# Higher Specialist Diploma

# Haematology

## September 2025

## Short Answer Questions

## 60 minutes

## Attempt all Four Questions

## Instructions to Candidates

1. Record your candidate number and HSD discipline on the front sheet of the answer booklet.

2. Record your candidate number, the question number and the page number in the spaces provided on the answer sheets.

3. Begin each new answer on a new page.

4. Each question is worth 25 marks.

1. You are seeking accreditation for a haematology laboratory test for which formal EQA is not available. Describe how you would ensure quality assurance of this test, and what issues you may face.

2. Identify the interfering substances and conditions that can affect the MCH and MCHC and describe how these would be overcome

3. You have recently been appointed as a Senior Biomedical Scientist within an area of Haematology. Devise a standardised draft SOP template for an investigation in your new area. Include brief explanations for why each section has been included in the SOP using named examples.

4. You identify an unexplained increase in immature granulocytes on the analyser. How would you interpret this finding and what could be the underlying pathology?

# Higher Specialist Diploma

## Haematology

## September 2025

## Essay Paper

## 120 minutes

## Attempt 2 out of 5 Questions

## Instructions to Candidates

1. Record your candidate number and HSD discipline on the front sheet of the answer booklet.

2. Record your candidate number, the question number and the page number in the spaces provided on the answer sheets.

3. Begin each new question on a new page.

4. Each question is worth 100 marks.

1. Critically discuss the value of genetic analysis in the diagnosis, monitoring and treatment of selected haematological malignancies

2. Your laboratory has recently switched from a low-prevalence area for the sickle cell and thalassaemia screening programme to a high prevalence area. Critically discuss how this would be managed and the implications for the laboratory

3. Critically discuss the measurement and result interpretation of D-Dimers.

4. Critically discuss the use and value of mixing studies in the haemostasis laboratory

5. Critically evaluate laboratory methods used to provide a differential diagnosis of vitamin $B_{12}$ deficiency from other macrocytic anaemias.

# Higher Specialist Diploma

# Haematology

# September 2025

# Case Studies

# 120 minutes

## Attempt all Case Studies

## Instructions to Candidates

1. Record your candidate number and HSD discipline on the front sheet of the answer booklet.

2. Record your candidate number and the page number in the spaces provided on the answer sheets.

3. Begin **each new case study on** a new page.

4. Each case study is worth 100 marks.

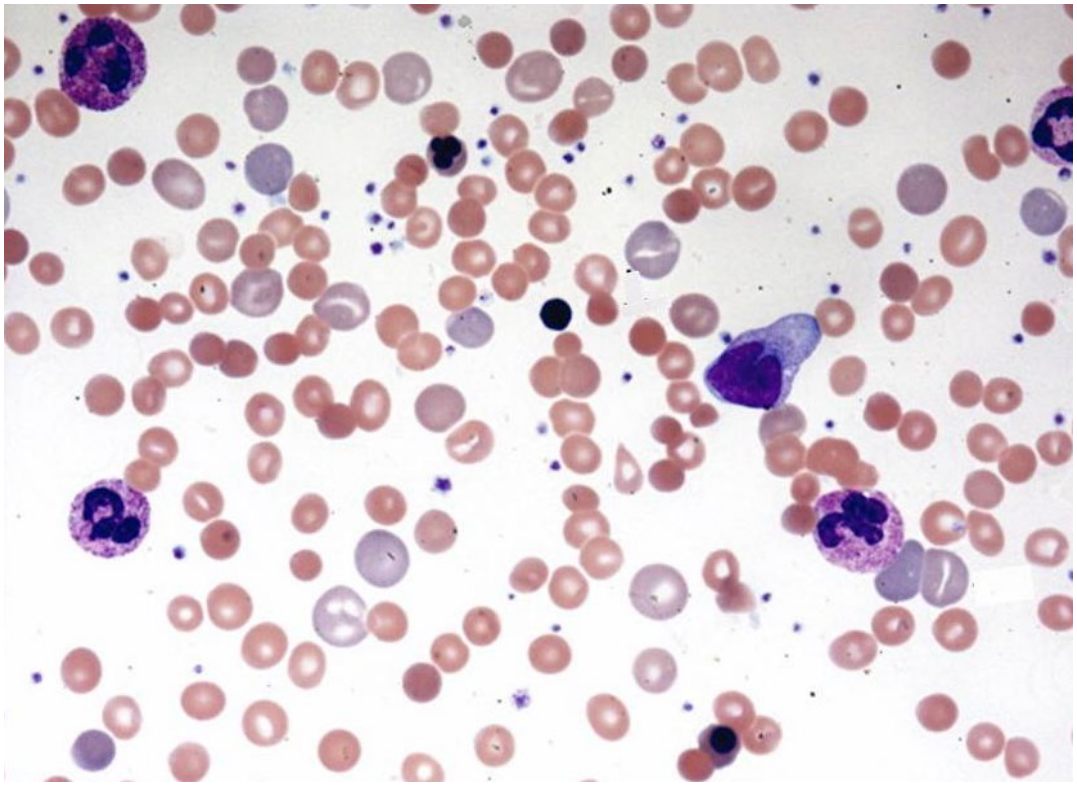
5. For these case study questions you are strongly advised to answer the questions as they arise during the case study to avoid later information impacting adversely on your answers to the earlier questions by presuming an "outcome".

**SEEN CASE STUDY**

1.

A 42 year old man presented with a nine-day history of increasing lethargy, malaise, dizziness, muscle and joint pain and brown urine. Clinical examination revealed jaundice and mild hepatosplenomegaly. Six years previously he had been successfully treated with chemotherapy for Hodgkin lymphoma. His FBC results and a representative field from a Romanowsky stained peripheral blood film are shown below.

| Parameter | Result | Units | Reference interval |
|---|---|---|---|
| WBC | 19.8 | x $10^9$/L | 4.0 – 11.0 |
| Neutrophils | 16.3 | x $10^9$/L | 2.0 – 7.0 |
| Hb | 60 | g/L | 120 – 160 |
| MCV | 95 | fL | 80 - 99 |
| Platelets | 382 | x $10^9$/L | 150 - 400 |



a. Comment on the FBC results and blood film appearances. (10%)

b. Suggest and justify an initial diagnosis. (10%)

c. Is it possible to exclude Evan's Syndrome at this stage? Justify your answer. (5%)

The results of follow-up analyses are given below. The direct antiglobulin test was strongly positive for IgG, moderately positive for C3 and negative for IgM. The coagulation screen sample was rejected by the laboratory due to the plasma exhibiting marked haemolysis.

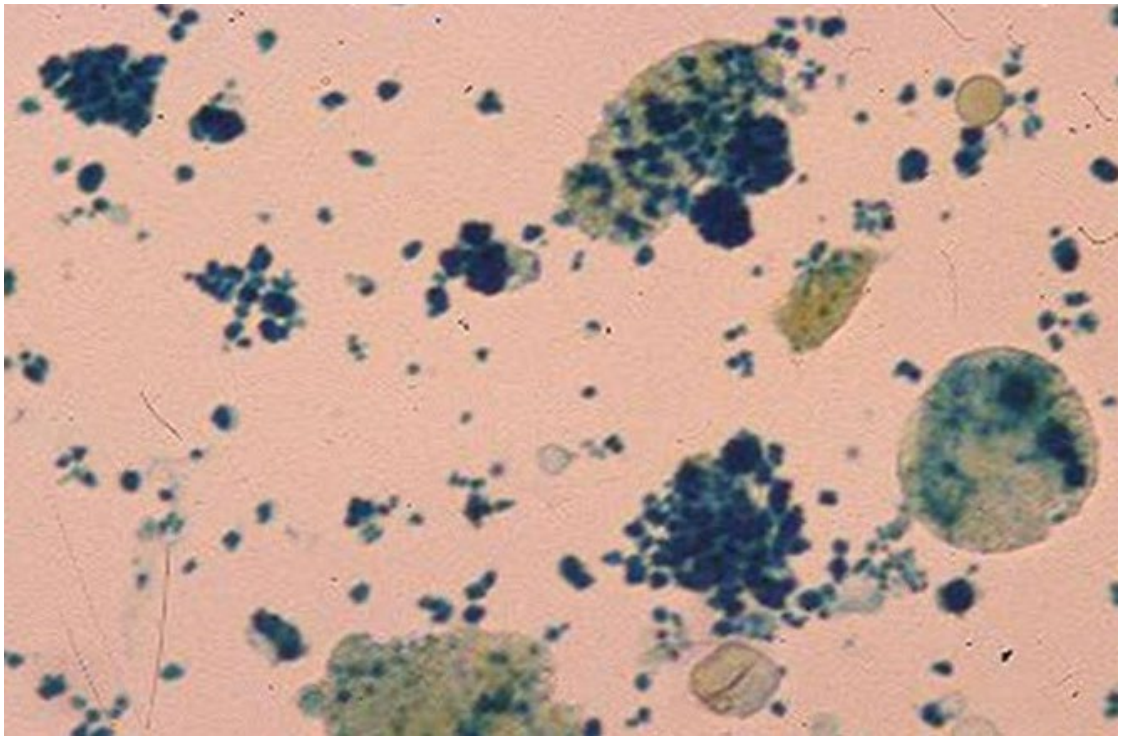
| Parameter | Result | Units | Reference interval |
|---|---|---|---|
| Reticulocytes | 370 | x $10^9$/L | 25 - 125 |
| Haptoglobins | Undetectable | mg/dL | 95 - 240 |
| LDH | 1760 | IU/L | 90 - 210 |
| ALT | 22 | IU/L | 5 - 45 |
| AST | 31 | IU/L | 10 - 50 |
| Total bilirubin | 155 | µmol/L | <17 |
| Direct bilirubin | 7 | µmol/L | <5 |

d. Comment on the follow-up results (10%)

e. Revise, refine or confirm your original diagnosis correlating all results to pathophysiology. (25%)

f. Discuss the rejection of the coagulation screen sample (10%)

A Perl's Prussian Blue stain was performed on the deposit from a sample of the patient's centrifuged urine and a representative field from the slide shown below.



g. What is the principle of this staining method? (5%)

h. Interpret the Perl's Prussian Blue stain (5%)

i. What does the Perl's Prussian Blue result tell us about the patient's pathological processes. Discss the occurrence of this result in this type of anaemia. (15%)

j. What other tests may be appropriate and why? (5%)

## UNSEEN CASE STUDIES

2.

A 45 year old patient is seen in his local surgery complaining of recent shortness of breath. His GP requested a full blood count and coagulation screen, performed in the local hospital laboratory.

| **Full Blood Count** | | |
|---|---|---|
| | **Result** | **Reference Range** |
| Red cell count ($x10^{12}$/L) | 4.5 | 4.3-5.7 |
| Haemoglobin (g/L) | 140 | 133-167 |
| Mean Cell Volume (fL) | 90 | 77-98 |
| Mean Cell Haemoglobin (pg) | 31 | 27-34 |
| Platelets ($x10^9$/L) | 250 | 143-400 |
| White Blood Cell count ($x10^9$/L) | 7.3 | 4.0-10.0 |
| Neutrophils ($x10^9$/L) | 4.3 | 2.0-7.0 |
| Lymphocytes ($x10^9$/L) | 2.8 | 1.0-3.0 |

| **Haemostasis Investigations** | | |
|---|---|---|
| | **Result** | **Reference Range** |
| Prothrombin Time (s) | 13.0 | 10-14 |
| Activated partial Thromboplastin Time (s) | 32.0 | 24-34 |
| Fibrinogen (g/L) | 3.5 | 1.5-4.0 |

a. Describe the findings of this initial set of results. (10%)

A few days later, the patient attends A&E at your hospital complaining of chest pain and shortness of breath. He is tachycardic, and examination reveals swelling of his right calf. The clinician requests a further FBC, CS and a D-Dimer.

| **Full Blood Count** | | |
|---|---|---|
| | **Result** | **Reference Range** |
| Red cell count ($x10^{12}$/L) | 4.5 | 4.2-5.8 |
| Haemoglobin (g/L) | 140 | 120-160 |
| Mean Cell Volume (fL) | 90 | 77-98 |
| Mean Cell Haemoglobin (pg) | 31 | 27-34 |
| Platelets ($x10^9$/L) | 250 | 140-400 |
| White Blood Cell count ($x10^9$/L) | 10.0 | 4.0-10.0 |
| Neutrophils ($x10^9$/L) | 7.0 | 2.0-7.0 |
| Lymphocytes ($x10^9$/L) | 2.8 | 1.0-3.0 |

| **Haemostasis Investigations** | | |
|---|---|---|
| | **Result** | **Reference Range** |
| Prothrombin Time (s) | 13.0 | 9-11 |
| Activated partial Thromboplastin Time (s) | 34.0 | 22-30 |
| Fibrinogen (g/l) | 3.5 | 1.5-4.0 |
| D-Dimer (ng/ml FEU) | 600 | <500 |

b. Describe the findings of this follow up set of results. (10%)

c. Can you suggest a diagnosis based on these results so far? (10%)

d. The patient is age 45 – would you change your decision if patient was age 75. Explain your reasoning. (10%)

e. What reasons could be behind any discrepancy between the 1st and 2nd set of results? (15%)

f. The patient is referred for a VQ scan and is diagnosed with a PE. Your haematologist states he wouldn't have requested a D-Dimer test given the patients clinical details – why might this be? (5%)

g. The patient is started on Apixaban, and his GP requests a thrombophilia screen. Your haematologist cancels the request whilst he is still on treatment – what reasons would he have? (10%)

The patient is treated for 6 months. His GP then requests a thrombophilia screen again, after he has stopped apixaban for a week. The following results are obtained:

| | Result | Reference Range |
|---|---|---|
| Protein C activity iu/dl | 100 | 50-150 |
| Protein S activity iu/dl | 100 | 65-135 |
| Protein S free antigen iu/dl | 80 | 55-145 |
| Antithrombin activity iu/dl | 100 | 80-120 |
| FV Leiden screen | FVL absent | - |
| P20210A screen | P20210A absent | - |
| DRVVT test ratio | 2.0 | 0.8-1.2 |
| DRVVT confirm ratio | 1.2 | 0.8-1.2 |
| Anticardiolipin IgG ug/ml | 80 | 0-40 |
| B2Gp1 IgG ug/ml | 100 | 0-30 |

h. Comment on these results. (15%)

i. Would you carry out any further testing? (5%)

j. The patient is restarted anticoagulation on warfarin – explain this choice. (5%)

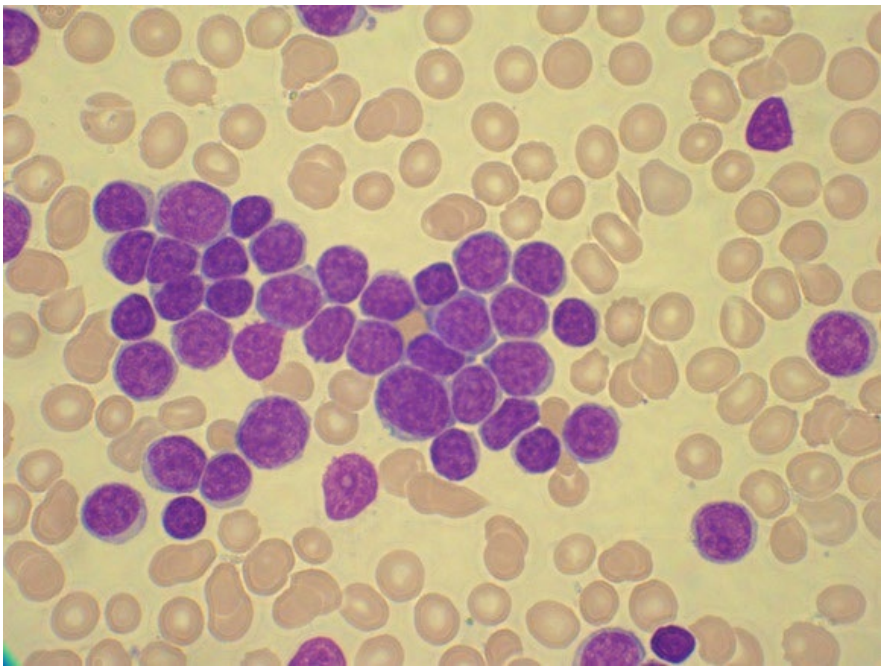
k. The patient's warfarin is monitored in his GP surgery using POC device. After an INR result of 4.5, a sample is sent to his local hospital for checking and the INR comes back as 3.5. Comment on this finding. (5%)

3.

A 68 year-old male presents to his GP with a three month history of weight loss (approx. 5kg), increasing lethargy, night sweats and unilateral cervical lymphadenopathy. Physical examination revealed hepatosplenomegaly, pallor and slight jaundice. The GP requested a full blood count which generated the following results:

| Parameter | Result | Reference Range |
|---|---|---|
| RBC | 2.78 | 4.3-5.7x$10^{12}$/L |
| Haemoglobin | 85 | 133-167 g/L |
| MCV | 103 | 77-98 fL |
| HCT | 0.31 | 0.35-0.53 L/L |
| MCH | 31 | 26-33pg |
| MCHC | 285 | 330-370 pg/L |
| Plt | 62 | 143-400 x$10^{9}$/L |
| WBC | 220.6 | 4.0-10.0 x$10^{9}$/L |
| Neutrophils | 16.2 | 2.0-7.0 x $10^{9}$/L |
| Lymphocytes | 97 | 1.0-3.0 x $10^{9}$/L |
| Monocytes | 3.24 | 0.2-1.0 x $10^{9}$/L |
| Eosinophils | 0.32 | 0.02-0.5 x $10^{9}$/L |
| Basophils | 0.54 | 0.02-0.1 x $10^{9}$/L |
| Large unstained cells | 103.3 | 0.00 x $10^{9}$/L |

A representative field from a Romanowsky stained blood film from the FBC sample is show below.



a. Comment on the FBC results and the field captured from the patient's peripheral blood film. (20%)

b. Based upon the initial information provided from the presentation, FBC and blood film, outline and justify the possible differential diagnoses for this patient. (20%)

c. Predict the features you would expect to see in the patient's bone marrow trephine biopsy. (10%)

Following the full blood count and blood film results, immunophenotyping of peripheral blood cells was requested. The table below provides an outline of the results.

| **CD antigen** | **Result** |
|---|---|
| CD5 | positive |
| CD10 | negative |
| CD19 | positive |
| CD20 | positive |
| FMC7 | strong |
| CD79b | positive |
| CD22 | weak |
| CD23 | negative |
| CD25 | weak |
| CD200 | positive |
| Surface IgM | strong |

d. Critically discuss the value of immunophenotyping these cells and how it might be employed effectively in this case. (10%)

e. Cytogenetic analysis demonstrated the presence of t(11;14)(q13; q32).

(i) What is the diagnostic significance of t(11;14)(q13;q32)? (10%)

(ii) Provide the names of the genes involved in the reported translocation and explain their role in this pathology. (10%)

Further examination using immune-histochemical techniques demonstrated the proportion of ki-67 positive nuclei at 47% with immune-reactivity against p53.

f. Explain what these results represent in the context of this case. (15%)

g. Provide concluding remarks outlining this patient's diagnosis and prognosis. (5%)