Higher Specialist Diploma

Transfusion Science

Examination – September 2023

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

Please note this question paper is not to be removed from the examination room.

1. You have been asked to develop a sample acceptance policy for all blood transfusion samples received into your department. With regards to legislation and safety notices, briefly describe your policy and justify your decisions.

2. Your laboratory manager has asked you to evaluate the performance of a new third party blood grouping and antibody screening quality control kit. Briefly outline how you plan to do this, what you must consider and why.

3. You test a patient's sample on your automated analyser and the results indicate the patient has no red cell alloantibodies present. A serological crossmatch for two red cells is performed and is found to be positive against one of the units. Discuss the possible reasons for these results, the steps you would take and why.

4. You receive a second blood group and antibody screen sample from Theatres for a patient who was seen in your Emergency Department earlier the same day. During testing you discover the ABO blood group results are different to the one recorded earlier on the laboratory computer system. Outline the process you would follow to investigate the discrepancy and discuss any subsequent actions that you should take.

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Essay Paper

Discipline-specific questions

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 answer on a new page
4. Each question is worth 100 marks

1. With regards to current legislation, discuss the management of blood components in the hospital setting with respect to storage, transportation, and maintaining temperature control inside and outside the transfusion laboratory.

2. Critically discuss the reasons and various scenarios for performing red cell Rh/K and other extended phenotypes on both patient and donor red cell units, within the Blood Transfusion laboratory.

3. Describe the principles and practice of both serological crossmatch and electronic issue of red cells in a hospital laboratory setting. Critically discuss the risks and benefits associated with both techniques.

4. Discuss your approach to resolving cases where you have identified a pan reactive autoantibody in a recently transfused patient.

5. Critically discuss various causes of platelet refractoriness, how it can be confirmed and the treatment options available.

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CASE STUDIES

1. This seen case study will be the first question in the case studies examination.

2. There will be a further two unseen case studies in the examination.

3. Candidates should note that whilst they should spend time between the publication of the case study and the examination preparing their responses, they are **not** permitted to take any prepared answers into the examination room.

4. 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 77-year-old female patient presents in the Emergency Department, past medical history of hypertension and angina with a body weight of 39kg. Symptoms include increasing fatigue, shortness of breath and a productive cough. The patient has no transfusion history in the last three months. The patient was given IV antibiotics and prescribed three units of red cells. Preliminary results are shown below.

Parameter	**Result**	**Reference range (Adult female)**
Haemoglobin (Hb)	65g/L	115 – 155 g/L
White blood count (WBC)	17.3 x 10^9/L	4.5 -13.0 x 10^9/L
Platelet count	165 x 10^9/L	150 – 450 x 10^9/L
Blood group	O D Negative	
Antibody Screen	Negative	

Pre-transfusion observations
Heart Rate: 108bpm
Blood Pressure: 120/60

The patient received three units of group O D Positive red cells as per local transfusion policy:

- Unit 1 – transfused 275mls over 2.5 hours
- Unit 2 – transfused 280mls over 3 hours
- Unit 3 – transfused approximately 100mls and then stopped due to worsening shortness of breath and tachycardia.

Post- transfusion observations
Heart Rate: 115bpm
Blood Pressure: 180/70

a. From the information provided critically evaluate which of the following conditions is most likely to have caused the reaction and why, proactively excluding the other three conditions. (60 marks)

i. Transfusion-related acute lung injury (TRALI)
ii. Transfusion-associated circulatory overload (TACO)
iii. Acute haemolytic transfusion reaction (AHTR)
iv. Transfusion associated dyspnoea (TAD)

b. What further clinical and laboratory testing should be undertaken to aid in this differential diagnosis? (10 marks)

c. From the condition you have identified what current treatments are available? (10 marks)

d. Describe any preventative measures that can be put in place to prevent this from reoccurring? (10 marks)

e. Who would this be reportable to and why? (10 marks)

Unseen Case Studies

2.
A 12 year old female patient of African origin, with suspected sickle crisis/cell disease presents in the Emergency department with chest pain, fever and a violent cough. There is no patient history available, and her family explain that they are new to this country. Preliminary samples are taken.

Haematology and Biochemistry Results

Parameter	Result (pre transfusion)	Reference range (female child)
Haemoglobin (Hb)	55g/L	115 – 155 g/L
White blood count (WBC)	15.3 x 10^9/L	4.5 -13.0 x 10^9/L
Platelet count	108 x 10^9/L	150 – 450 x 10^9/L
LDH	340 IU/L	140-280 IU/L
Total Bilirubin	28 mmol/L	1.7 – 5.1 mmol/L

Blood Group Results

Anti-A	Anti-B	Anti-D1	Anti-D2	Control	A1 cells	B cells
0	4+	4+	4+	0	4+	0

Antibody Screen Results

Cell	Rh	C^w	C	c	D	E	e	M	N	S	s	P1	Lu^a	K	k	Kp^a	Le^a	Le^b	Fy^a	Fy^b	Jk^a	Jk^b	IAT
I	$R_1^wR_1$	+	+	-	+	-	+	-	+	-	+	-	-	-	-	+	-	-	+	-	-	**+**	**2+**
II	R_2R_2	-	-	+	+	+	-	+	-	+	+	+	-	-	+	-	+	-	+	-	+	-	**4+**
III	rr	-	-	+	-	-	+	+	-	+	-	+	+	+	+	-	-	+	-	+	+	+	**0**

Antibody Panel Results

Cell	Rh	C^w	C	c	D	E	e	M	N	S	s	P_1	Lu^a	K	k	Kp^a	Le^a	Le^b	Fy^a	Fy^b	Jk^a	Jk^b	**IAT**	**Pap**
1	$R_1^wR_1$	+	+	0	+	0	+	+	+	0	+	0	0	0	+	0	0	+	+	0	+	0	**3**	**0**
2	R_1R_1	0	+	0	+	0	+	+	0	+	0	3+	0	0	+	0	+	0	+	0	+	0	**4**	**1**
3	R_2R_2	0	0	+	+	+	0	+	0	+	+	3+	0	+	+	0	0	+	0	+	0	+	**4**	**4**
4	r'r	0	+	+	0	0	+	0	+	0	+	4+	0	0	+	0	0	+	+	0	+	+	**3**	**0**
5	r''r	0	0	+	0	+	+	0	+	+	0	0	0	0	+	0	0	0	+	+	0	+	**4**	**4**
6	rr	0	0	+	0	0	+	+	0	+	0	4+	0	+	+	+	0	0	0	+	+	0	**0**	**0**
7	rr	0	0	+	0	0	+	0	+	0	+	2+	0	+	+	0	0	0	+	+	+	+	**2**	**0**
8	rr	0	0	+	0	0	+	0	+	+	+	3+	0	0	+	0	0	+	+	+	0	+	**2**	**0**
9	rr	0	0	+	0	0	+	+	+	0	+	0	+	+	+	+	0	+	0	+	0	+	**0**	**0**
10	rr	0	0	+	0	0	+	+	0	0	+	3+	0	0	+	0	+	0	+	+	+	0	**3**	**1**
Auto																							**0**	

a. Critically discuss **ALL** of the results provided and what conclusions you have drawn. At this stage, if blood had been requested, what would you provide and why? (20 marks)

It has been confirmed that the patient has sickle cell disease. You perform an extended phenotype (shown below). Two units of red cells are requested for the next 4-6 hours from the ward.

Extended red cell phenotype:
C- D+ E- c+ e+ K- Fya- Fyb- M+ N- S- s+ Lea- Leb+ Jka- Jkb+

b. What are you most likely to provide and why? (10 marks)

The patient's condition improves, and she is sent home the following day. On day seven post transfusion she arrives back into ED and has developed severe pain, fever and dark urine with Hb of 46 g/dL, an LDH of 3082 IU/L, and total bilirubin of 64 mmol/L. The ward has requested three units of red cells.

Here are her new antibody screen and identification panel results

Cell	Rh	C^w	C	c	D	E	e	M	N	S	s	P1	Lu^a	K	k	Kp^a	Le^a	Le^b	Fy^a	Fy^b	Jk^a	Jk^b	IAT
I	$R_1^wR_1$	+	+	-	+	-	+	-	+	-	+	-	-	-	-	+	-	-	+	-	-	**+**	**4+**
II	R_2R_2	-	-	+	+	+	-	+	-	+	+	+	-	-	+	-	+	-	+	-	+	-	**4+**
III	rr	-	-	+	-	-	+	+	-	+	-	+	+	+	+	-	-	+	-	+	+	+	**4+**

Cell	Rh	C^w	C	c	D	E	e	M	N	S	s	P_1	Lu^a	K	k	Kp^a	Le^a	Le^b	Fy^a	Fy^b	Jk^a	Jk^b	**IAT**	**Pap**
1	$R_1^wR_1$	+	+	0	+	0	+	+	+	0	+	0	0	0	+	0	0	+	+	0	+	0	**4**	**4**
2	R_1R_1	0	+	0	+	0	+	+	0	+	0	3+	0	0	+	0	+	0	+	0	+	0	**4**	**4**
3	R_2R_2	0	0	+	+	+	0	+	0	+	+	3+	0	+	+	0	0	+	0	+	0	+	**4**	**4**
4	r'r	0	+	+	0	0	+	0	+	0	+	4+	0	0	+	0	0	+	+	0	+	+	**4**	**4**
5	r''r	0	0	+	0	+	+	0	+	+	0	0	0	0	+	0	0	0	+	+	0	+	**4**	**4**
6	rr	0	0	+	0	0	+	+	0	+	0	4+	0	+	+	+	0	0	0	+	+	0	**4**	**4**
7	rr	0	0	+	0	0	+	0	+	0	+	2+	0	+	+	0	0	0	+	+	+	+	**4**	**4**
8	rr	0	0	+	0	0	+	0	+	+	+	3+	0	0	+	0	0	+	+	+	0	+	**4**	**4**
9	rr	0	0	+	0	0	+	+	+	0	+	0	+	+	+	+	0	+	0	+	0	+	**4**	**4**
10	rr	0	0	+	0	0	+	+	0	0	+	3+	0	0	+	0	+	0	+	+	+	0	**4**	**4**
Auto																							**1**	

c. Discuss the significance of the patients results so far and what may be causing the reactions. What further testing would be required and why? (20 marks)

The ward informs you that the patient has deteriorated and would like the blood urgently.

d. What would you look to provide, what problems may you encounter and what is the likelihood you have suitable blood in stock? (25 marks)

e. In light of current guidelines, the patients identified condition and your local policies, how would you manage this case going forward if there was an ongoing blood requirement. (10 marks)

f. What current treatment regimes are available for patients with sickle cell disease? (15 marks)

3.

You receive a blood group and antibody screen sample for an antenatal patient presenting with a spontaneous abruption. You have no transfusion history on the patient in your laboratory computer system however upon contacting Labour ward you find out that she is from out of the area, is 26 weeks pregnant.

Mother Blood Group

Anti-A	Anti-B	Anti-D1	Anti-D2	Control	A1 cells	B cells
0	4+	0	0	0	4+	0

Mother Antibody Screen

Cell	Rh	C^w	C	c	D	E	e	M	N	S	s	P1	Lu^a	K	k	Kp^a	Le^a	Le^b	Fy^a	Fy^b	Jk^a	Jk^b	IAT
I	$R_1^wR_1$	+	+	-	+	-	+	-	+	-	+	-	-	-	-	+	-	-	+	-	-	**+**	**4+**
II	R_2R_2	-	-	+	+	+	-	+	-	+	+	+	-	-	+	-	+	-	+	-	+	-	**4+**
III	rr	-	-	+	-	-	+	+	+	+	-	+	+	+	+	-	-	+	-	+	+	+	**0**

Antibody Panel Results

Cell	Rh	C^w	C	c	D	E	e	M	N	S	s	P_1	Lu^a	K	k	Kp^a	Le^a	Le^b	Fy^a	Fy^b	Jk^a	Jk^b	**IAT**	**Pap**
1	$R_1^wR_1$	+	+	0	+	0	+	+	+	0	+	0	0	0	+	0	0	+	+	0	+	0	4	4
2	R_1R_1	0	+	0	+	0	+	+	0	+	0	3+	0	0	+	0	+	0	+	0	+	0	4	4
3	R_2R_2	0	0	+	+	+	0	+	0	+	+	3+	0	+	+	0	0	+	0	+	0	+	4	4
4	r'r	0	+	+	0	0	+	0	+	0	+	4+	0	0	+	0	0	+	+	0	+	+	0	0
5	r''r	0	0	+	0	+	+	0	+	+	0	0	0	0	+	0	0	0	+	+	0	+	0	0
6	rr	0	0	+	0	0	+	+	0	+	0	4+	0	+	+	+	0	0	0	+	+	0	0	0
7	rr	0	0	+	0	0	+	0	+	0	+	2+	0	+	+	0	0	0	+	+	+	+	0	0
8	rr	0	0	+	0	0	+	0	+	+	+	3+	0	0	+	0	0	+	+	+	0	+	0	0
9	rr	0	0	+	0	0	+	+	+	0	+	0	+	+	+	+	0	+	0	+	0	+	0	0
10	rr	0	0	+	0	0	+	+	0	0	+	3+	0	0	+	0	+	0	+	+	+	0	0	0
Auto																								

One hour later you receive samples from the baby. Results provided. Clinical details ? sepsis/anaemia

Baby Blood Group

Anti-A	Anti-B	Anti-D1	Anti-D2	Control	DAT
0	mf	mf	mf	0	2+

Baby Haematology and Biochemistry Results

Parameter	Result (pre transfusion)	Reference range (BABY)
Haemoglobin (Hb)	76 g/L	130 - 180 g/L
White blood count (WBC)	17.9 x 10^9/L	10.0 -26.0 x 10^9/L
Platelet count	96 x 10^9/L	150 – 450 x 10^9/L
Total Bilirubin	72 mmol/L	0 – 22mmol/L

a. Discuss all the results provided and suggest possible reasons for the baby's blood grouping results. (20 marks)

b. What further actions or testing would you undertake at this point and why? (15 marks)

Following the baby's results and deteriorating condition, you are asked to provide paediatric red cells urgently.

c. With regards to current guidance, what blood and platelet specifications would you select/provide in this scenario? (20 marks)

You work in a District General hospital, over two hours away from stock holding unit, where **no paediatric red cells are stocked**, the request for the baby has now become critically urgent. You have the choice of two red cell units in stock.

Red cell unit 1	Red cell unit 2
1 adult O D Negative red cell K- CMV- Expires in 15 days	1 adult O D Negative red cell K- Irradiated Expires in 13 days

d. Critically discuss pros and cons to selecting and transfusing either of these units in this scenario. (20 marks)

e. You have provided suitable blood and the baby has now been transferred to a specialist hospital. How will you report this event and what could be put in place to mitigate repetition of this event? (15 marks)

f. The mother suffers a post-partum haemorrhage - what red cells would you provide and why? (10 marks)