1. Which of the following is **NOT** recommended as a part of routine pre-transplant immunological evaluation:
    a. HLA typing of Donor and Recipient
    b. Assessment of Anti-HLA antibodies using a solid phase assay
    c. Flowcytometric or a CDC crossmatch
    d. Non-HLA antibody assessment

2. Match the following tests with the platform(s) or equipment used:

1. CDC Crossmatch	A. Next-Generation Sequencing
2. Flowcytometric Crossmatch	B. Terasaki 72 well Plates
3. Panel Reactive Antibody testing	C. Luminex platform
4. High Resolution HLA typing	D. FITC-Conjugated anti-IgG Antibodies

    The correct combination is

    a. 1-D, 2-A, 3-C, 4-B
    b. 1-B, 2-C, 3-D, 4-A
    c. 1-B, 2-D, 3-C, 4-A
    d. 1-B, 2-D, 3-A, 4-C

3. The purpose of pre-transplant immunologic testing is to:
    a. Risk Stratify Donor-Recipient pairs and Identify pre-formed antibodies
    b. Identify which patients will benefit from Kidney Paired Donation or Desensitization
    c. Identify which patients are unlikely to get an organ offer
    d. All of the above

4. Which type of sensitization is most long lived?
    a. Blood transfusion
    b. Pregnancy
    c. Previous Transplant
    d. Post-Infections

5. The CDC crossmatch of a patient with his prospective donor is positive (reported as 60%). What does this number “60” signify?
    a. 60% cells will appear bright yellow-orange, and are considered viable
    b. 60% cells will appear red and are considered dead
    c. This is reported from the well with highest dilution
    d. Only nucleated cells (mononuclear) are counted while scoring

6. Which one of the following will best identify a high risk for hyper-acute rejection?
    a. Complete HLA mismatch between recipient and donor
    b. Positive B cell Flow crossmatch
    c. Positive T-cell Complement Dependent Cytotoxicity crossmatch
    d. Positive virtual crossmatch

7. HLA typing is commonly performed using all of the following methods, **EXCEPT**
    a. Sequence-Specific Oligonucleotide (SSO) probes

b. sequence-specific primer (SSP)
c. Flowcytometry
d. Luminex

8. The microcytotoxicity test for HLA typing was developed by
   a. Paul Terasaki and McClelland
   b. Jean Dausset
   c. Paul Terasaki and Ramon Patel
   d. Jon van Rood and Rose Payne

9. A CDC crossmatch between a recipient and his prospective donor is as under

CDC-XM	CDC-AHG	Auto Xm	CDC-DTT
30%	35%	Neg	Neg

   The inference from the above testing is:
   a. The CDC crossmatch is labelled NEGATIVE, standard cut off being >40%
   b. The XM is positive: positivity is due to an IgM antibody
   c. IgM antibodies are not significant in kidney transplantation
   d. We should wait for 12 weeks for an IgM to IgG class switch

10. Which is the CORRECT interpretation of results of T-cell and B-cell crossmatch results

	T Cell Flow Xm	B Cell Flow Xm	Interpretation
a	Pos	Pos	Flow Xm is often false positive Can transplant if CDC-XM is negative
b	**Pos**	**Pos**	**Antibodies to Class I ± Class II HLA** **Should not transplant**
c	Neg	Pos	Class II antibodies or False Positive Can proceed for transplant
d	Pos	Neg	Can be due to RITUXIMAB effect May proceed for Transplant if such history is present

11. Mitosis occurs when mixing lymphocytes of two individuals of differing MHC class II haplotype. This principle is used in
    a. Serologic PRA estimation
    b. Mixed lymphocyte culture techniques
    c. Desensitization with Bortezomib
    d. SSOP methods

12. A 40 year male, on dialysis is being worked up for transplant with his elder sister as donor. He hasn't had any previous transplants or blood transfusions. The flow crossmatch shows negative T-cell crossmatch with Positive B Cell crossmatch. However, the positivity is borderline (108 MCS, Lab cut off 100 MCS). The SAB analysis is negative. Which of the following is NOT TRUE in this scenario:

a. Isolated B cell crossmatch can be caused by previous rituximab treatment
b. Non-HLA antibody testing may be positive in some cases.
c. Non-specific, non-pathogenic autologous antibodies can cause low level false positive B-cell crossmatch positivity
d. Isolated B cell crossmatch positivity can be neglected, as it is not associated with rejections or poor graft outcomes

13. Which B-cell development stages are NOT targeted by rituximab (anti-CD20 antibody)?
    a. Peripheral B cells
    b. Pre-B cell
    c. Memory B cell
    d. Plasma cells

14. What does linkage disequilibrium mean in the context of HLA-typing
    a. It is the reason why siblings can have 0% HLA match
    b. It denotes some HLA loci combinations are more frequent than what can be expected by chance
    c. It is the reason why children may have less than haplo-match or no match with one of the parents
    d. Knowledge of linkage disequilibrium helps us predict HLA-A and HLA-B combinations

15. The first principle of transplant immunology would be to
    a. Identify donors with highest HLA match, especially Class II
    b. Avoid pre-formed antibodies, both class I and Class II
    c. Identify the youngest compatible donor
    d. Avoid ABO-incompatible donors

16. In the context of deceased donor transplant, what is true?
    a. Donor cell viability is similar in living and deceased donors
    b. NGS platforms are the preferred method of HLA typing as it gives high resolution typing
    c. Flow cytometric crossmatches can be done using cells form spleen or lymph nodes
    d. A recipient SAB analysis within 1 year is needed for virtual crossmatching

17. Regarding Panel Reactive Antibody Assay, which is TRUE?
    a. It is based on serological testing with multiple donors from the community
    b. It is based on a solid phase assay and the knowledge of local HLA prevalences
    c. The commercially available kits are based on western population and cannot be extrapolated to our population
    d. The PRA beads contain recombinant HLA antigens from many patients coated on each bead.

18. A multiparous female has enlisted on deceased donor waitlist. On evaluation her PRA class I was 52% and PRA class II was 38%. What is the interpretation?

a. She is likely have antibodies to 90 (52+38)% of all donors
b. She is likely to have to have VERY HIGH LEVELS of Donor Specific Antibodies to 52% of donors
c. She is likely to have antibodies to AT LEAST 52% DONORS, although some of these antibodies may not have very high MFIs
d. She is a candidate for desensitization

19. A 28 year male with IgA nephropathy developed ESKD. He has come to you for transplant with his elder brother as the donor. He has never received any transfusion. What will be your immunological assessment strategy?
    a. HLA typing may not be undertaken as he is likely to be haplotype-matched
    b. A CDC or Flow crossmatch is sufficient
    c. A Mixed Antigen Screen Assay (qualitative anti-HLA antibody assay) is the most cost-effective method to rule out preformed antibodies
    d. A full single antigen bead assay is necessary

20. A 22 year unmarried female with crescentic lupus nephritis presented with ESKD. Her mother is the prospective donor. She has received 3 units of blood transfusion at the time of diagnosis of lupus, 4 years back. The Mixed Antigen Screen Assay for anti-HLA antibodies is negative. However, the CDC crossmatch is positive (T cell 35%, B cell 50%). What will be the ideal approach?
    a. Counsel for a second donor
    b. Do a SAB analysis
    c. Repeat a CDC crossmatch with Auto-Crossmatch
    d. Ask for a flowcytometric crossmatch

21. A 30 year male, with CKD of unknown etiology has come for transplant. His father is the prospective donor. He has 4 units of blood transfusions 5 months back. His Mixed Antigen Screen Assay is positive. The Calculated PRA is 54% for class I and 10% for class II. He has multiple class I anti-HLA antibodies on the SAB analysis. None of these are donor specific. What will be the ideal approach?
    a. Proceed for transplant with the same donor
    b. Counsel for a second donor
    c. Wait for 6 month, repeat a SAB assay and then decide
    d. Counsel for kidney paired exchange

22. The HLA typing of two sisters is presented below:

	A		B		DR		DQB	
Sister 1	1	2	8	44	4	17	2	8
Sister 2	3	29	44	-	7	15	2	6

The correct interpretation is:
    a. Unlikely to be real sisters, as there is poor HLA match
    b. If 2 donates to 1, there is 5/6 mismatch at ABDR.
    c. If 1 donates to 2, there is 5/6 mismatch at ABDR.
    d. High Resolution typing is needed to decide on relationship

23. A kidney transplant recipient developed graft failure after 8 years of transplant. He had previously received a kidney from his mother. Their HLA typing is as under:

	A		B		DR		DQB	
Patient	2	33	7	78	1	10	5	-
Donor	2	**24**	7	78	1	**15**	5	6

His SAB analysis shows multiple anti-HLA antibodies in Class I against HLA-A2, A9(23,24), A28(68,69), B17(57,58)All MFIs are above 8000. He denies any previous blood transfusions. What is the reason for developing so many antibodies?

a. It may be due to drug non-compliance
b. Intermittent infections can cause such antibodies
c. **This is due to cross reactive epitopes shared between these HLA antigens**.
d. These antibodies don't have any clinical relevance

24. A 35 year female with CKD on dialysis came for transplant. Her husband is the only prospective donor. Both are blood group A. She has 1 living child and a unexplained fetal death at 7 month gestation. There is no history of blood transfusion. The HLA typing is shown as under:

	A		B		DR		DQB	
Patient	2	33	7	78	1	10	1	5
Donor	**1**	**24**	**8**	78	**4**	**15**	**6**	**7**

The mismatches are highlighted. There are multiple DSA, but all are low titer.
A24 – 1500 MFI, B8-1700 MFI, DR15 1300 MFI, DQ7 1000 MFI.
What will be the best approach?

a. PROCEED: The current antibody profile is favourable
b. OPT FOR KPD: With multiple pregnancies and DSAs, there is risk of strong memory response
c. DECIDE: If the flow crossmatch is negative, we can proceed for the transplant
d. OPT TO ENLIST FOR DDKT

25. A 44 year male is on dialysis for 7 months. His elder brother has come forward as a donor. There are one haplo-matched. The patient was found to have CDC and Flow Crossmatches negative. Mismatches are highlighted.

	A		B		DR		DQB	
Patient	11	24	35	61	14	15	6	-
Donor	**1**	24	**7**	35	**4**	15	6	**7**

SAB analysis shows multiple DSAs: A24 -3600 MFI, B35 – 2100 MFI, DR4 2950MFI, DQ7 2500 MFI.
What is NOT true about the approach to such positive DSAs with negative crossmatches:

a. Check the negative and positive control of the crossmatches and SAB analysis
b. Revisit sensitization history: Rule out false positives
c. Flow crossmatches are usually able to pick up antibodies beyond 3000-4000 MFI, but its not universal
d. A CDC XM is more useful in such settings as it is more specific.

26. A 27 year old male, with CAKUT is currently on dialysis. He has received multiple blood transfusions since birth, typically during surgeries for various CAKUT components and once for a burst AV Fistula. Mismatches are highlighted.

	A		B		C		DR		DQB		DP	
Patient	11	31	51	52	12	14	17	15	2	6	2	3
Donor	11	31	51	**57**	**6**	14	17	**7**	2	**9**	**1**	2

The SAB analysis shows multiple DSAs: DP1-8000, DR7-4500, B57-4000. Which antibodies should you be most concerned about?

a. DP1, DR7, as they are Class II antibodies
b. B57 as it is Class I antibody
c. B57 and DR7: as ABDR matching is of highest significance.
d. Depends on the flow Xm results.

27. Why are HLA-C and HLA-DP antibodies on SAB analysis not considered significant at MFI below 10000?

a. They are usually non-pathogenic
b. They don't bind complement
c. Their expression on the cell surface is not very high
d. Beads usually contain denatured HLA-C and -DP antigens

28. The Single Antigen Bead assay of a 54 year male, planned for a 2nd transplant with a deceased donor is presented below. Pick the CORRECT statements.

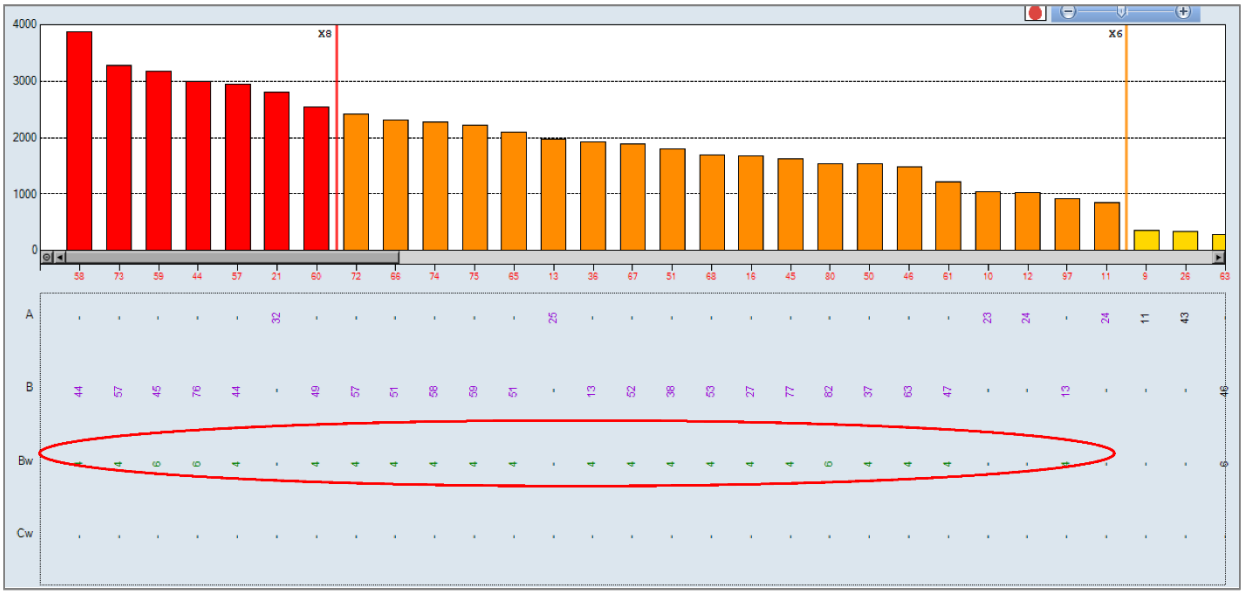
Positive CON MFI: 19246 **Negative CON MFI:** 210 **Analysis Mode:** Manual **% PRA:** 64

Antigen ID	Cut-off	Raw Value	MFI/LRA	BG Adjusted	AD-MFI	AD-BG Adjusted	A	B	C	Bw	A Serology	B Serology	C Serology	RAD	Epitopes
118	3.96	19410	147.05	19216	13027	12897	***A*29:02***				A29(19)			1.4900	
117	4.07	19240	145.76	19006	15197	15013	***A*29:01***				A29(19)			1.2660	
134	4.32	19119	110.20	18864	12944	12772		***B*07:02***		***Bw6***		B7		1.4770	
177	3.47	19077	109.95	18939	11478	11395		***B*67:01***		***Bw6***		B67		1.6620	
126	4.00	19075	144.50	18851	15546	15363	***A*43:01***				A43			1.2270	
150	3.41	19021	109.63	18898	10603	10534		***B*27:08***		***Bw6***		B2708		1.7940	
173	3.98	19011	109.57	18751	14413	14216		***B*56:01***		***Bw6***		B56(22)		1.3190	
159	4.06	18776	108.22	18585	13556	13418		***B*42:01***		***Bw6***		B42		1.3850	
181	3.94	18730	107.95	18501	13782	13614		***B*82:02***		***Bw6***				1.3590	
171	4.11	18561	106.98	18311	13401	13221		***B*54:01***		***Bw6***		B54(22)		1.3850	
180	3.87	18267	105.29	18048	13314	13154		***B*81:01***		***Bw6***		B81		1.3720	
172	4.45	17665	101.82	17386	15388	15145		***B*55:01***		***Bw6***		B55(22)		1.1480	
115	3.58	16560	125.45	16428	9810	9732	***A*25:01***			Bw4	A25(10)			1.6880	
130	3.54	16222	122.89	16066	10425	10325	***A*68:02***				A68(28)			1.5560	

i. The positive and the negative controls are proper
ii. The numbers in parenthesis in the right columns (A and B serology) denote broad HLA antigens
iii. We should avoid a donor with HLA-B*42:01/B*55:01
iv. Epitope analysis is not provided; it will be mandatory for deceased donor organ allocation in this situation

a. i and ii are correct
b. i and iii are correct
c. i, ii and iii are correct
d. All options are correct

29. A 38 year old male, had undergone kidney transplant with father donor 12 years back. Now he has come to you for a second transplant. He has multiple anti-HLA antibodies on his SAB assay. Pick the INCORRECT analysis.



   a. **There are multiple DONOR SPECIFIC ANTIBODIES in the assay**
   b. The assay is positive, but whether these are DSAs is not known
   c. There is broad sensitization against Bw4 public antigen
   d. Bw4 is shared between multiple B types and a few A types, while Bw6 is shared between multiple B types and a few C types

30. A mother wants to be the kidney donor for her daughter with CKD. The daughter is currently on CAPD with multiple failed accesses. She is awaiting a 3rd transplant. She is also broadly sensitized, with PRA > 80%. She has multiple donor specific antibodies to her mother's HLA antigen: Class I around 15000-20000 MFI , Class II – 20000-22000 MFIs. She has been told that desensitization can be helpful for her. The Flow XM and CDC-XM are both strongly positive.
   a. Desensitization can offer the only chance of early transplant
   b. She will require 5-7 sessions of Plasma Exchange and Rituximab for desensitization
   c. Tocilizumab will be the first line drug due to strong DSA MFIs
   d. **She is not a candidate for desensitization due to extremely high DSA MFIs**