% chance that they will be a carrier (heterozygous) and 25% chance that they will be unaffected (homozygous dominant).

4.	Brittle skin/nails, koilonychia, subconjunctival pallor, atrophic glossitis, angular stomatitis.
5.	Malaria is the most common imported tropical disease in the UK. Patients often present with a fever (often 39 degrees or higher), sweats and/or chills, chills, headache, myalgia, fatigue, diarrhoea, vomiting and abdominal discomfort. The signs you would expect include anaemia, jaundice, hepatosplenomegaly and 'Black Water Fever'. Black water fever is a complication of malaria causing haemolysis of RBCs which results in Hb being released directly into the urine.
6.	P. ovale and P. vivax can form hypnozoites in the liver which can lie dormant for years and cause relapses. The medication primaquine can be given to eliminate these – however be careful as this can cause haemolysis in those with G6PD. Primaquine is also contraindicated in pregnancy and breastfeeding.
7.	Multiple myeloma is characterised by: - Monoclonal protein in serum or urine - Lytic bone lesions/ CRAB end organ damage - Excess plasma cells in bone marrow
8.	The most common chromosome abnormality associated with myeloma is t (11;14) – this is a reciprocal translocation between chromosome 11 and 14. An abnormality in chromosome 13q is associated with treatment resistance and poorer prognosis.
9.	a) Acute myeloid leukaemia b) Auer rods c) Down Syndrome Radiation d) Blood transfusion Allopurinol (to prevent tumour lysis) IV antibiotics Chemotherapy Steroids Bone marrow transplant
10.	a) 70+ b) Enlarged, rubbery, non-tender lymph nodes Sweating, anorexia Commonly asymptomatic c) Smudge cells d) Chemotherapy Monoclonal antibodies (rituximab) Bruton kinase inhibitors (ibrutinib) e) Richter's syndrome – transformation of CLL to an aggressive lymphoma
11.	a) FBC – anaemia, high ESR

	CXR – wide mediastinum Blood film – Reed-Sternberg cells b) Hodgkin lymphoma c) Chemotherapy ABVD treatment Marrow transplant
12.	a) It protects the RBCs against oxidative damage b) Fatigue, palpitations, shortness of breath, pallor c) Bite cells, reticulocytes d) Nitrofurantoin
13.	a) DVT b) pain, pallor, perishingly cold, pulselessness, paralysis, paraesthesia c) PE, post-thrombotic syndrome, chronic venous insufficiency d) D-dimer (if positive then follow with Doppler US which is the gold standard) e) Well's score f) **Features** — **Score (points)** Clinical signs and symptoms of DVT — 3.0 No alternative diagnosis — 3.0 Heart rate >100 beats/min — 1.5 Immobilization ≥3 days or surgery in the previous 4 weeks — 1.5 Previous DVT or PE — 1.5 Hemoptysis — 1.0 Malignancy with active treatment in the past 6 months or under palliative care — 1.0 Pretest clinical probability PE unlikely — ≤4.0 PE likely — >4.0 PE = Pulmonary embolism, DVT = Deep vein thrombosis
14.	a) Disseminated intravascular coagulation b) Tissue damage (from ARDS) will cause release and activation of tissue factor. This leads to widespread clot formation and the consumption of platelets and coagulation factors (thrombosis formation).A lso, the Tissue Plasminogen Activator is activated leading to increased fibrinolysis hence clotting is removed but increased risk of bleeding. DIC is a consumptive coagulopathy. Tissue Factor Release causes coagulation from both intrinsic & extrinsic pathways ➔ THROMBOSIS Thrombus are broken down by Fibrinolysis ➔ BLEEDING

	c) Give: Fluids, Broad spectrum Abx, Administer O2 if required Take: Bloods, Urine Output, Lactate levels d) Nitrofurantoin or trimethoprim
15.	a) EPO levels b) Polycythaemia ruba vera c) Acute dehydration, chronic obesity/HTN/alcohol excess
16.	a) **Disease** / **Genetic** / **Deficiency** Haemophilia A / X Linked Recessive / Factor VIII Haemophilia B / X Linked Recessive / Factor IX Haemophilia C / Autosomal Recessive / Factor XI b) Platelet count – level of platelets. A normal **platelet count** ranges from 150,000 to 450,000 **platelets** per microliter of blood. Having more than 450,000 **platelets** is a condition called thrombocytosis; having less than 150,000 is known as thrombocytopenia. Bleeding time - Bleeding time is a laboratory test to assess platelet function and the body's ability to form a clot. The test involves making a puncture wound in a superficial area of the skin and monitoring the time needed for bleeding to stop (ie, bleeding site turns "glassy"). PT – The prothrombin time is a measure of the integrity of the extrinsic and final common pathways of the coagulation cascade. This consists of tissue factor and factors VII, II (prothrombin), V, X, and fibrinogen. The test is performed by adding calcium and thromboplastin, an activator of the extrinsic pathway, to the blood sample then measuring the time (in seconds) required for fibrin clot formation. APTT – a measure of the functionality of the intrinsic and common pathways of the coagulation cascade. Thrombin time – Thrombin time is a screening coagulation test designed to assess fibrin formation from fibrinogen in plasma. The reference range for the thrombin time is usually less than 20 seconds Fibrin degradation products - Fibrin and fibrinogen-degradation product (FDP) testing is commonly used to diagnose disseminated intravascular coagulation (DIC). d-dimer – D-dimer is the degradation product of crosslinked (by factor XIII) fibrin. It reflects ongoing activation of the hemostatic system. The reference concentration of D-dimer is < 250 ng/mL, or < 0.4 mcg/mL. c) Platelet Count – normal Bleeding Time – normal Partial Thromboplastin Time (PT) – normal Activated partial Thromboplastin Time (APTT) – increased Thrombin Time (TT) – normal or increased Fibrin Degradation Products – normal D-Dimer – normal d) Deep bruising, pain and swelling in joints, epistaxis, other unexplained bleeding, bleeds into heads can cause headaches/double vision/weakness/vomiting e) Replace the missing factor with plasma

Additional info - Blood products (taken from https://www.msdmanuals.com/en-gb/professional/hematology-and-oncology/transfusion-medicine/blood-products)

Red blood cells (RBCs)

Packed RBCs are ordinarily the component of choice with which to increase hemoglobin (Hb). Indications depend on the patient.

Washed RBCs are free of almost all traces of plasma, most white blood cells, and platelets. They are generally given to patients who have severe reactions to plasma (eg, severe allergies, paroxysmal nocturnal hemoglobinuria, IgA immunization).

WBC-depleted RBCs are prepared with special filters that remove ≥ 99.99% of white blood cells. They are indicated for patients who have experienced nonhemolytic febrile transfusion reactions, for exchange transfusions.

Fresh frozen plasma

Fresh frozen plasma (FFP) is an unconcentrated source of all clotting factors without platelets. Indications include correction of bleeding secondary to factor deficiencies for which specific factor replacements are unavailable, multifactor deficiency states (eg, massive transfusion, disseminated intravascular coagulation [DIC], liver failure), and urgent warfarin reversal only when prothrombin complex concentrate (PCC is the first choice), is unavailable..

Cryoprecipitate

Cryoprecipitate is a concentrate prepared from fresh frozen plasma. Each concentrate usually contains about 80 units each of factor VIII and von Willebrand factor and about 250 mg of fibrinogen. It also contains ADAMTS13 (an enzyme that is deficient in congenital thrombotic thrombocytopenic purpura), fibronectin, and factor XIII. Although originally used for hemophilia and von Willebrand disease, cryoprecipitate is currently used as a source of fibrinogen in acute DIC with bleeding.

White blood cells (WBCs)

Granulocytes may be transfused when sepsis occurs in a patient with profound persistent neutropenia (neutrophils < 500/mcL [0.5×10^9/L]) who is unresponsive to antibiotics.

Immune globulins

Rh immune globulin (RhIg), given IM or IV, prevents development of maternal Rh antibodies that can result from fetomaternal hemorrhage.

Platelets

Platelet concentrates are used

- To prevent bleeding in asymptomatic severe thrombocytopenia (platelet count < 10,000/mcL (<10×10^9/L))
- For bleeding patients with less severe thrombocytopenia (platelet count < 50,000/mcL (< 50×10^9/L))
- For bleeding patients with platelet dysfunction due to antiplatelet drugs but with normal platelet count
- For patients receiving massive transfusion that causes dilutional thrombocytopenia

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