Higher Specialist Diploma

Transfusion Science

Examination 2019

Paper 3

Discipline-specific questions
120 minutes

Attempt 3 out of 6 questions

Instructions to candidates

1. Record your candidate number, qualification title and where appropriate the discipline and examination paper number 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 answer on a new page
4. Write on one side of the answer sheet only
5. Each question is worth 100 marks

1. Discuss the investigation of a suspected Donath Landsteiner (DL) antibody and the transfusion support required for a positive DL patient, should this be required.

2. Describe the theory and principles behind the indirect antiglobulin test (IAT); including how and why it is performed.

3. Provide an in-depth explanation of the immunological basis of red cell destruction due to incompatible transfusion and the laboratory testing associated with such an event.

4. Is there any standardisation in antibody titration? Critically evaluate the clinical relevance of undertaking titration studies and the results obtained.

5. Evaluate the benefit of access to patient clinical history and laboratory records in the transfusion process.

6. Discuss the advances in blood donation and preparation that have contributed to making blood and blood components safer for recipients. Explain the techniques involved and the reasons behind their introduction.

Higher Specialist Diploma

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Examination 2019

Paper 4 - Case studies

120 minutes

Attempt all case studies

Instructions to candidates

1. Record your candidate number, qualification title and where appropriate the discipline and examination paper number 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 answer on a new page
4. Write on one side of the answer sheet only
5. Each case study is worth 100 marks

PLEASE NOTE: Throughout this paper, where either antibody screening cells or antibody identification panel cells are shown are Lu(b+), Kp(b+) and Wr(a-), unless otherwise stated in the question itself. "I", "II" and "III" are screening cells 1 and 2.
"Pap" stands for Papain-treated red cells.
"IAT" stands for indirect antiglobulin technique using untreated red cells.
"DAT" stands for direct antiglobulin technique.
"^{mf}" stands for mixed-field.

Question 1 (Seen Question)

MV is a male patient of 1 year-of-age of a White ethnicity. He is undergoing investigations as a result of numerous unexplained bacterial and fungal infections, including recurrent pneumonia. He has lymphadenopathy, hepatosplenomegaly and growth deficiency. He was transfused at birth as a result of a low Hb caused by foetal infection by parvovirus B19, but this was not thought to have any clinical *sequalae*. His older brother and sister have no such symptoms, and his mother and father appear well.

His full blood count appeared relatively normal, however, upon examination of the blood film, there was evidence of acanthocytes. The creatine kinase level was found to slightly raise at 180 UL^{-1} (normal range 24-170 UL^{-1} for age and sex). A defect in the nicotinamide adenine dinucleotide phosphate (NADPH) oxidase in the neutrophils was detected.

Although the haemoglobin and haematocrit were normal, a group and save and antibody screen were sent to the Blood Bank.

a. Why? (15 marks)

The results of the grouping of the baby's red cells were group O, D+, C+, c+, E-, e+, K-. The results of the antibody screen and the antibody panel are shown below.

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
																							MV
I	$R_1{}^wR_1$	+	+	-	+	-	+	+	-	-	+	-	-	-	-	-	-	-	+	-	-	+	**3+**
II	R_2R_2	-	-	+	+	+	-	+	-	-	+	+	-	-	+	-	+	-	+	-	+	-	**3+**
III	rr	-	-	+	-	+	+	+	+	+	-	+	-	+	+	-	-	+	-	+	+	+	**3+**

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+**	**3+**
2	R_1R_1	0	+	0	+	0	+	+	0	+	0	3+	0	0	+	0	+	0	+	0	+	0	**3+**	**3+**
3	R_2R_2	0	0	+	+	+	0	+	0	+	+	3+	0	+	+	0	0	+	0	+	+	+	**3+**	**3+**
4	r'r	0	+	+	0	0	+	0	+	0	+	4+	0	0	+	+	0	+	+	0	0	+	**3+**	**3+**
5	r''r	0	0	+	0	+	+	0	+	+	+	0	0	0	+	0	+	0	+	+	0	+	**3+**	**3+**
6	rr	0	0	+	0	0	+	+	+	+	0	4+	0	+	+	0	0	0	0	+	+	0	**3+**	**3+**
7	rr	0	0	+	0	0	+	0	+	0	+	2+	0	0	+	0	+	0	+	+	0	+	**3+**	**3+**
8	rr	0	0	+	0	0	+	+	0	+	+	3+	0	0	+	0	0	+	+	+	0	+	**3+**	**3+**
9	rr	0	0	+	0	0	+	0	+	0	+	0	+	0	+	0	0	+	0	+	0	+	**3+**	**3+**
10	rr	0	0	+	0	0	+	+	+	0	+	3+	0	+	0	0	+	0	0	+	+	0	**3+**	**3+**
Auto	R_1r	/	+	+	+	0	+	/	/	/	/	/	/	0	/	/	/	/	/	/	/	/	**0**	**0**

b. Would you test for any other antigens? If so, which antigens, why and how? (20 marks)
c. What is the probable specificity of the antibody/are the specificities of the antibodies? How would you prove your theory? (20 marks)
d. If your theory as to the child's ailment is to be proved at a genetic level, which chromosome would be examined and why? (20 marks)
e. What other, very rare, weakened form of blood group system antigen expression is also governed by genes mapped to the same position? (10 marks)

f. What blood would this child require if a transfusion is needed? (5 marks)

g. Given modern medicine, and given your theory as to the main ailment from which the child is suffering, can this child look forward to a normal life, or will he have symptoms? If he has symptoms, what will these be, and what, if any, will be the most serious, possibly even fatal? (10 marks)

Unseen Case Studies

2.

a. Identify the antibody/antibodies present in the plasma of a multigravida, multiparus 28-year-old group A Caucasian pregnant woman, SN, who is 19/40 weeks of gestation, and who declined foetal genotyping at 14/40 weeks of gestation. From the antibody screen and antibody identification panel below, what antibodies are probably present, and what cannot be ruled out. Explain, in detail, what would be required to prove your supposition. (30 marks)

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 **SN**
I	$R_1{}^wR_1$	+	+	-	+	-	+	+	-	-	+	-	-	-	-	-	-	-	+	-	-	**+**	**0**
II	R_2R_2	-	-	+	+	+	-	+	-	-	+	+	-	-	+	-	+	-	+	-	+	-	**4+**
III	rr	-	-	+	-	+	+	+	+	+	-	+	-	+	+	-	-	+	-	+	+	+	**2+**

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	**0**	**0**
2	R_1R_1	0	+	0	+	0	+	+	0	+	0	3+	0	0	+	0	+	0	+	0	+	0	**0**	**0**
3	R_2R_2	0	0	+	+	+	0	+	0	+	+	3+	0	+	+	0	0	+	0	+	+	+	**4+**	**5+**
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	+	**4+**	**5+**
6	rr	0	0	+	0	0	+	+	+	+	0	4+	0	+	+	0	0	0	0	+	+	0	**2+**	**0**
7	rr	0	0	+	0	0	+	0	+	0	+	2+	0	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	+	0	+	**2+**	**0**
10	rr	0	0	+	0	0	+	+	+	0	+	3+	0	+	0	0	+	0	0	+	+	0	**2+**	**0**
Auto	rr	/	0	+	0	0	+	/	/	/	/	/	/	0	/	/	/	/	/	/	/	/	**0**	**0**

b. What further tests would you perform on the current sample, using what reagents and why? (30 marks)

c. What other samples would you request and why? (30 marks)

d. Describe how you would go about providing blood components/products for this lady, and what special requirements may be appropriate during her pregnancy, and at birth if different. (10 marks)

3.

An out-of-hours request is received by a hospital laboratory for four units of red cells required for urgent transfusion to a 60-year-old female patient (Mrs. Z), previously unknown to the laboratory, following a road traffic accident. The patient is found to be group A, D Positive on two samples taken at different times, the antibody screen is positive and all four units are IAT cross-match compatible.

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
																							Z
I	$R_1{}^wR_1$	+	+	-	+	-	+	+	-	-	+	-	-	-	-	-	-	-	+	-	-	**+**	**0**
II	R_2R_2	-	-	+	+	+	-	+	-	-	+	+	-	-	+	-	+	-	+	-	+	-	**1 +**
III	rr	-	-	+	-	+	+	+	+	+	-	+	-	+	+	-	-	+	-	+	+	+	**0**

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	**1+**	**3+**
2	R_1R_1	0	+	0	+	0	+	+	0	+	0	3+	0	0	+	0	+	0	+	0	+	0	**1+**	**3+**
3	R_2R_2	0	0	+	+	+	0	+	0	+	+	3+	0	+	+	0	0	+	0	+	+	+	**0**	**1+**
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**
6	rr	0	0	+	0	0	+	+	+	+	0	4+	0	+	+	0	0	0	0	+	+	0	**1+**	**3+**
7	rr	0	0	+	0	0	+	0	+	0	+	2+	0	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	+	0	+	**0**	**0**
10	rr	0	0	+	0	0	+	+	+	0	+	3+	0	+	0	0	+	0	0	+	+	0	**1+**	**3+**
Auto	R_2r	/	0	+	+	+	+	/	/	/	/	/	/	0	/	/	/	/	/	/	/	/	**0**	**/**

a. While the antibody identification panel is in progress, the clinical team require that the cross-matched red cells are issued due to the deteriorating condition of the patient. Discuss an appropriate response to the clinical area. (30 marks)

b. Having reviewed the antibody screen and panel data (see above) suggest the possible reasons for the original serological findings and identify any further testing that might be required. (40 marks)

c. The continuing deterioration of the patient's condition results in the Clinical Area requesting a further six units of red cells to be prepared within the next 45 minutes. Identify the immediate actions to be taken. (15 marks)

d. The Clinical Area telephones the Laboratory two hours later to inform you that the patient's condition has now stabilised and the patient has been transferred to intensive care. What follow-up actions need to be considered on hand-over to the routine day Laboratory staff, and how might this incident need to be documented? (15 marks)